Vidarbha Youth Welfare Society, Amravati's

Bar. Ramrao Deshmukh Arts, Smt. Indiraji Kapadiya Commerce and Ny. Krushnarao Deshmukh Science College, Badnera

Distt. Amravati (Maharashtra) 444 701

(Accredited by NAAC with "B++" Grade, CGPA 2.78)

(Affiliated to Sant Gadge Baba Amravati University, Amravati, MS)

CRITERION–III
Research, Innovations and Extension
3.5 Collaboration
3.5.1 (C) List and copies of documents indicating the functional MOUs/linkage/collaborations activity-wise and year-wise

Vidarbha Youth Welfare Society's
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Ny. Krushnarao Deshmukh Science College, Badnera Distt. Amravati (Maharashtra) 444 701
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Ref.No. 248/2824

Date : 29 / 01 /2025

DECLARATION

This is to declare that the information, photos, reports, true copies, numerical data, etc. furnished in this file as supporting documents is verified by IQAC and found correct.

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IQAC Co-Ordinator

Dr. Nakul A. Deshmukh
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PRINCIPAL
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Science College,BADNERA.

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BADNERA
AMRAVATI

Vidarbha Youth Welfare Society, Amravati

Bar. Ramrao Deshmukh Arts, Smt. Indiraji Kapadiya Commerce and Ny. Krushnarao Deshmukh Science College,

Badnera Dist. Amravati (M.S) 444701

SUPPORTING DOCUMENTS

Vidarbha Youth Welfare Society, Amravati

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Badnera Dist. Amravati (M.S) 444701

Metric No. 3.5.1 (C)

INDEX

List and copies of documents indicating the functional MOUs / linkage / collaborations activity-wise and year-wise

प्राचार्य कार्यालय के कार्यालय प्रमुख

अजय विष्णुपंत देशमुख
मुद्रांक विक्रेता अज्ञ. ३/१९८६
अमरावती

09 DEC 2022

Memorandum Of Understanding (MoU)
Between
Bar. Ramrao Deshmukh Arts, Smt. Indiraji Kapdiya Commerce & Nyaymurti Krushnarao Deshmukh Science College, Badnera (Rly.), Dist. Amravati (M.S.)
and
Vidya Bharati Mahavidyalaya, Amravati (M.S.)

It is hereby agreed by and between the parties here to as follows:

This MoU is initiated on 09 December 2022 and enforced from the same date for next five years i.e. upto 08 December 2027, by and between Vidya Bharati Mahavidyalaya, Amravati (here in after abbreviated as VBMV) and Bar. Ramrao Deshmukh Arts, Smt. Indiraji Kapdiya Commerce & Nyaymurti Krushnarao Deshmukh Science College, Badnera (Rly.), Dist. Amravati (M.S.) (here in after abbreviated as RDIK and NKD College) for the following objectives:

Objectives of this MoU:

1) To promote and enhance the academic interest of the students of both institutes by providing training, internship, field trip, On-the-job training or innovative activities such as Quiz, Essay, Poster, Elocution competition, etc. through a suitable mode.
2) Both parties shall co-operate in organizing various workshops/conferences/seminars/training sessions, as and when needed.
3) Both the parties shall collaborate to provide students and faculty the necessary atmosphere and facilities for the promotion of:
    - Joint publications of research work in various disciplines.
    - Inter-disciplinary and multi-disciplinary studies.
    - Participation and support in various academic activities.
    - Exchange of materials in education and research, publications, and academic information;
    - Exchange of research scholars;
    - Exchange of UG/PG students;
    - Joint research and meetings for education and research;
    - Technical assistance
4) To provide academic interactions by organizing guest lectures of faculty of both the institutions on various topics with mutual consent, as and when needed.
5) To promote research and continuing co-curricular and extra-curricular activities in conjugation, as an when needed.
6) To share information about various funds available from various funding agencies for research, infrastructure development, teaching aids, etc.
7) Collaboration and sharing of Academic data, Scientific Information, Intellectual properties, Articles and Publications.
8) The financial implications and expenditures, if any, associated with execution of any training, internship, field trip, On-the-job training, co-curricular and extra-curricular activities or other learner centric activities through a suitable mode will be subjected to negotiations and mutual consensus.
9) To promote co-curricular and extra-curricular activities in conjunction, as and when needed, for achieving other objectives of this MoU.
10) To promote and enhance the capacity building amongst the students of the two institutions, as and when required, using a suitable mode.
11) To develop the creative leadership amongst the students for the nation building by providing suitable platforms and facilities, to be offered jointly, using resources of both the parties.

Before these activities can be implemented, both parties shall discuss the same in details involved to the satisfaction of each party and enter into specific activity agreements based on the mutually agreed objectives and outcomes. Any issue or dispute arising, while execution or in interpretation of these objectives, will be resolved by mutual understanding and deliberations. Breach of any terms and conditions would make this agreement liable for termination.

This MoU is executed in duplicate with each copy being an official version and having equal legal validity.

By signing below, the Institutes, acting by their duly authorized officials, have caused this MoU to be executed on the date written above.

Principal
Bar. Ramrao Deshmukh Arts,
Smt. Indiraji Kapdiya Commerce
& Nyaymurti Krushnarao
Deshmukh Science College
Badnera, Dist. Amravati (M.S.)

Principal
Vidya Bharati Mahavidyalaya,
Vidya Bharati Mahavidyalaya
Amravati.

Witness 1:

Witness 2:

The details of witnesses are on next page along with their signature.

Witness 1:

Dr. J. R. Bansod
28, Kantakunj, Meghdoot Colony,
Near Amar Colony, Amravati- 444 606

Witness 2:

Prof. Dr. V. H. Masand
A-101, Platinum Empire Building,
Sindhi Chowk, Amravati- 444 603

Report on

Student Exchange Program

conducted under MoU with RDIK & NKD College, Badnera-Amravati

Session: 2022-23

Under an active and functional MoU in existence between Vidya Bharati Mahavidyalaya, Amravati and RDIK & NKD College, Badnera-Amravati has proved to be of mutual benefits of students and teachers for optimum utilization of available resources for holistic development of learners. The objective of the MoU is to facilitate the holistic development of the learners of the two institutions. In this regard, the two institutions have made good joint efforts to provide students and faculty the necessary atmosphere and facilities for the promotion of skill enhancement. In the session 2022-23, the Department of chemistry, RDIK & NKD College, Badnera-Amravati deputed five students pursuing M.Sc. (Chemistry) to accomplish their research projects, which are a part of their curriculum. Further, details are as following:

Sr. No.	Name of students/Beneficiaries	Class	Supervisor/Head	Duration
1	Ms. Komal S. Raut	M.Sc. (Chemistry)	Dr. S.D. Thakur, RDIK &NKD College. Badnera-Amravati	January 2022 to May 2022
2	Mr. Hemant R. Garud	M.Sc. (Chemistry)	Dr. S.D. Thakur, RDIK &NKD College, Badnera-Amravati	January 2022 to May 2022
3	Ms. Danshree M. Borse	M.Sc. (Chemistry)	Dr. S.D. Thakur, RDIK &NKD College, Badnera-Amravati	January 2022 to May 2022
4	Ms. Kavita A. Parsankar	M.Sc. (Chemistry)	Dr. S.D. Thakur, RDIK &NKD College, Badnera-Amravati	January 2022 to May 2022
5	Ms. Pragati A. Rithe	M.Sc. (Chemistry)	Dr. S.D. Thakur, RDIK &NKD College, Badnera-Amravati	January 2022 to May 2022

The students were training for using 'Microscale techniques', handling different advanced instruments like FT-IR, UV-Vis spectrophotometer, pH-meter, Rotary evaporator, a few to mention. Prof. Dr. M. M. Rathore, Head, Department of Chemistry, Prof. Dr. V. H. Masand and

Dr. C. N. Deshmukh continuously took efforts and supervised for the successful accomplishment of the projects. The students were present all the time in the college for the project. The students revealed their satisfaction after competing their project.

Outcome: The students were benefitted by the expertise of the subject experts. They learned handling advanced instruments. They developed a high level of interest in doing research. They acquired new skills, which could help them to secure a bright career in the field of chemistry.

Head
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Certificate

This is to certify that Ms./Mr Ms. **Komal S. Raut** studying in M.Sc.II (Chemistry) Semester-IV at Department of Chemistry, RDIK & NKD College, Badnera-Amravati has accomplished his/her P.G. project during the session 2022-23 at Vidya Bharati Mahavidyalaya, Amravati under the joint MoU. His/her performance was found to be satisfactory.

Date: 15/03/2023

Place: Amravati

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Date: 15/03/2023

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This is to certify that Ms./Mr Ms. **Danshree M. Borse** studying in M.Sc.II (Chemistry) Semester-IV at Department of Chemistry, RDIK & NKD College, Badnera-Amravati has accomplished his/her P.G. project during the session 2022-23 at Vidya Bharati Mahavidyalaya, Amravati under the joint MoU. His/her performance was found to be satisfactory.

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Journal of Drug Design and Research

Research Article

QSAR Analysis of Tipifarnib Analogues for Anti-Chagas Disease

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Keywords
- QSAR
- Tipifarnib
- Anti-Chagas Disease
- Drug Designing

Abstract

The cancer drug trial candidate Tipifarnib and its derivatives were subjected to a thorough QSAR analysis in the current study for the undertreated disease anti-Chagas. The study was effective in identifying the crucial structural elements that regulate the anti-Chagas profile of tipifarnib derivatives as a potential treatment. The genetic algorithm-multilinear regression (GA-MLR) method was used to create many models employing multiple splits in order to determine the greatest number and set of significant molecular descriptors. The created QSAR models have R2 > 0.85, Q2 > 0.82, and R2ext > 0.90, making them tri-parametric and statistically robust. The models are both internally and externally predictively strong. The models show a correlation between nitrogen's interaction with lipophilic atoms and the anti-Chagas activity of tipifarnib analogues.

ABBREVIATIONS

QSAR = Quantitative Structure-Activity Relationship; GA-MLR= Genetic Algorithm-Multilinear Regression; CYP51 = Cytochrome P450 51; ADMET = Absorption; Distribution; Metabolism; Excretion; and Toxicity; EC_{50} = Median Effective Concentration; pEC50 = negative logarithm of the EC_{50}; OECD = Organisation for Economic Co-operation and Development; GA = Genetic Algorithm; CV = Cross-validation; LOO = Leave-one-out; LMO = Leave-many-out; AD = Applicability Domain; FSM = Full Set Model; RMSE = Root Mean Square Error ; MAE = Maximal Absolute Error; MSA = Molecular Surface Area

INTRODUCTION

Chagas disease commonly spread by contact with an infected triatomine bug also known as "Kissing bug," "Benchuca," "Vinchuca," "Chinche," or "Barbeiro," is one of the most underdiagnosed parasitic diseases that can lead to life-threatening cardiac and stomach conditions [1]. It is often communicated through contact with an infected triatomine bug. Each year, the disease affects about ten million individuals, with the majority of cases concentrated in tropical areas like Africa and Latin America [2]. The protozoan parasite Trypanosoma cruzi (T. cruzi), a kinetoplastid hemoflagellate, is the cause of Chagas disease. Because there is no effective treatment available during the chronic stage of the illness, those who have been infected typically become a permanent host to the parasite. Nitrofuran, nifurtimox, benznidazole, and nitroimidazole are only a few of the very toxic medications that are commonly used in chemotherapy. The situation has worsened with the advent of resistance against nifurtimox [1,3-7]. Therefore, search for a new therapeutic agent or modification of existing one to curb Chagas disease is essential [8,9].

T. cruzi was recently discovered to be successfully inhibited by tipifarnib, a well-known anti-cancer drug created by Johnson & Johnson Pharmaceuticals [1]. The inhibition of endogenous sterol biosynthesis and binding to recombinant T. cruzi CYP51 provided further evidence that the target enzyme, CYP51, was implicated in the mechanism of bio-action in T. cruzi. T. cruzi amastigotes, which are the stage of the parasite's life cycle that develop in mammalian host cells, use ergosterol as a crucial component in the creation of their membranes because they are unable to utilise cholesterol from the host cells. It is a desirable lead molecule due to a number of benefits including excellent oral bioavailability, acceptable pharmacokinetic characteristics, and good human tolerance. But because tipifarnib has a chiral centre, it can exist in two stable isomeric forms [1]. Therefore, choosing a therapeutic candidate would require a separate examination of the pharmacokinetic and toxicity characteristics of both molecules. Additionally, it binds to the human protein farnesyl

transferase, which poses a hazardous problem for the use of tipifarnib as a T. cruzi inhibitor. To increase its potential as a drug candidate against T. cruzi, these problems must be resolved. Tipifarnib needs to be further optimized in order to remain a potent T. cruzi inhibitor with the appropriate ADMET profile. In order to continue the optimization, it would be appealing to create QSAR (Quantitative structure-activity relationship) models using the data that is now available for the detection of lead/drug similarity properties. For the purpose of identifying the pharmacophoric patterns and structural characteristics that control the bio-activity profile of congeneric series of compounds, QSAR is a well-known chemometric approach [10-14]. It is a ligand-based approach to drug design that heavily relies on mathematical, statistical, and algorithmic techniques combined with computer science. For example, risk assessment, toxicity prediction, and drug/lead optimisation have all been successful uses of QSAR [15-18].

In the current study, a thorough QSAR analysis was conducted to identify the structural characteristics that control tipifarnib and its analogues' anti-Chagas action.

Experimental methodology

Data set: The data set includes 33 Tipifarnib analogues with various substituents at various locations [1]. The electron-donating/-withdrawing groups in the substituents cause a positive alteration in the molecules' steric and electrostatic profiles (Table 1, Figure 1). The T. cruzi amastigote was used to test the Tipifarnib analogues. Prior to QSAR analysis, the EC50 (nM) values were transformed to pEC50 (M) values [16,17]. Table 1 lists the structures, EC50 (nM), and pEC50 (M).

QSAR methodology

The standard methodology and guidelines recommended and put into practise by many researchers and the OECD (Organisation for Economic Co-operation and Development) have been followed in the current work for successful QSAR analysis [10-12, 18-20]. The structures were created using the free ChemSketch 10 software, and then the energy consumption was reduced using TINKER and MMFF94 (Cut-off: 0.01). Then, a large number of descriptors were calculated using PowerMV, CDK and PADEL, PyDescriptor (a custom PyMOL plugin), and e-Dragon. More than 29,000 different 1D- to 3D -descriptors are included in the descriptor pool. After removing the constant, almost constant, highly correlated (|R| > 0.80), and redundant variables using objective feature selection in QSARINS 2.2.4 using

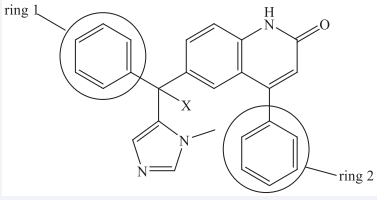

Figure 1 Tipifarnib analogues with a variety of substituents at different positions

default settings [21], Weka's genetic algorithm (GA) was used to conduct a heuristic search for selecting subjective features using default settings, except number of generations =10000 and number of features = 3. The data set was split into training (80%) and prediction (20%) sets at random for external validation before feature (descriptor) selection [18]. To obtain the most information possible, numerous splittings were used to generate multiple models.

Validation of the model: Effective QSAR model creation requires model validation. Therefore, for the purpose of model validation, OECD rules and suggested threshold values for a number of statistical parameters were used. The following characteristics were often taken into account: Using the prediction set, data randomization, or Y-scrambling, cross-validation (CV) via leave-one-out (LOO) and leave-many-out (LMO) procedures, and (d) determining whether the following requirements are met [16-19]: $R^2_{tr} \geq 0.6$, $Q^2_{loo} \geq 0.5$, $Q^2_{LMO} \geq 0.6$, $R^2 > Q^2$, $R^2_{ex} \geq 0.6$, $RMSE_{tr} < RMSE_{cv}$, $\Delta K \geq 0.05$, $CCC \geq 0.80$, $Q^2\text{-}F^n \geq 0.60$, $r^2_m \geq 0.6$, $(1\text{-}r^2/r_o^2) < 0.1$, $0.9 \leq k \leq 1.1$ or $(1\text{-}r^2/r'^2_o) < 0.1$, $0.9 \leq k' \leq 1.1$,$| r_o^2 - r'^2_o | < 0.3$ with *RMSE* and *MAE* close to zero. Any model not satisfying these criteria were subsequently rejected.

Applicability Domain (AD): AD assessment of a QSAR model is essential criterion for QSAR model development. In the present work, Williams plot have been plotted to assess the AD of the developed model. QSARINS-Chem 2.2.1 was used for getting the Williams plot using the default setting [11-14].

RESULTS AND DISCUSSION

Our team recently demonstrated that using multiple modelling to capture less-privileged chemical characteristics is a wise decision. Therefore, to ensure the capture of dominant and less prominent structural features that influence the bio-activity of PBIs, the same stated technique has been applied in the current study. As a result, various QSAR models were created utilising both the entire data set (referred to in the present study as the full set model, or FSM) and the divided data set (80% training and 20% prediction sets). The data set was randomly divided before model building when employing a divided data set to prevent developer bias in choosing the training and prediction sets. One model's prediction set for a chemical might or might not include it. QSARINS-Chem 2.2.1 was operating with the default parameters for OFS and SFS. The heuristic search for variables was restricted for simplicity to a collection of only three descriptors. There was no appreciable improvement in the statistical quality of the model after three variables. The following are the statistical parameters for the tri-parametric GA-MLR models:

Model-1 (FSM)

pEC_{50} = 20.013 (± 3.350) + 3.285 (± 1.131) * O_don_8Ac – 0.563 (± 0.249) * N_lipo_5B – 0.009 (± 0.003) * QXXm

N_{tr} = 33, Q^2_{loo} = 0.823, R^2_{tr} = 0.865, R^2_{adj} = 0.851, K_{xx} = 0.310, ΔK = 0.203, $RMSE_{tr}$ = 0.315, $RMSE_{cv}$ = 0.358, s = 0.336, F = 61.714, CCC_{tr} = 0.927, CCC_{cv} = 0.906, MAE_{tr} = 0.264, MAE_{cv} = 0.301, Q^2_{LMO} = 0.820

Table 1: Experimental EC_{50}, and substituents on Tipifarnib analogues used in the present study

S.N.	*T. cruzi* EC_{50} (nM)	X	ring 2	ring 1	Imidazole
1	4	NH_2	3-chloro	4-chloro	1-methyl-1H-imidazole
2	0.6	OMe	3-chloro-2-methyl	4-chloro	1-methyl-1H-imidazole
3	3.1	OMe	3-chloro	4-chloro	1-methyl-1H-imidazole
4	0.7	OMe	2-methyl	4-chloro	1-methyl-1H-imidazole
5	0.8	OMe	2-trifluoromethyl	4-chloro	1-methyl-1H-imidazole
6	1.1	OMe	3-fluoro	4-chloro	1-methyl-1H-imidazole
7	1.2	OMe	3-methyl	4-chloro	1-methyl-1H-imidazole
8	12	OMe	3-trifluoromethyl	4-chloro	1-methyl-1H-imidazole
9	0.8	OMe	2-fluoro	4-chloro	1-methyl-1H-imidazole
10	0.8	OMe	phenyl	4-chloro	1-methyl-1H-imidazole
11	0.82	OMe	4-chloro	4-chloro	1-methyl-1H-imidazole
12	0.5	OMe	4-fluoro	4-chloro	1-methyl-1H-imidazole
13	2	OMe	4-methyl	4-chloro	1-methyl-1H-imidazole
14	1.8	OMe	2,6-dimethyl	4-chloro	1-methyl-1H-imidazole
15	3.21	OMe	2,6-dichloro	4-chloro	1-methyl-1H-imidazole
16	0.31	OMe	2,6-difluoro	4-chloro	1-methyl-1H-imidazole
17	1.4	OMe	3,5-dimethyl	4-chloro	1-methyl-1H-imidazole
18	2.2	OMe	3-chloro	naphthyl	1-methyl-1H-imidazole
19	17	OH	3-chloro	4-chloro	1-methyl-1H-imidazole
20	112	OH	3-chloro-2-methyl	4-chloro	1-methyl-1H-imidazole
21	27	OEt	3-chloro-2-methyl	4-chloro	1-methyl-1H-imidazole
22	69	OPr	3-chloro-2-methyl	4-chloro	1-methyl-1H-imidazole
23	5	NHMe	3-chloro-2-methyl	4-chloro	1-methyl-1H-imidazole
24	118	NH_2	3-chloro	4-chloro	1-ethyl-1H-imidazole
25	100	NHMe	3-chloro	4-chloro	1-ethyl-1H-imidazole
26	3	OMe	3-chloro	4-chloro	1-ethyl-1H-imidazole
27	228	OH	3-chloro	4-chloro	1-ethyl-1H-imidazole
28	3	OMe	3-chloro	4-methyl	1-methyl-1H-imidazole
29	5	OMe	3-chloro	4-trifluoromethyl	1-methyl-1H-imidazole
30	10	OMe	3-chloro	4-ethyl	1-methyl-1H-imidazole
31	33	OMe	3-chloro	4-cumene	1-methyl-1H-imidazole
32	320	OMe	3-phenyl	4-chloro	1-methyl-1H-imidazole
33	83	OMe	3-benzene	4-chloro	1-methyl-1H-imidazole

Model-2 (Divided data set)

pEC_{50} = 20.993 (± 3.988) – 0.095 (± 0.044) * da_H_9B – 0.540 (± 0.289) * N_lipo_5B – 0.010 (± 0.003) * QXXm

N_{tr} = 27, N_{ex} = 6, Q^2_{loo} = 0.831, R^2_{tr} = 0.870, R^2_{adj} = 0.853, K_{xx} = 0.303, ΔK = 0.202, $RMSE_{tr}$ = 0.306, $RMSE_{cv}$ = 0.348, $RMSE_{ex}$ = 0.394, s = 0.331, F = 51.151, Q^2-F^1 = 0.809, Q^2-F^2 = 0. 0.801, Q^2-F^3 = 0.783, CCC_{tr} = 0.930, CCC_{cv} = 0.909, CCC_{ex} = 0.897, r^2m av = 0.794, r^2m de = 0.093, MAE_{tr} = 0.249, MAE_{cv} = 0.288, MAE_{ex} = 0.338, R^2_{ext} = 0.918, Q^2_{LMO} = 0.811

Model-3 (Divided data set)

pEC_{50} = 35.716 (± 9.621) – 0.319 (± 0.182) * accminus_MSA – 0.690 (± 0.261) * N_lipo_5B – 0.010 (± 0.003) * QXXm

N_{tr} = 27, N_{ex} = 6, Q^2_{loo} = 0.837, R^2_{tr} = 0.870, R^2_{adj} = 0.853, K_{xx} = 0.470, ΔK = 0.077, $RMSE_{tr}$ = 0.291, $RMSE_{cv}$ = 0.325, $RMSE_{ex}$ = 0.451, s = 0.315, F = 51.403, Q^2-F^1 = 0.826, Q^2-F^2 = 0. 0.756, Q^2-F^3 = 0.688, CCC_{tr} = 0.931, CCC_{cv} = 0.913, CCC_{ex} = 0.885, r^2m av = 0.698, r^2m de = 0.069, MAE_{tr} = 0.243, MAE_{cv} = 0.280, MAE_{ex} = 0.373, R^2_{ext} = 0.786, Q^2_{LMO} = 0.794

The statistical symbols have their typical meanings, which are also provided in the accompanying data. Table 2 displays the pEC50 values as well as the descriptor values that were employed. Based on the statistical characteristics, it appears that the produced models have good internal fitting and meet the cutoff values for a number of statistical parameters that are crucial for determining internal resilience and external predictability. The models' strong external prediction capacity is indicated by the high value of several external validation parameters, including CCCex, Q2-Fn, R2ext, etc., and the low values of RMSE, s, and MAE, etc. An adequate number of descriptors are present in the model, according to the close value of R2adj. And R2. Similar to how similar R2 and Q2 values indicate that the models do not exhibit over-fitting. The low value of *RMSE* and *MAE* (fitting, cross-validation and external validation) specifies that the developed models have statistical acceptability.

DISCUSSION

In the developed models, the common descriptor is QXXm, which is a geometrical descriptor and corresponds to COMMA2 value/weighted by atomic masses activity, has negative correlation with the activity. Therefore, its value must be kept

Table 2: Values of molecular descriptors and pEC_{50} for the data set

S. N.	pEC_{50}	QXXm	da_H_9B	N_lipo_5B	O_don_8Ac	accminus_MSA
1.	8.398	311.237	13	16	0	43.06295
2.	9.222	326.92	13	15	0	41.51342
3.	8.509	320.129	11	15	0	41.54747
4.	9.155	257.504	14	15	0	41.98221
5.	9.097	297.908	11	15	0	41.87246
6.	8.959	278.501	11	15	0	42.02498
7.	8.921	271.578	14	15	0	41.87778
8.	7.921	360.145	11	15	0	41.92143
9.	9.097	257.09	11	15	0	41.81082
10.	9.097	248.193	12	15	0	41.99664
11.	9.086	286.032	11	15	0	41.99585
12.	9.301	286.032	11	15	0	41.99585
13.	8.699	280.88	14	15	0	41.81427
14.	8.745	267.324	16	15	0	42.11884
15.	8.493	299.339	10	15	0	42.05618
16.	9.509	268.724	10	15	0	42.17695
17.	8.854	292.784	16	15	0	42.09243
18.	8.658	313.751	11	15	0	41.84568
19.	7.77	314.262	21	15	-0.3736	44.85659
20.	6.951	321.68	23	15	-0.3736	44.99809
21.	7.569	344.106	13	16	0	41.52892
22.	7.161	373.782	13	16	0	41.96532
23.	8.301	312.637	14	16	0	40.64602
24.	6.928	349.198	13	17	0	42.45161
25.	7	362.533	12	17	0	40.60624
26.	8.523	347.097	11	16	0	41.05926
27.	6.642	356.071	23	16	-0.3736	44.61465
28.	8.523	319.429	11	16	0	41.21349
29.	8.301	342.56	11	16	0	41.09026
30.	8	319.508	11	16	0	41.30114
31.	7.481	328.818	11	16	0	41.29695
32.	6.495	481.969	13	16	0	40.76464
33.	7.081	439.806	13	16	0	41.2677

as low as possible to enhance the activity. The second common descriptor N_lipo_5B (number of lipophilic atoms within five bonds from Nitrogen atoms) has negative coefficient in all the developed models. Hence, the value of this descriptors must be restricted for enhanced activity. da_H_9B corresponds to number of Hydrogen atoms within nine bonds from such a group which can act as H-bond donor as well as acceptor such as -OH, $-NH_2$, etc. the negative coefficient for this descriptor in model 2 indicates that lowering the value of this descriptor would result in better activity profile.

A molecular descriptor with negative coefficient in model 3 is accminus_MSA (molecular surface area of negatively charged H-bond acceptor atoms). Therefore, the molecular surface area of negatively charged H-bond acceptor atoms must be constrained to increase the anti-Chagas activity. The molecular descriptors accminus_MSA, N_lipo_5B and da_H_9B have been depicted in Figure 2 using the most and least active molecules (molecule number 16 and 32), as the representatives only.

The only molecular descriptor with a positive coefficient in model 1 is O_don_8Ac, which stands for sum of partial charges on H-bond donor atoms which are present within 8Å from oxygen atoms. In case of compound number **2**, **3** and **26** the oxygen atom of -OMe group (with lesser negative charge) is within a distance of 8Å from oxygen atom of quinolinone moiety. Whereas for compound number **20**, **19** and **27**, though, the oxygen atom of -OH group is within a distance of 8Å from oxygen atom of quinolinone moiety but possesses a higher negative charge. This could be one of the possible reasons for better activity of **2** (EC_{50} = 0.6 nM) than **20** (EC_{50} = 112 nM), **3** (EC_{50} = 3.1 nM) than **19** (EC_{50} = 17 nM), and **26** (EC_{50} = 3 nM) than **27** (EC_{50} = 228 nM). This points out another observation that -OMe is a better substituent at -X than -OH for increasing the activity.

In Table 3, the status of the molecule, predicted and the residual values by developed models 1-3 have been tabulated.

The fitting curve, residual plot, Y-scrambling and Williams plots are available in the supporting information.

CONCLUSIONS

In conclusion, the robust QSAR models with good predictive ability indicate that activity has good relation with $-OCH_3$ group, lipophilic atoms within five bonds from Nitrogen atoms, presence

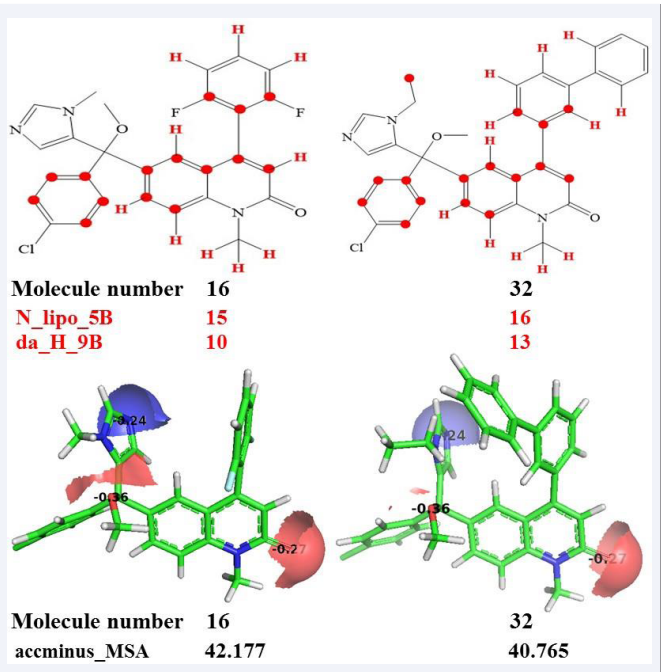

Figure 2 Representation of accminus_MSA, N_lipo_5B and da_H_9B using molecule number 16 (most active) and 32 (least active) as the representatives only (red filled circles for N_lipo_5B and red coloured hydrogen atoms for da_H_9B).

Table 3: Status of the molecule, predicted and the residual values by developed models 1-3

S.N.	Status Model-1	Pred. by model-1	Residual Model-1	Status Model-2	Pred. by model-2	Residual Model-2	Status Model-3	Pred. by model-3	Residual Model-3
1	Training	8.1521	-0.2459	Training	8.1220	-0.2760	Prediction	7.6498	-0.7482
2	Training	8.5704	-0.6516	Training	8.5100	-0.7120	Training	8.6691	-0.5529
3	Training	8.6328	0.1238	Training	8.7652	0.2562	Training	8.7298	0.2208
4	Training	9.2085	0.0535	Training	9.0858	-0.0692	Training	9.2510	0.0960
5	Training	8.8371	-0.2599	Prediction	8.9799	-0.1171	Training	8.8602	-0.2368
6	Training	9.0155	0.0565	Training	9.1673	0.2083	Training	9.0161	0.0571
7	Training	9.0791	0.1581	Training	8.9498	0.0288	Prediction	9.1360	0.2150
8	Training	8.2649	0.3439	Training	8.3786	0.4576	Training	8.1887	0.2677
9	Training	9.2123	0.1153	Training	9.3742	0.2772	Training	9.3101	0.2131
10	Training	9.2941	0.1971	Prediction	9.3653	0.2683	Training	9.3445	0.2475
11	Training	8.9463	-0.1397	Training	9.0946	0.0086	Training	8.9460	-0.1400
12	Training	8.9463	-0.3547	Training	9.0946	-0.2064	Training	8.9460	-0.3550
13	Training	8.9936	0.2946	Training	8.8599	0.1609	Prediction	9.0583	0.3593
14	Training	9.1183	0.3733	Training	8.8013	0.0563	Training	9.1039	0.3589
15	Training	8.8239	0.3309	Prediction	9.0608	0.5678	Training	8.7865	0.2935
16	Training	9.1054	-0.4036	Training	9.3566	-0.1524	Training	9.0706	-0.4384
17	Training	8.8842	0.0302	Training	8.5553	-0.2987	Training	8.8440	-0.0100
18	Training	8.6914	0.0334	Training	8.8268	0.1688	Training	8.7018	0.0438
19	Training	7.4593	-0.3107	Training	7.8738	0.1038	Training	7.7353	-0.0347
20	Training	7.3911	0.4401	Prediction	7.6125	0.6615	Prediction	7.6119	0.6609
21	Training	7.8499	0.2809	Training	7.8044	0.2354	Training	7.7931	0.2241
22	Training	7.5771	0.4161	Training	7.5177	0.3567	Training	7.3410	0.1800
23	Training	8.1392	-0.1618	Training	8.0137	-0.2873	Training	8.4066	0.1056
24	Training	7.2407	0.3127	Training	7.2158	0.2878	Training	6.7549	-0.1731
25	Training	7.1181	0.1181	Prediction	7.1817	0.1817	Training	7.2035	0.2035
26	Training	7.8224	-0.7006	Training	7.9652	-0.5578	Training	7.9115	-0.6115
27	Training	6.5125	-0.1295	Training	6.7408	0.0988	Prediction	6.6819	0.0399
28	Training	8.0768	-0.4462	Training	8.2325	-0.2905	Training	8.1539	-0.3691
29	Training	7.8641	-0.4369	Training	8.0090	-0.2920	Training	7.9494	-0.3516
30	Training	8.0761	0.0761	Prediction	8.2317	0.2317	Training	8.1250	0.1250
31	Training	7.9905	0.5095	Training	8.1418	0.6608	Training	8.0283	0.5473
32	Training	6.5825	0.0875	Training	6.4726	-0.0224	Training	6.5842	0.0892
33	Training	6.9701	-0.1109	Training	6.8799	-0.2011	Prediction	6.8680	-0.2130

of less negatively charged donor atom from oxygen atom of quinolinone ring and molecular surface area of negatively charged H-bond acceptor atoms.

AUTHOR CONTRIBUTIONS

R.G. and S.T.: conceptualization, project design, and experimental studies; R.G., S.T. and V.H.M.: drafting, resources, and funding management; R.G., S.T. and R.P.: data collection and curation, drafting, and data compilation; R.G., V.H.M. and R.P.: draft revision and analysis. All authors have read and agreed to the published version of the manuscript.

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Article

Pharmacophore Synergism in Diverse Scaffold Clinches in Aurora Kinase B

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Abstract: Aurora kinase B (AKB) is a crucial signaling kinase with an important role in cell division. Therefore, inhibition of AKB is an attractive approach to the treatment of cancer. In the present work, extensive quantitative structure–activity relationships (QSAR) analysis has been performed using a set of 561 structurally diverse aurora kinase B inhibitors. The Organization for Economic Cooperation and Development (OECD) guidelines were used to develop a QSAR model that has high statistical performance (R^2_{tr} = 0.815, Q^2_{LMO} = 0.808, R^2_{ex} = 0.814, CCC_{ex} = 0.899). The seven-variable-based newly developed QSAR model has an excellent balance of external predictive ability (Predictive QSAR) and mechanistic interpretation (Mechanistic QSAR). The QSAR analysis successfully identifies not only the visible pharmacophoric features but also the hidden features. The analysis indicates that the lipophilic and polar groups—especially the H-bond capable groups—must be present at a specific distance from each other. Moreover, the ring nitrogen and ring carbon atoms play important roles in determining the inhibitory activity for AKB. The analysis effectively captures reported as well as unreported pharmacophoric features. The results of the present analysis are also supported by the reported crystal structures of inhibitors bound to AKB.

Keywords: aurora kinase B; QSAR; pharmacophore modeling

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1. Introduction

The machinery for cell division, also known as mitosis, is completely regulated. Any irregularity or imperfect mitosis results in nondiploid DNA content, which ultimately causes cancer [1]. Researchers have therefore become interested in developing cancer chemotherapeutics that target centrosome maturation and separation, mitotic spindle assembly, chromosomal separation, and cytokinesis involving the participation of numerous important signaling kinases, including aurora, polo-like-kinase (Plk), and cyclin-dependent kinase (Cdk) [2,3]. The successful transition to mitosis depends on the aurora kinase family of serine/threonine kinases [4–7]. Since their discovery in 1995 and the initial detection of their expression in human cancer tissue in 1998 [2,5,7–9], these kinases have received a great deal of attention. This is due to their aberrant and excessive expression in a wide range of solid and liquid tumors, such as pancreatic, lung, liver, and breast tumors, as well as their oncogenic activity [2,4,5,7–11].

The aurora kinase family consists of three isoforms (A, B, and C), each of which differs in the length and amino acid composition of the N-terminal domain, but they share a common and conserved ATP binding site [2,12]. In order for the centrosome to mature,

and for spindle assembly, meiosis, and metaphase spindle orientation to occur, aurora-A is essential [2,12]. In order to achieve precise chromosomal segregation and cytokinesis, aurora kinase B (AKB) is required [2,12]. Massive polyploidization and failure to bio-orientate chromosomes result from AKB inhibition [2,12]. Since aurora kinase C (AKC), which complements the activity of AKB, has received less attention to date, we decided to focus only on AKB in this investigation, due to a lack of data for AKC [12].

Aurora kinases have been suggested as prospective targets for anticancer treatments due to their crucial function in controlling the cell cycle. At this time, none of the ATP-competitive inhibitors targeting AKB that are in clinical development (Figure 1) have been granted approval [4,5,13].

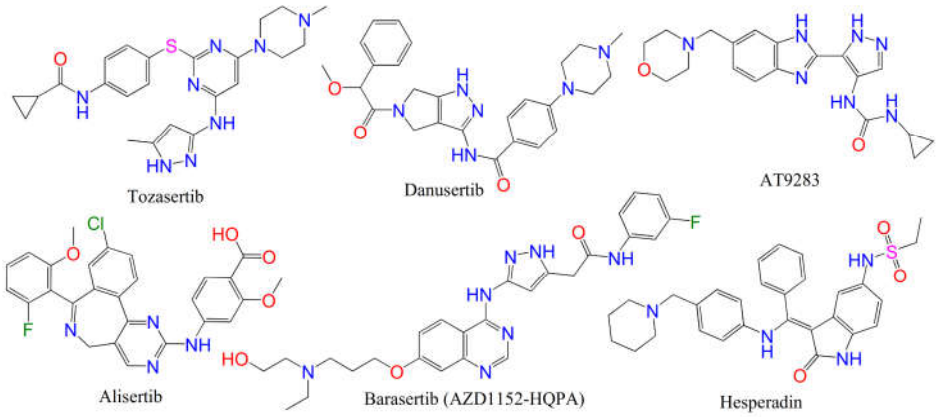


Figure 1. Structures of some known aurora inhibitors in different clinical trial stages.

In these conditions, a quick and effective strategy to find AKB inhibitors is still a key goal for medicinal chemists. To fulfill this goal, there is a need to use modern methods such as computer-aided drug design (CADD) to reduce time, costs, trial-and-error procedures, and other required resources [14,15]. The vibrant and developing field of CADD is successful due to the result-oriented performance of molecular docking, QSAR, and its other branches [14–16]. In QSAR, a mathematical model is created to connect chemical descriptors (structural features) to a desired bioactivity profile using a wide range of machine learning techniques [17,18]. In a more pragmatic sense, QSAR allows one to prioritize compounds with desirable attributes for a subsequent (and presumably successful) biological evaluation [17–19]. Traditional QSAR concentrates on producing statistically significant models [17–19]. Previously, different researchers have reported QSAR models for AKB using different techniques. For example, Neaz et al. [20] reported a 3D-QSAR model for a dataset of forty-eight quinazoline derivatives possessing other heterocyclic rings. The developed model had a leave-one-out cross-validated correlation coefficient (Q2LOO) of 0.56. Another 3D-QSAR and molecular docking study of azaindole derivatives as AKB inhibitors was accomplished by Lan and co-workers [21]. The best developed QSAR model based on forty-one molecules had Q2LOO = 0.575. Likewise, Ashraf et al. [22] used a dataset of 57 acylureidoindolin derivatives to develop a 3D-QSAR model, which had Q2LOO = 0.641, and indicated that electrostatic and hydrophobic fields determine the activity of compounds. Thus, AKB has been the subject of QSAR research; however, the developed QSAR models find little usage due to a lack of generalizability, low predictive power, being based on small datasets comprising limited scaffolds, or a combination of these factors. Therefore, there is a need to develop a robust and balanced QSAR model based on a larger dataset, encompassing diverse structural scaffolds. Consequently, in the present work, a QSAR model has been developed that possesses high external predictive ability and extensive mechanistic interpretations supported by X-ray-resolved structures.

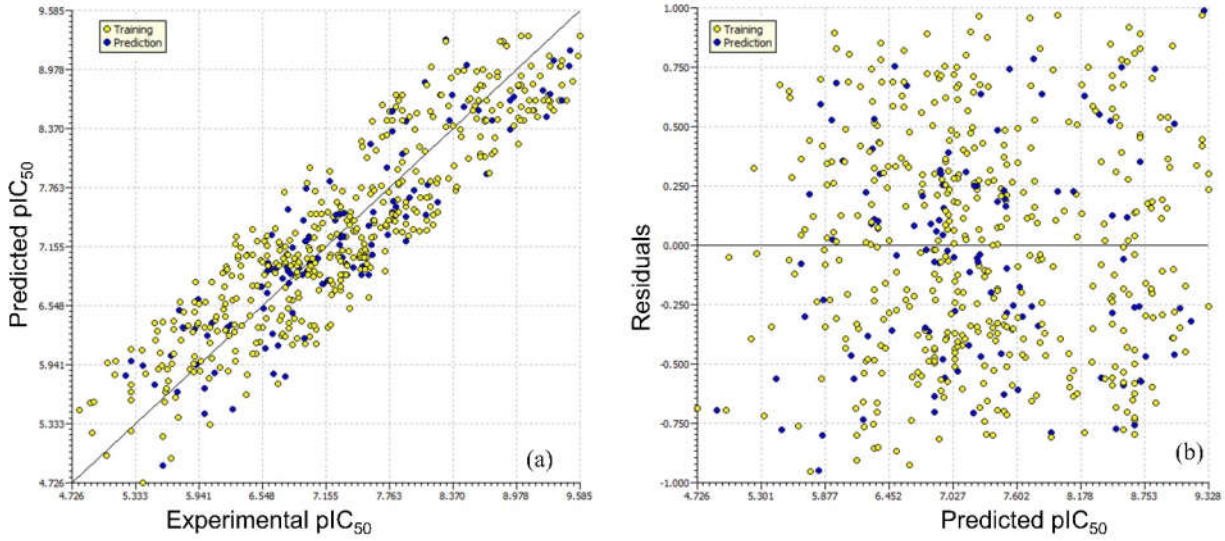
2. Results

As stated in Section 1, the focus was on developing a genetic algorithm–multilinear regression (GA–MLR) model with a combination of mechanistic interpretation and high predictive power. We have discovered several structural features in the current investigation. The recently constructed seven-parameter model and its statistical validation parameters are as follows.

Model A: pIC50 = 4.611 (±0.224) + 0.559 (±0.105) × fringNplaN4B + 0.436 (±0.11) × fsp3Csp2N5B + 0.253 (±0.038) × N_H_2B + 0.164 (±0.035) × fsp2Osp2C5B + 0.1 (±0.015) × da_lipo_5B − 0.317 (±0.056) × fringNC6B − 0.262 (±0.048) × fOringC6B.

Statistical parameters associated with model A: R^2_{tr} = 0.815, RMSEtr = 0.468, MAEtr = 0.401, CCCtr = 0.898, s = 0.473, F = 277.836, R2cv (Q2LOO) = 0.808, RMSEcv = 0.477, MAEcv = 0.408, CCCcv = 0.895, Q2LMO = 0.807, R2Yscr = 0.016, Q2Yscr = −0.02, RMSEex = 0.446, MAEex = 0.373, R^2_{ex} = 0.814, Q2-F1 = 0.811, Q2-F2 = 0.811, Q2-F3 = 0.833, CCC_{ex} = 0.900.

Model A is statistically robust, as shown by the high values of various statistical parameters, such as the coefficient of determination (R^2_{tr}) and cross-validated coefficient of determination for leave-one-out (R2cv or Q2LOO), the external coefficient of determination (R^2_{ex}), Q2-Fn and the Concordance Correlation Coefficient (CCC_{ex}), etc., and the low values of lack-of-fit (LOF), root mean square error (RMSEtr), and mean absolute error (MAE). As a result, model A has high external predictive ability [23–30], is devoid of random correlations [31,32], and meets suggested threshold values for key parameters. The Supplementary Materials contain the formulae to determine these parameters. A Williams plot was used to evaluate the model's applicability domain [33–36]. As a result, it complies with all the OECD-recommended standards and requirements for developing a valuable QSAR model. Different graphs associated with model A are depicted in Figure 2.



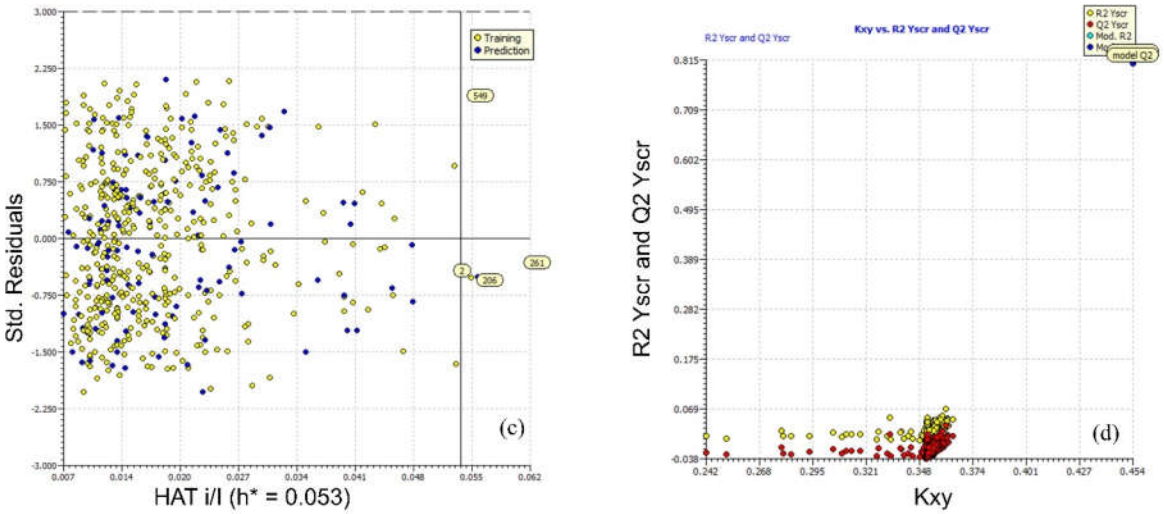


Figure 2. Different graphs related to model A: (**a**) experimental vs. predicted pIC50 (the solid line represents the regression line); (**b**) experimental vs. residuals; (**c**) Williams plot for applicability domain (the vertical solid line represents h* = 0.053 and horizontal dashed lines represent the upper and lower boundaries for applicability domain); (**d**) Y-randomization plot.

There are seven descriptors in model A, which have been calculated by PyDescriptor [37] and tabulated in Table 1. Of the seven descriptors, five descriptors, viz. fringNplaN4B, fsp3Csp2N5B, N_H_2B, fsp2Osp2C5B, and da_lipo_5B, have positive coefficients in model A, implying that increasing their value could lead to a better activity profile, whereas the reverse is true for the remaining two descriptors, fOringC6B and fringNC6B, which have negative coefficients in model A. Each molecular descriptor, which is a numeric representation of structural features [37–39], has correlations with different types of pharmacophoric features, which govern the inhibitory profile. However, it is to be noted that a single structural feature can neither explain nor fully determine the final biological activity (IC50) of a molecule. The biological activity IC50, etc., is an outcome of a combination of different structural features and some unknown factors. Some features enhance the desired pharmacological activity, whereas others are responsible for reversing it. It is believed that two or more pharmacophoric groups concomitantly decide the biological activity (pharmacophore synergism).

Table 1. Different molecular descriptors present in model A and their descriptions.

Molecular Descriptor	Description
fringNplaN4B	Frequency of occurrence of planer nitrogen atoms exactly at 4 bonds from ring nitrogen atom
fsp3Csp2N5B	Frequency of occurrence of sp2-hybridized nitrogen atoms exactly at 5 bonds from sp3-hybridized carbon atoms
N_H_2B	Total number of nitrogen atoms present within 2 bonds from hydrogen atoms
fsp2Osp2C5B	Frequency of occurrence of sp2-hybridized carbon atoms exactly at 5 bonds from sp2-hybridized oxygen atoms
da_lipo_5B	Total number of lipophilic atoms present within 5 bonds from H-bond donor cum acceptor atoms
fOringC6B	Frequency of occurrence of ring carbon atoms exactly at 6 bonds from oxygen atoms
fringNC6B	Frequency of occurrence of carbon atoms exactly at 6 bonds from ring nitrogen atoms

3. Discussion

Of the seven descriptors in model A, five descriptors, viz. fringNplaN4B, fsp3Csp2N5B, N_H_2B, da_lipo_5B, and fringNC6B, indicate the importance of different types of nitrogen atoms in determining the inhibitory activity for aurora kinase B. The

same is true for carbon, which is present in four descriptors, viz. fsp3Csp2N5B, da_lipo_5B, fringNC6B, and fOringC6B. The relevance of oxygen is due to its presence in three descriptors, viz. fsp2Osp2C5B, da_lipo_5B, and fOringC6B. At the same time, it should be noted that the descriptors present in model A are highly interlinked; that is, increasing the value of one descriptor could significantly change the value of another descriptor. This leads to substantial changes in the biological profile of a molecule, pointing toward pharmacophore synergism, as molecular descriptors are mathematical representations of pharmacophores. For example, the values of descriptors fringNplaN4B and fringNC6B vary with the presence/absence of ring nitrogen atoms. Therefore, increasing the value of fringNplaN4B by escalating ring nitrogen atoms could also lead to a higher fringNC6B value. Therefore, in the present work, we have adopted an approach that involves the concomitant consideration of two or more molecular descriptors to explain the variance in the activity profile of matched molecular pairs (MMP). Accordingly, the molecular descriptors whose values have changed for MMP have been discussed concurrently with relevant examples in Section 3.

da_lipo_5B:

The descriptor da_lipo_5B is simultaneously associated with two important aspects of a molecule: lipophilic character and H-bonding-capable (donor and acceptor) atoms. It is to be noted that, in the present work, a carbon atom is non-lipophilic while calculating da_lipo_5B, if oxygen or nitrogen is attached to it. The average value of da_lipo_5B for the top one hundred active molecules (IC50 = 0.26 to 4.3 nM) is 15.29, and the value for the least active one hundred molecules (IC50 = 611 to 16,000 nM) is 8.51. This reveals that the higher the number of lipophilic atoms within five bonds of a H-bond-capable atom, the higher the activity. This gives an initial impression that lipophilicity (mostly represented by logP [40]) is the only governing factor. However, the calculated logP (clogP), which represents molecular lipophilicity, has a weak correlation of 0.077 with pIC50, whereas da_lipo_5B has a value of 0.533. Therefore, the conditional occurrence of lipophilic atoms in the vicinity of H-bonding-capable atoms is a better choice. A plausible reason could be the composition of the active site of AKB, which consists of the persistent presence of lipophilic residues such as Gly, Leu, Val, Phe, etc., between the acidic or basic residues such as Glu, Asp, Lys [22]. This is why an aurora kinase B inhibitor also requires the presence of H-bond-capable atoms, preferably with separation by five bonds and the concomitant occurrence of lipophilic atoms in their vicinity. This observation is confirmed by the reported X-ray-resolved structure of aurora kinase B (pdb: 4c2w [41]) (see Figure 3).

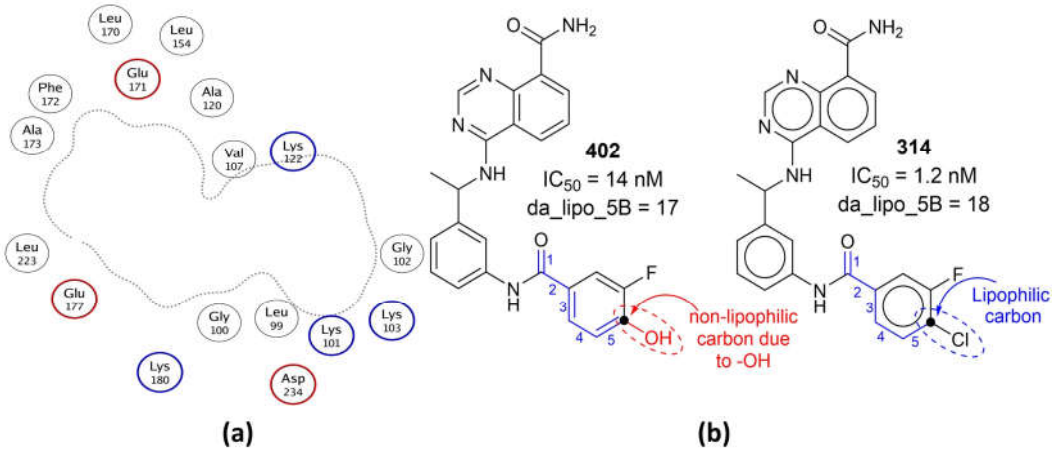


Figure 3. (**a**) A 2D depiction of active site of aurora kinase B (pdb: 4c2w). The dotted line represents the contour proximity of active site residues. Acidic and basic residues have been highlighted using

red- and blue-colored circles. (**b**) Comparison of molecule 402 with 314 with respect to da_lipo_5B (blue-colored bonds and numbering).

The importance of da_lipo_5B highlights the significance of determining the numbers of donor cum acceptor atoms required to obtain better activity. The average value of donor cum acceptor atoms for the top one hundred active molecules (IC50 = 0.26 to 4.3 nM) is 3.21, and the value for the least active one hundred molecules (IC50 = 611 to 16,000 nM) is 2.24. A comparison of the following pairs of molecules as representative examples further highlights the importance of da_lipo_5B: 314 with 402 (see Figure 3), 355 with 347, 206 with 207, 103 with 101, 103 with 99, 61 with 142, 57 with 58, etc.

fringNplaN4B:

fringNplaN4B stands for the frequency of occurrence of planer nitrogen atoms exactly at four bonds from a ring nitrogen atom. If the same planer nitrogen atom is also present at ≤ 4 bonds from the same or any other ring nitrogen atom through any path, then it is excluded while calculating fringNplaN4B. The importance of fringNplaN4B is reflected by the fact that the most active 110 molecules with IC50 values ranging from 0.26 to 5.9 nM have one or more combinations of planer and ring nitrogen atoms. The reverse is true for less active molecules (IC50 = 16,000 to 611 nM), with some exceptions, such as molecule numbers 213, 73, 71, 66, 20, etc. Moreover, it was observed that replacing fringNplaN4B with its corresponding equivalents, fringNplaN3B and fringNplaN5B, for three and five bonds led to a reduction in the performance of model A (R^2 = 0.770, for both). Moreover, fringNplaN3B and fringNplaN5B have a correlation of R = 0.084 and 0.028 with pIC50, respectively, whereas fringNplaN4B is a better choice as a descriptor, with R = 0.628.

However, at first sight, it appears that, individually, ringN (number of ring nitrogen atoms) or nplanN (number of planer nitrogen atoms) could be an alternative to fringNplaN4B. However, both have a weak correlation of 0.207 and 0.374 with pIC50, respectively. Moreover, a loss in the statistical performance of model A on replacing fringNplaN4B with ringN (R^2 = 0.772) or nplanN (R^2 = 0.770) again confirmed the importance of fringNplaN4B. Therefore, a combination of ring and planer nitrogen atoms separated exactly by four bonds is an important structural feature to obtain a better pIC50 for AKB.

A literature survey reveals that for pyrrolopyrazole derivatives, a substituted 3-aminopyrazole moiety is important due to its ability to interact with the hinge region of the ATP binding site [2]. The three nitrogen atoms of the N-C-N-N pattern present in 3-aminopyrazole are responsible for binding with the receptor [2]. Unfortunately, it appears that the reported pattern is exclusive to pyrrolopyrazole derivatives bearing a substituted 3-aminopyrazole moiety. Interestingly, the terminal nitrogen atoms of the N-C-N-N pattern are actually ring and planer nitrogen atoms, thereby suggesting the possible presence of fringNplaN4B. However, in many active molecules of the present dataset bearing a substituted 3-aminopyrazole moiety, the value of fringNplaN4B is zero; this is because the planer nitrogen of the N-C-N-N pattern is also present within ≤4 bonds of the other ring nitrogen atom. However, in several active molecules for AKB, fringNplaN4B is present due to other scaffolds (see Figure 4). In other words, instead of the N-C-N-N pattern or a substituted 3-aminopyrazole moiety, an emphasis on the simultaneous presence of planer and ring nitrogen atoms separated by four bonds in the molecule is a better strategy to enhance the inhibitory profile against AKB. Hence, the present work successfully identified a novel aspect of a reported pattern (N-C-N-N) and extended it for other scaffolds.

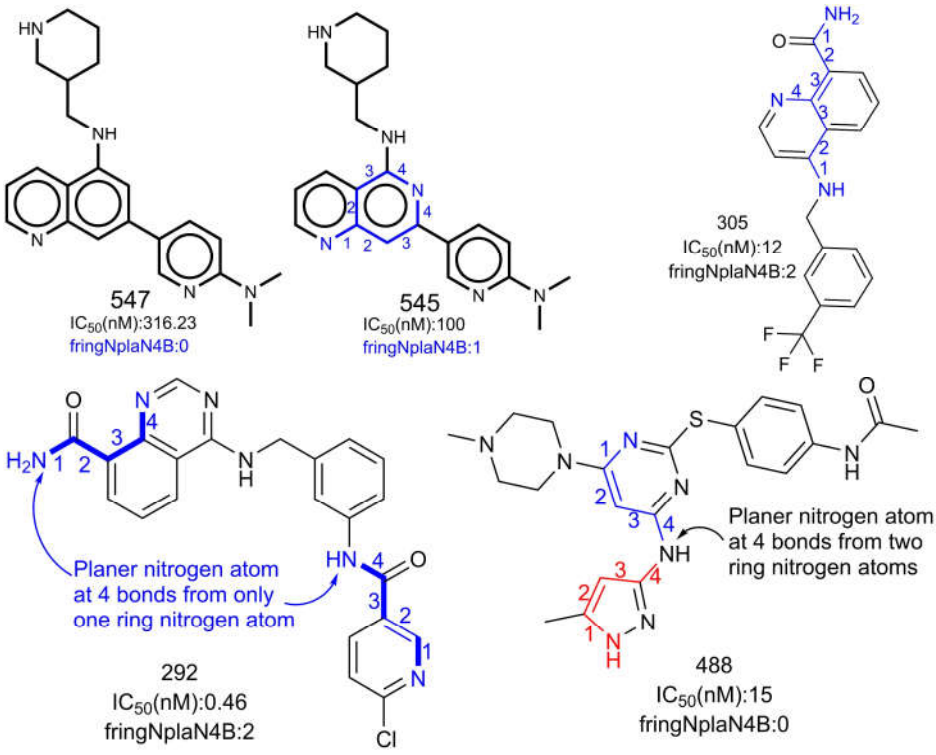


Figure 4. Representation of influence of fringNplaN4B on activity profile of AKB inhibitors. The numbers (blue/red) indicate the counting of number of bonds between ring and planer nitrogen.

N_H_2B:

The positive coefficient for N_H_2B indicates that the presence of hydrogen in the vicinity of nitrogen is beneficial to increase the inhibitory activity for aurora kinase B. In many molecules, N_H_2B exists due to the direct attachment of a hydrogen atom to a nitrogen atom (N-H) or due to hydrogen atoms bonded to carbon atoms adjacent to nitrogen (N-CHn fragment). N_H_2B favors two important structural features that could lead to a better inhibitory profile: (1) the presence of polar hydrogen atoms as N-H or N-CHn fragments; (2) steric hindrance or bulkiness in the vicinity of nitrogen atoms, because hydrogen is the smallest among all the elements. The lesser the bulkiness around nitrogen atoms, the better the inhibitory profile. These two structural features in combination allow the polar interactions or H-bond formation between the ligand and the receptor. This observation, and the significance of N_H_2B as well as da_lipo_5B, is confirmed by the two forms of the ligand VX-680 (molecule number 14) in the pdb 4b8m [42].

The ligand VX-680 exists in two different forms, labeled as TA and TB in the present work, in the two chains of pdb 4b8m. From Figure 5 and Table 2, it is clear that the TA form consists of a higher number of hydrogen atoms than TB, especially in the vicinity of nitrogen atoms. This led to different values for N_H_2B for the two forms (see Figure 5). The form TA, having a higher N_H_2B value, has a higher number of interactions with the receptor, because the additional hydrogen atoms attached to the nitrogen atoms of the pyrazole (designated as N19 and N20) ring and aminopyrimidine (designated as N14) are responsible for H-bond interactions with Glu171, Phe172, and Ala173 (see Table 2). Meanwhile, these interactions are absent for TB, even though the respective atoms N19 and N14 of TB are more proximate to receptor atoms. The TB form has only one prominent interaction with the receptor due to the nitrogen (designated as N20) of the pyrazole ring in the form of a H-bond with Ala173.

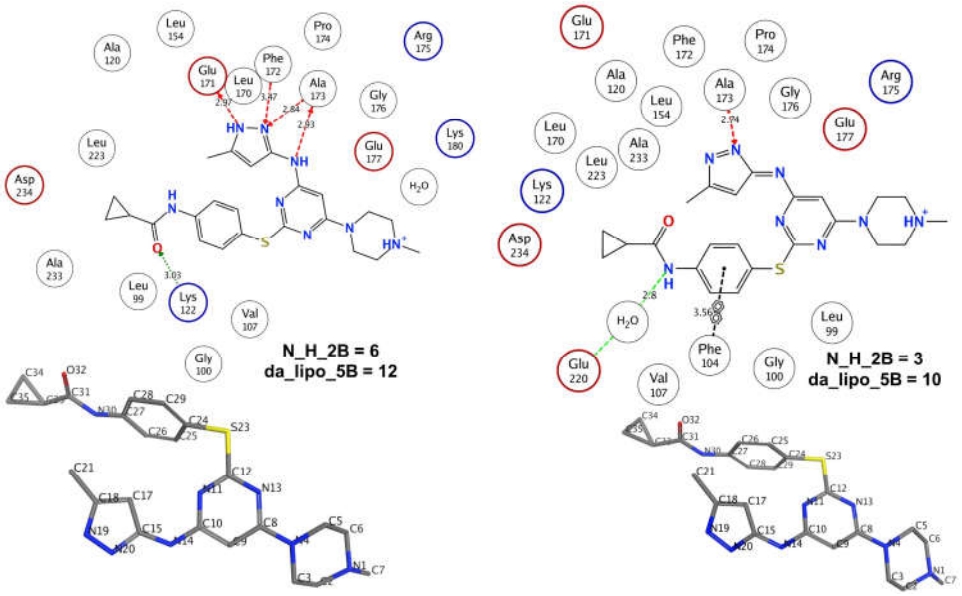


Figure 5. Pictorial representation of N_H_2B using VX-680 (pdb 4b8m) as an example.

Table 2. Distances of different atoms of TA and TB forms of VX-680 (molecule number 14) from the receptor atoms (pdb 4b8m).

TA Form				TB Form			
Residue	**Residue Atom**	**Ligand Atom**	**Distance**	**Residue**	**Residue Atom**	**Ligand Atom**	**Distance**
GLU171	O	N19	2.97	GLU171	O	N19	2.74
PHE172	CA	N20	3.47	PHE172	CA	N20	3.52
ALA173	N	N20	2.84	ALA173	N	N20	2.74
ALA173	O	N14	2.93	ALA173	O	N14	2.91
HOH2005	O	N13	3.32	HOH2005	O	N30	2.80

The following comparisons of molecules further highlight the importance of N_H_2B (see Figure 6): 108 with 75 and 101, 486 with 487 and 484, and 148 with 144, to list a few. A simple analysis of these examples indicates that the presence of a pyrazole ring leads to a better IC50 for a molecule (see Figure 6). However, it has a negative correlation (R = −0.177) with pIC50. A plausible reason appears from the present work suggesting that H-bond-capable polar groups are more suitable near the periphery of a molecule, rather than a pyrazole ring, to achieve good interactions with the receptor.

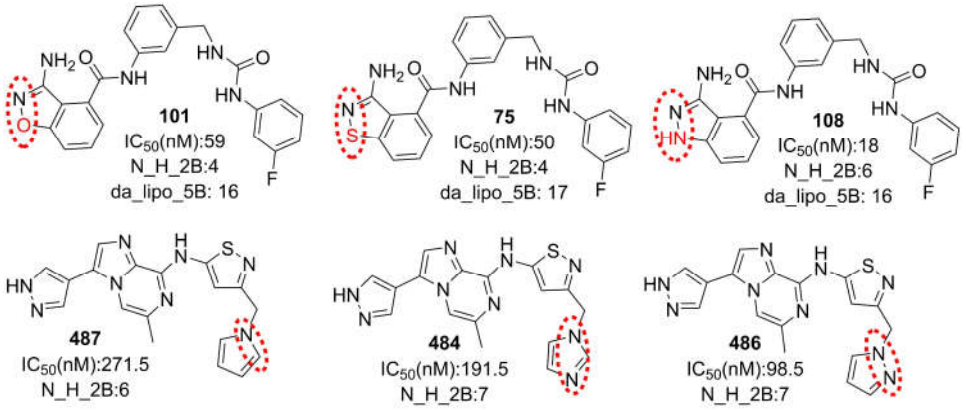


Figure 6. Representative examples to understand N_H_2B.

fsp3Csp2N5B:

The descriptor fsp3Csp2N5B is associated with two features, viz. sp2-hybridized nitrogen and sp3-hybridized carbon atoms. As it has a positive coefficient in model 1, increasing the numbers of such atoms favors the augmentation of pIC50. At the same time, increasing fsp3Csp2N5B could influence the values of da_lipo_5B and N_H_2B, as these descriptors are associated with carbon and nitrogen too. Therefore, it indicates that pharmacophore synergism determines the final inhibitory ability of a molecule for AKB. This is clearly reflected when molecule 435 is compared with molecule 438.

The pdb 4c2v contains two different tautomeric forms of ligand YJA in two different chains, A and B. The influence of fsp3Csp2N5B along with N_H_2B is observed for the two tautomeric forms of co-crystallized ligand 'YJA' in the pdb 4c2v [41]. The two tautomeric forms show that YJA-T1 and YJA-T2 (see Figure 7) of ligand YJA have different values for fsp3Csp2N5B and N_H_2B (see Table 3). The online tautomer generator from Chemaxon (https://disco.chemaxon.com/calculators/demo/plugins/tautomers/, accessed on 28 October 2022) indicates that the ligand YJA can exist in seven different tautomeric forms. However, only two tautomeric forms, YJA-T1 and YJA-T2, predominate, with approximately 16 and 84 percent, respectively. The rest of the tautomeric forms have less than a 0.1% probability of existence.

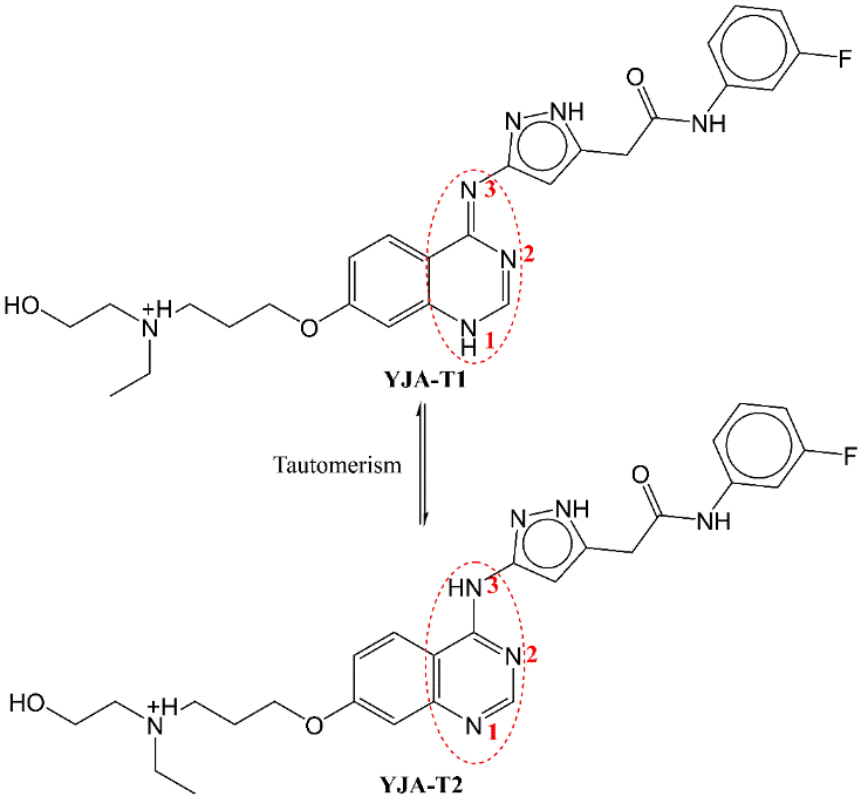
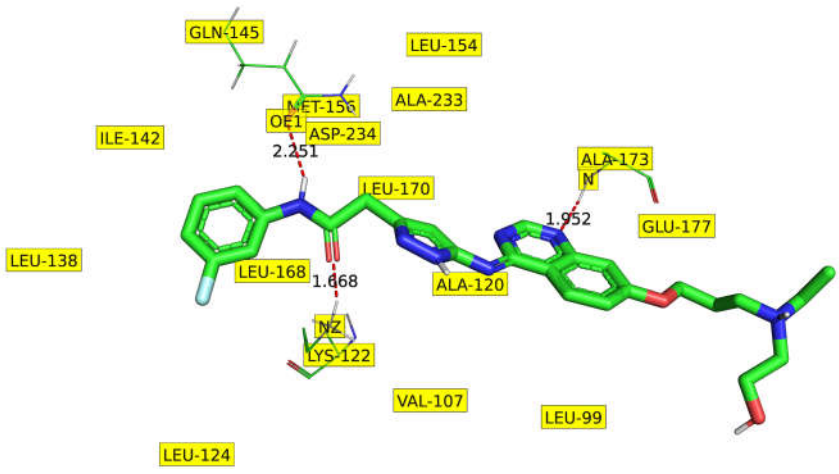


Figure 7. Tautomeric forms of ligand YJA (pdb 4c2v). The red colored numbers have been used for indication of nitrogen atoms involved in tautomerism.

Table 3. A comparison of two tautomeric forms, YJA-T1 and YJA-T2.

Tautomer with Descriptor Value	H-Bonds Formed with Distance (Å) with Angle (Donor–Hydrogen–Acceptor) (Cut-Off: 5 Å)	List of Receptor Heavy Atoms within 5 Å of N3 atom of Ligand (Residue–Atom–Distance in Å)	List of Receptor Heavy Atoms within 5 Å of N1 Atom of Ligand (Residue–Atom–Distance in Å)
YJA-T1 fsp3Csp2N5B = 0 N_H_2B = 6 fsp2Osp2C5B = 3	LYS122 at 1.668 with 159.8°, GLN145 at 2.251 with 142.4, ALA173 at 1.952 with 163.9°	VAL107-CB-4.672, VAL107-CG1-4.351, VAL107-CG2-4.419, LU177-OE2-4.842, LEU223-CG-4.608, LEU223-CD1-3.627, LEU223-CD2-4.406	LEU99-CD1-4.259, ALA120-CB-4.501, GLU171-C-4.888, GLU171-O-4.058, PHE172-N-4.808, PHE172-CA-3.818, PHE172-C-3.832, PHE172-CB-4.641, PHE172-CG-4.403, PHE172-CD1-3.550, PHE172-CE1-4.156, ALA173-N-2.936, ALA173-CA-3.743, ALA173-C-4.208, ALA173-O-3.930, ALA173-CB-3.623, LEU223-CD1-4.121
YJA-T2 fsp3Csp2N5B = 1 N_H_2B = 7 fsp2Osp2C5B = 3	LYS122 at 2.361 with 157.8°, GLN145 at 2.323 with 115.7°, ALA173 at 1.946 with 174.4°, HOH2108 2.222 with 106.7°	PHE104-CG-4.358, PHE104-CD2-3.203, PHE104-CE2-3.058, PHE104-CZ-4.124, VAL107-CB-4.591, VAL107-CG1-4.413, VAL107-CG2-4.142, LEU223-CD1-4.047, LEU223-CD2-4.948	LEU99-CD2-3.977, ALA120-CB-4.707, GLU171-C-4.734, GLU171-O-3.872, PHE172-N-4.690, PHE172-CA-3.669, PHE172-C-3.814, PHE172-CB-4.567, PHE172-CG-4.418, PHE172-CD1-3.618, PHE172-CE1-4.265, ALA173-N-2.953, ALA173-CA-3.799, ALA173-C-4.271, ALA173-O-3.915, ALA173-CB-3.635, LEU223-CD1-4.165

A comparison of the interactions of YJA-T1 and YJA-T2 with the receptor and the solvent indicates that the two forms have established H-bonds with the similar amino acid residues of the receptor but with different distances (see Figure 8). The YJA-T2 has an additional H-bond with the solvent (HOH2108). Moreover, it has a higher number of interactions with the receptor and the solvent (H_2O) within 5 Å compared to YJA-T1. Thus, the increased value of fsp3Csp2N5B and N_H_2B for these two tautomeric forms correlates with a higher number of receptor atoms in the vicinity, which ultimately leads to an augmented number of interactions. Additional details related to the interactions of YJA-T1 and YJA-T2 with the receptor are available in Table S1 in the Supplementary Materials.



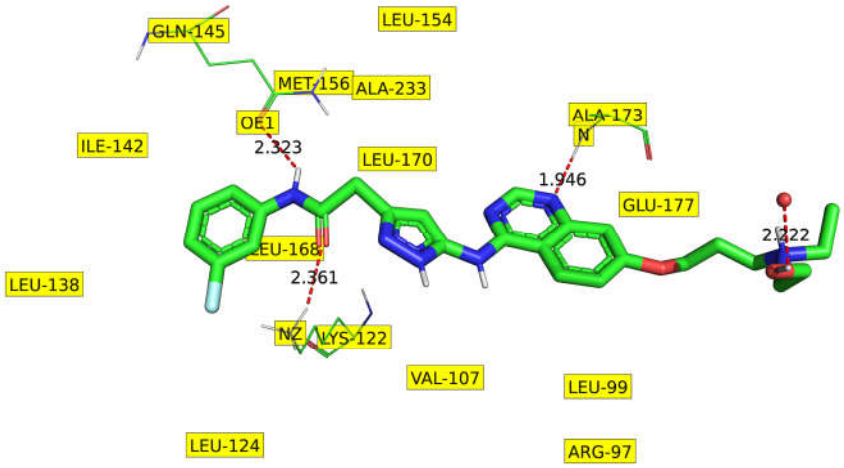


Figure 8. Depiction of prominent interactions of YJA-T1 and T2 with the receptor (pdb: 4c2v).

fsp2Osp2C5B:

The molecular descriptor fsp2Osp2C5B underlines the influence of a specific combination of sp2-hybridized carbon with sp2-hybridized oxygen in determining the inhibitory profile for AKB. The positive coefficient for fsp2Osp2C5B indicates that increasing such a combination of oxygen and carbon could lead to a better inhibitory profile. In the present dataset, there are 426 molecules with the presence of at least one such combination of oxygen and carbon. Likewise, the 200 most active molecules with IC50 values in the range of 0.26 to 24 nM, except molecule numbers 36 and 469, also possess fsp2Osp2C5B >1. A comparison of molecule number 167 with 168 further strengthens this observation (see Figure 9).

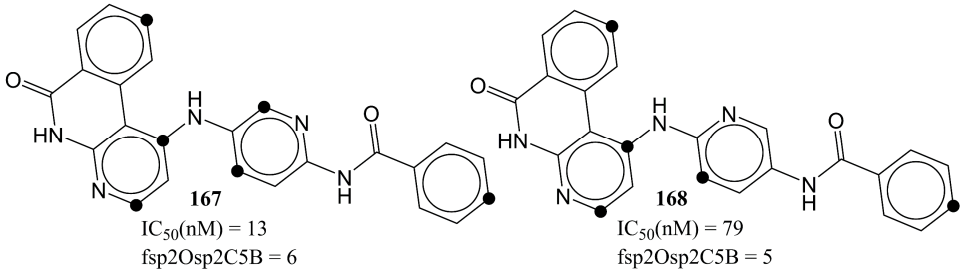


Figure 9. Representation of fsp2Osp2C5B using molecule numbers 167 and 168 as representative examples. The black circle represents the sp2-hybridized carbon at five bonds from sp2-hybridized oxygen.

A closer analysis revealed that the sp2-hybridized carbon with sp2-hybridized oxygen, required for the existence of fsp2Osp2C5B are, in general, aromatic carbon atoms and oxygen of the carbonyl group, especially the amide group, respectively. This further highlights the importance of aromatic rings—and in turn lipophilic atoms—as aromatic carbons are mostly lipophilic in nature. The need for an amide group in conjugation point outs the necessity of a polar group to enhance the interactions with the receptor. The two tautomeric forms of YJA-T1 and T2 possess such a combination and it results in enhanced interactions with the receptor (see Figure 8). Obviously, a sp2-hybridized carbon atom will be at a respective distance of three and five bonds from the nitrogen and oxygen atoms of the same amide group; therefore, we also checked the importance of famdNsp2C3B (frequency of occurrence of sp2-hybridized carbon atoms exactly at three bonds from amide nitrogen atoms). It was observed that fsp2Osp2C5B and famdNsp2C3B

have a correlation of 0.64 and 0.58, respectively, with pIC50. Therefore, fsp2Osp2C5B is a better choice to be considered for future optimizations and activity predictions.

fOringC6B:

The descriptor fOringC6B is associated with the simultaneous and conditional occurrence of polar (oxygen) and lipophilic characters (ring carbons) with an exact separation by six bonds. If a ring carbon is also present within five or less bonds of any other oxygen atom, then it is omitted while calculating fOringC6B. The molecular descriptor fOringC6B has a negative coefficient in model 1, which means that a higher number of such carbon atoms could reduce the inhibitory profile of a molecule for AKB. This is confirmed when the following pairs of molecules are compared: 526 with 511, 526 with 521, 204 with 205, 229 with 231, 477 with 485, and 256 with 257. The descriptor has been depicted in Figure 10. The red dots indicate the ring carbons, which contribute to fOringC6B at exactly six bonds from the oxygen atom. The six bonds separating such carbon and oxygen atoms have been labeled with numbers.

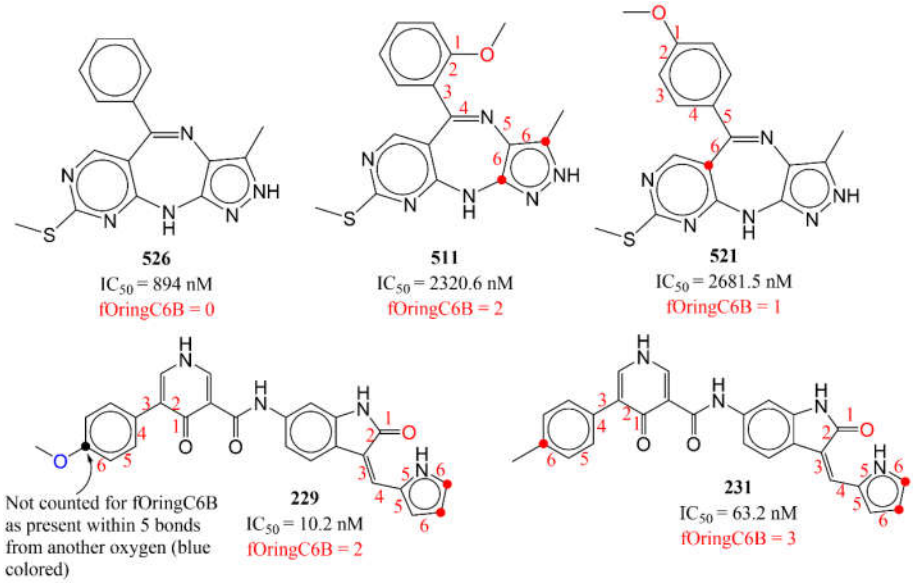


Figure 10. Representative examples for fOringC6B. The numbers (red) indicate the counting of number of bonds between ring carbon and oxygen atom.

It appears that reducing the number of ring carbon atoms is a feasible solution to achieve a lower value of fOringC6B, but this will affect negatively other descriptors, viz. da_lipo_5B, fsp2Osp2C5B. Instead, a solution is to reduce the number of oxygen atoms or alternatively increase their presence within five or less bonds of ring carbon atoms. The second solution is observed in the case of molecule number 229. The additional -OCH3 led to a decreased value of fOringC6B, because, while calculating fOringC6B, if a ring carbon atom was simultaneously present within six bonds of two or more oxygen atoms, it was excluded.

fringNC6B:

The molecular descriptor fringNC6B provides crucial information about the upper limit for separation required between the lipophilic (carbon atoms) and polar (nitrogen atoms) moieties to achieve a better activity profile. While calculating fringNC6B, if a carbon atom is also present within five bonds of any other ring nitrogen, then it is omitted. If a carbon atom is present exactly at a distance of six bonds from a ring nitrogen atom, then it contributes negatively; therefore, such a combination should be avoided. Reducing the bond gap between carbon and ring nitrogen is a feasible and justified solution, as other descriptors, viz. da_lipo_5B and fsp3Csp2N5B, also indicate the same. As stated earlier, a plausible reason for this could be the active site of AKB (see Figure 11). The influence of

fringNC6B on activity is confirmed when following pairs of molecules are compared: 5 with 500, 5 with 506, 374 with 406, 507 with 514, to list a few.

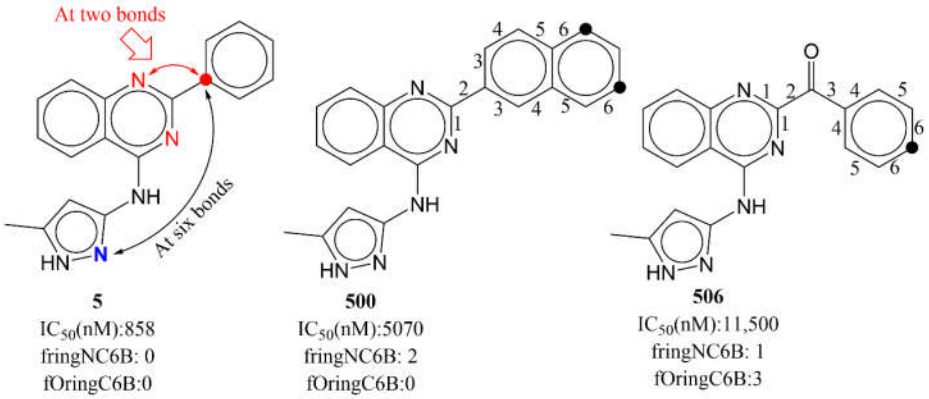


Figure 11. Depiction of fringNC6B using molecule numbers 5, 500, and 506 as representative examples. The carbon present at six bonds from ring nitrogen has been depicted using black dots. The numbers (black) indicate the counting of number of bonds between ring nitrogen and carbon.

As stated earlier, the descriptors present in model A are entangled. Therefore, changing one descriptor could result in changes in other descriptors. For example, the descriptors fringNplaN4B and fringNC6B indicate the importance of ring nitrogen atoms. The fringNplaN4B has a positive correlation with pIC50 but fringNC6B has the opposite relation. Therefore, increasing the value of fringNplaN4B by escalating the ring nitrogen atoms could also lead to a higher fringNC6B value. Hence, a balance of the appropriate number and types of nitrogen, carbon, and oxygen could lead to significant inhibitory activity for aurora kinase B.

4. Materials and Methods

In this work, we adhered to the OECD's and other researchers' suggested standards and recommendations [17–19,32,43,44] for a successful QSAR analysis. The various procedures for creating a model included meticulous dataset selection, data curation, 3D structure production for all molecules, computation and trimming of molecular descriptors, model creation and extensive validation, and mechanistic interpretation [45,46]. To eliminate bias and ensure proper model validation, these stages were carried out one at a time.

4.1. Selection of Dataset

The success and efficacy of a QSAR analysis in the drug discovery pipeline are significantly influenced by the size, composition, and structural diversity of the selected dataset used for the analysis [17–19,32,43,44]. As a result, a sizable dataset of 3398 reported AKB ligands was downloaded from BindingDB (https://www.bindingdb.org/bind/index.jsp, accessed on 14 January 2022). The dataset was then reduced to 561 molecules only after duplicates (average value for duplicates), salts, metal derivatives, rule-of-five violators, molecules with undefinable Ki values, etc., were eliminated during data curation [47]. The condensed dataset still included a variety of molecules, such as stereoisomers, positional and chain isomers, various heterocyclic and aromatic scaffolds, etc. Thus, it covered a broad chemical space. The experimental IC50 ranged from 0.26 to 16,000 nM. The experimental IC50 values were converted to pIC50 for a better QSAR analysis ($-\log_{10}$IC50). Figure 12 and Table 4 comprise some molecules that are very active and those that are least active, to help the readers to understand the structural variation present in the dataset.

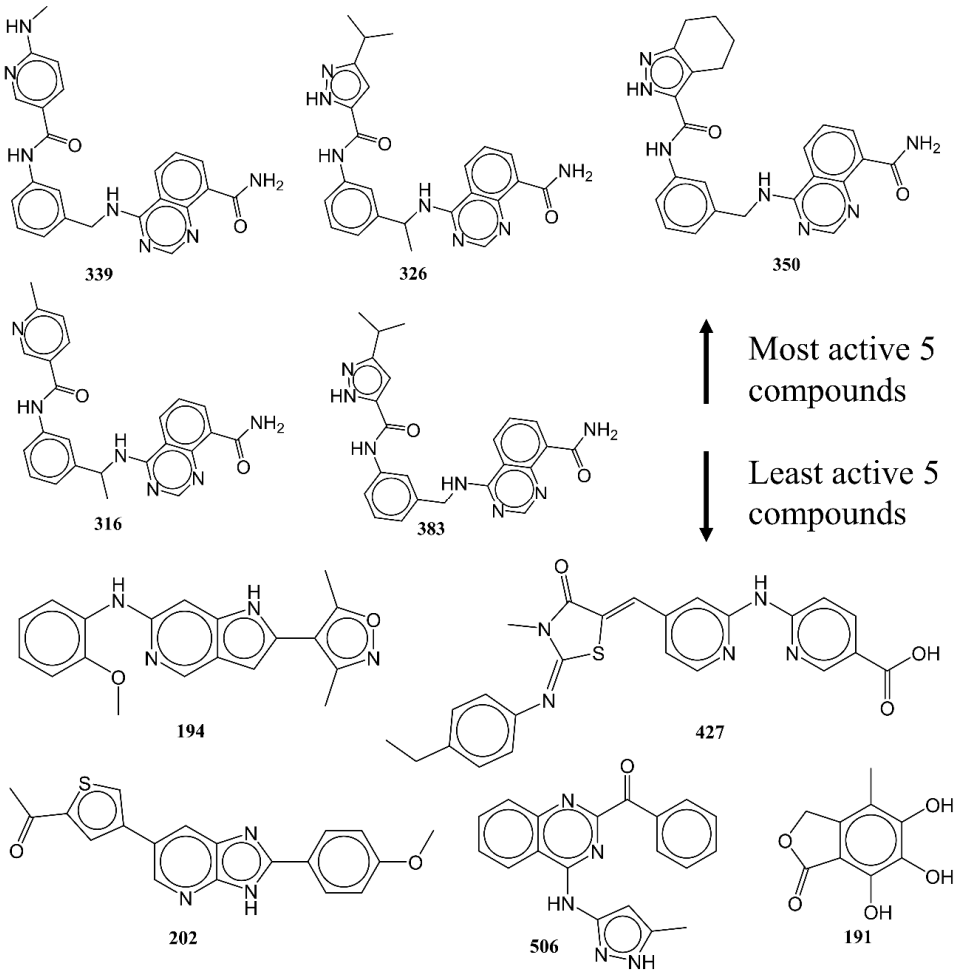


Figure 12. Representative examples from the selected dataset (five most active and five least active molecules).

Table 4. SMILES notation, IC50 (nM), and pIC50 (M) of five most and least active molecules of the selected dataset.

Mol ID	SMILES	IC50 (nM)	pIC50 (M)
339	O=C(Nc1cc(CNc2ncnc3c(C(=O)N)cccc23)ccc1)c1cnc(NC)cc1	0.26	9.585
326	O=C(Nc1cc(C(Nc2ncnc3c(C(=O)N)cccc23)C)ccc1)c1[nH]nc(C(C)C)c1	0.27	9.569
350	O=C(Nc1cc(CNc2ncnc3c(C(=O)N)cccc23)ccc1)c1[nH]nc2c1CCCC2	0.3	9.523
316	O=C(Nc1cc(C(Nc2ncnc3c(C(=O)N)cccc23)C)ccc1)c1cnc(C)cc1	0.32	9.495
383	O=C(Nc1cc(CNc2ncnc3c(C(=O)N)cccc23)ccc1)c1[nH]nc(C(C)C)c1	0.33	9.481
191	O=C1OCc2c(C)c(O)c(O)c(O)c12	8690	5.061
506	O=C(c1nc(Nc2n[nH]c(C)c2)c2c(n1)cccc2)c1ccccc1	11,500	4.939
202	O=C(C)c1scc(-c2cnc3[nH]c(-c4ccc(OC)cc4)nc3c2)c1	12,100	4.917
427	O=C(O)c1cnc(Nc2nccc(/C=C\3/C(=O)N(C)/C(=N/c4ccc(CC)cc4)/S/3)c2)cc1	12,505.05	4.903
194	O(C)c1c(Nc2ncc3c([nH]c(-c4c(C)onc4C)c3)c2)cccc1	16,000	4.796

4.2. Calculation of Molecular Descriptors and Objective Feature Selection (OFS)

The next step involved applying the proper methodology to convert SMILES notations into 3D-optimized structures. OpenBabel 3.1 [48] was used to translate SMILES to SDF for this. Then, utilizing PM3 as a force field for structure optimization and partial charge assignment, SDF was converted to MOL2 using MOPAC [49] 2016. After this, PyDescriptor [37] and PaDEL [50], which together offered more than 40,000 molecular descriptors for each molecule, were used for molecular descriptor calculation. Although using a large number of molecular descriptors increases the likelihood that a QSAR analysis will be effective, with a balance of predictive and mechanistic interpretation abilities, it also raises the risk of overfitting due to noisy redundancy in the descriptors or chance correlations. As a result, OFS was carried out using QSARINS 2.2.4 [51], which eliminated molecular descriptors that were nearly constant (for 90% of molecules) and highly inter-correlated ($|R| > 0.90$). After extensive OFS, only 1150 descriptors were finally included in the reduced set of molecular descriptors, but they nevertheless covered a wide descriptor space because they included fingerprints, charged-based, 1D to 3D, and a good number of atom-pair descriptors. The likelihood of a mechanistic interpretation of the model increased because a significant portion of the descriptors could be readily interpreted in terms of structural traits.

4.3. Splitting the Dataset into Training and External Sets and Subjective Feature Selection (SFS)

SFS is one of the most important steps in the QSAR model-building process that involves choosing the right feature selection technique with an adequate number and set of molecular descriptors. Before developing the QSAR model, the dataset was randomly divided into a training set (80%, or 449 molecules) and a prediction set (20%, or 112 molecules), to allow for proper training and validation of the model. In order to eliminate bias, reduce information leakage [32], confirm the model's external predictive ability to predict for molecules other than the training set, and to improve the composition of the training and prediction sets, the dataset was randomly divided at a ratio of 80:20. The selection of molecular descriptors was done using the training set only. The prediction set, also known as the test set or external set, was used exclusively for judging the external predictive ability of the model.

To prevent over- and underfitting, the QSAR model must have an ideal number of molecular descriptors (variables). Consequently, the ideal number of descriptors for the model was identified using a straightforward graphical (or breaking point) method [45,46,52]. The value of Q2LOO typically increases considerably when a new variable (molecular descriptor) is added in stages to an MLR model until the desired elevation is reached. After this, the value of Q2LOO increases slightly or negligibly. As a result, the number of molecular descriptors that match the elevation point is ideal for creating a QSAR model. A graph of this is shown in Figure 13. The last elevation point in Figure 13 corresponds to seven molecular descriptors. Therefore, the genetic algorithm (GA) in combination with multi-regression (GA–MLR) method, using QSARINS 2.2.4, was used for the exhaustive search to identify seven molecular descriptors to develop the QSAR model. For GA–MLR, Q2LOO was used as the fitness parameter.

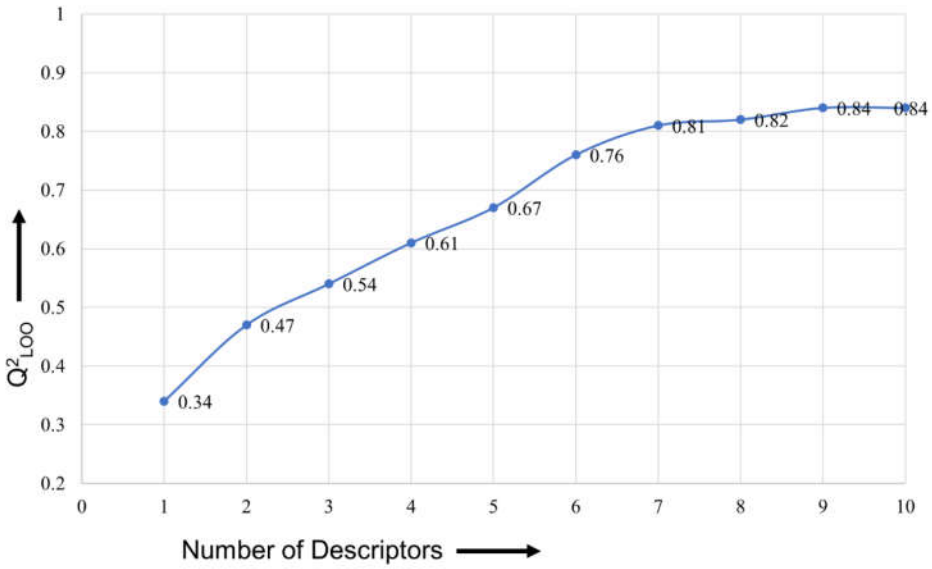


Figure 13. Plot of number of descriptors against leave-one-out coefficient of determination (Q2LOO) to identify the optimum number of descriptors.

4.4. Building Regression Model and Its Validation

Different combinations of various molecular descriptors were eventually found during the search for seven molecular descriptors for the QSAR model using GA–MLR. However, due to the statistical performance and the satisfaction of adhering to strict parameters and criteria, which have been recommended [17–19,23,27,32,33,44–46,52–57] by a significant number of researchers, only one combination of molecular descriptors was chosen. The following threshold values and conditions were used to select the model:

$R^2_{tr} \geq 0.6$, Q2LOO ≥ 0.5, Q2LMO ≥ 0.6, $R^2 >$ Q2LOO, $R^2_{ex} \geq 0.6$, RMSEtr < RMSEcv, ΔK ≥ 0.05, CCC ≥ 0.80, Q2-Fn ≥ 0.60, r2m ≥ 0.5, (1-r2/ro2) < 0.1, 0.9 ≤ k ≤ 1.1 or (1-r2/r′o2) < 0.1, 0.9 ≤ k′ ≤ 1.1, | ro2− r′o2| < 0.3, RMSEex, MAEex, R^2_{ex}, Q2F1, Q2F2, Q2F3, and low R2Yscr, RMSE and MAE.

The model's application domain must be identified for additional validation. In order to assess the application domain of the QSAR model, we employed a Williams plot (standardized residuals vs. hat values).

5. Conclusions

In relation to different features influencing the inhibitory activity for AKB, the present analysis successfully highlighted the significance of different types of atoms, groups, patterns, and tautomerism. Additionally, it emphasized the significance of specific patterns of atoms of different hybridization and their inter-relations in determining the final activity. The conditional presence of lipophilic (carbon) atoms or groups with respect to nitrogen atoms was also successfully recognized by model A as being beneficial for obtaining higher inhibitory for AKB. The present work, for the first time, pointed out the role played by tautomerism for AKB inhibitors. Model A performed statistically well, which was indicative of its strong external prediction power. As the current work successfully recognized both previously described and novel pharmacophoric properties associated with AKB inhibition, the results are of immense use throughout the drug discovery pipeline for the development of lead/drug candidates against AKB.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/ijms232314527/s1.

Author Contributions: V.H.M. and M.E.A.Z.: conceptualization, project design, and experimental studies; V.H.M. and S.A.A.-H.: drafting, resources, and funding management; M.M.R., S.A. and S.D.T.: data collection and curation, drafting, and data compilation; S.A., A.S. and A.A.A.-M.: draft revision and analysis. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

SMILES	Simplified molecular-input line-entry system
GA	Genetic algorithm
MLR	Multiple linear regression
QSAR	Quantitative structure–activity relationship
WHO	World Health Organization
OLS	Ordinary least squares
QSARINS	QSAR Insubria
OECD	Organization for Economic Cooperation and Development

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Vidarbha Youth Welfare Society's
Bar.Ramrao Deshmukh Arts, Smt. Indiraji Kapadia Commerce &
Nya. Krishnarao Deshmukh Science College,Badnera-Amravati (Maharashtra) 444 701
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Dr. N.R. Dhande, President | Adv. U.S. Deshmukh, Vice President | Prof. (Dr.) H.M. Deshmukh, Treasurer | Mr. Y.V. Choudhary, Secretary | Dr. R.D. Deshmukh, Principal

Ref.No. RDIKND/2018-19 Date : 26/11/2018

Memorandum of Understanding (MoU)

Between

Bar.Ramrao Deshmukh Arts,Smt.Indiraji Kapdiya Commerce & Nyaymurti Krushnarao Deshmukh Science College, Badnera Dist:-Amravati

and

Adarsha Science, Jairamdas Bhagchand Arts and Birla Commerce Mahavidyalaya
Dhamangaon Rly., Dist. Amravati, Maharashtra, India-444709

It is hereby agreed by and between the parties here to as follows:
This MoU is initiated on **26/11/2018** and enforced from the same date for next ten years i.e. upto 25/11/2028, by and between

Bar.Ramrao Deshmukh Arts, Smt. Indiraji Kapdiya Commerce & Nyaymurti Krushnarao Deshmukh Science College, Badnera Dist:-Amravati and Adarsha Science, Jairamdas Bhagchand Arts and Birla Commerce Mahavidyalaya
Dhamangaon Rly., Dist. Amravati, Maharashtra, India-444709
for the following objectives:

Objectives of this MoU:

1) To promote and enhance the academic interest of the students of both institutes by providing training, field trip and innovative activities such as Quiz, Essay, Poster, seminar competition, etc. through a suitable mode.
2) Both parties shall co-operate in organizing various workshops /conferences /seminars/training sessions, as and when needed.
3) Both the parties shall collaborate to provide students and faculty the necessary atmosphere and facilities for the promotion of:
    - Joint publications of research work in various disciplines.

- Inter-disciplinary and multi-disciplinary studies.
- Participation and support in various academic activities.
- Exchange of literatures in education and research, publications, and academic information;
- Joint research and meetings for education and research;

4) To provide academic interactions by organizing guest lectures of faculty of both the institutions on various topics with mutual consent, as and when needed.
5) To promote research and continuing co-curricular and extra-curricular activities in conjugation, as an when needed.
6) To share information about various funds available from various funding agencies for research, infrastructure development, teaching aids, etc.
7) Collaboration and sharing of Academic data, Scientific Information, Intellectual properties, Articles and Publications.
8) The financial implications and expenditures, if any, associated with execution of any field trip, co-curricular and extra-curricular activities or other learner centric activities through a suitable mode will be subjected to negotiations and mutual consensus.
9) To promote co-curricular and extra-curricular activities in conjunction, as and when needed, for achieving other objectives of this MoU.
10) To promote and enhance the capacity building amongst the students of the two institutions, as and when required, using a suitable mode.
11) To develop the creative leadership amongst the students for the nation building by providing suitable platforms and facilities, to be offered jointly, using resources of both the parties.

Before these activities can be implemented, both parties shall discuss the same in details involved to the satisfaction of each party and enter into specific activity agreements based on the mutually agreed objectives and outcomes. Any issue or dispute arising, while execution or

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Dr. N.R. Dhande, President | Adv. U.S. Deshmukh, Vice President | Prof. (Dr.) H.M. Deshmukh, Treasurer | Mr. Y.V. Choudhary, Secretary | Dr. R.D. Deshmukh, Principal

Ref.No. Date : / /20

in interpretation of these objectives, will be resolved by mutual understanding and deliberations. Breach of any terms and conditions would make this agreement liable for termination.

This MoU is executed in duplicate with each copy being an official version and having equal legal validity. By signing below, the Institutes, acting by their duly authorized officials, have caused this MoU to be executed on the date written above.

Dr.R.D.Deshmukh
PRINCIPAL
Bar. Ramrao Deshmukh Arts
Smt. Indiraji Kapadiya Commerce &
Nyaymurti Krushnarao Deshmukh
Science College, Badnera- Amravati.

Dr.Y.B.Gandole
PRINCIPAL
Adarsha Science, J.B. Arts &
Birla Comm. Mahavidyalaya,
Dhamangaon Rly.

Bar.Ramrao Deshmukh Arts,Smt.Indiraji Kapdiya Commerce &Nyaymurti Krushnarao Deshmukh Science College, Badnera Dist:-Amravati-444701	Adarsha Science, Jairamdas Bhagchand Arts and Birla Commerce Mahavidyalaya Dhamangaon Rly., Dist. Amravati, Maharashtra, India-444709
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Witness 1: Dr.V.G.Mete
Dr. V. G. Mete
Professor & Head
Department of Mathematics,
R.D.I.K. & K.D. College, Badnera-Amravati

Witness 2 : Dr.S.N.Bayaskar
Dr. S. N. Bayaskar
Associate Professor & Head
Department of Mathematics,
Adarsha Science, J.B.Arts Birla Commerce
Mahavidyalaya, Dhamangaon Rly.

Vidarbha Youth Welfare Society's
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Ref.No. RDIKKD/209-20

Date : 21 / 02 /2020

Memorandum of Understanding (MoU)

Between

Bar.Ramrao Deshmukh Arts,Smt.Indiraji Kapdiya Commerce & Nyaymurti Krushnarao Deshmukh Science College, Badnera Dist:-Amravati

and

Shri.Dr.R.G.Rathod Arts and Science Colleg , Murtizapur Dist:-Akola (M.S)

It is hereby agreed by and between the parties here to as follows:
This MoU is initiated on **21/02/2020and** enforced from the same date for next five years i.e. upto 20/02/2025, by and between

Bar.Ramrao Deshmukh Arts, Smt. Indiraji Kapdiya Commerce & Nyaymurti Krushnarao Deshmukh Science College,Badnera Dist:-Amravati and Shri.Dr.R.G.Rathod Arts and Science College, Murtizapur Dist : Akola .
for the following objectives:

Objectives of this MoU:

1) To promote and enhance the academic interest of the students of both institutes by providing training, field trip and innovative activities such as Quiz, Essay, Poster, seminar competition, etc. through a suitable mode.
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3) Both the parties shall collaborate to provide students and faculty the necessary atmosphere and facilities for the promotion of:

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Ref.No.

Date : 21 / 02 /2020

- Joint publications of research work in various disciplines.
- Inter-disciplinary and multi-disciplinary studies.
- Participation and support in various academic activities.
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Ref.No.

Date : 21 / 02 /2020

Before these activities can be implemented, both parties shall discuss the same in details involved to the satisfaction of each party and enter into specific activity agreements based on the mutually agreed objectives and outcomes. Any issue or dispute arising, while execution or in interpretation of these objectives, will be resolved by mutual understanding and deliberations. Breach of any terms and conditions would make this agreement liable for termination.

This MoU is executed in duplicate with each copy being an official version and having equal legal validity. By signing below, the Institutes, acting by their duly authorized officials, have caused this MoU to be executed on the date written above.

Dr.R.D.Deshmukh
PRINCIPAL
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Nyaymurti Krushnarao Deshmu
Science College, Badnera

Dr.A.P.Charjan
Principal
Shri. Dr. R. G. Rathod Arts & Science College, Murtizapur, Dist. Akola

Bar.Ramrao Deshmukh Arts,Smt.Indiraji Kapdiya Commerce &Nyaymurti Krushnarao Deshmukh Science College,Badnera Dist:-Amravati	Shri.Dr.R.G.Rathod Arts and Science College,Murtizapur Dist Akola
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Witness 1: Dr.V.G.Mete
Dr. V. G. Mete
Professor & Head
Department of Mathematics,
R.D.I.K. & K.D. College, Badnera-Amravati

Witness 2 : Dr.A.S.Nimkar
Dr A. S. Nimkar
Asst. Professor & Head
Dept. of Mathematics
Shri Dr. R. G. Rathod
Arts & Science College,
Murtizapur, Dist. Akola

1. Name of Organising Department	:	**Mathematics**
2. Name of Activity	:	University Level Workshop Research in Mathematics
3. Place of Activity	:	SGBAU, Amravati
4. No. of Participant	:	Research scholars: 103, Teachers: 28 Resource persons: 02
5. Dateof Activity	:	06/08/2022

Details of Activity (In Brief):

A "University Level Workshop on Research in Mathematics" was held on August 6th, 2022, as per the Memorandum of Understanding (MOU). The workshop was organized in collaboration with the Department of Mathematics at Sant Gadge Baba Amravati University, Amravati, Adarsha Mahavidyalaya in Dhamangaon Rly., and Shri. Dr. R.G.Rathod Arts and Science College in Murtizapur. A total of 133 participants, including research scholars, Ph.D. supervisors, and postgraduate students from various research centres, took part in the workshop.

Outcome of the Programme:

- **Knowledge sharing**: This workshop provides a platform for researchers, scholars, and students to share their knowledge, ideas, and research findings in the field of mathematics. This can lead to a deeper understanding of various mathematical concepts and methodologies
- **Collaboration opportunities**: The workshop brings together participants from different research centres and institutions, fostering collaboration and networking opportunities. This can result in potential research collaborations, joint projects, and partnerships in the future
- **Skill development**: Participants can enhance their skills and gain new insights into research methodologies, data analysis, problem-solving techniques, and more.
- **Feedback and improvement**: Participants can receive valuable feedback on their research work from experts and peers during the workshop. This feedback can help them refine their research methodologies, identify areas for improvement, and enhance the quality of their work
- **Dissemination of research:** The workshop provides a platform for researchers to present their work and findings to a wider audience. This can lead to the dissemination of research outcomes, potential publications, and increased visibility within the academic community
- **Professional development**: Participating in a university-level workshop can contribute to the professional development of researchers, scholars, and students. It allows them to stay updated with the latest advancements in the field, learn from experts, and broaden their understanding of mathematics research

Name & Contact No. of Expert (if any):

Dr. Deelip Malkhede, Vice Chancellor, Sant Gadge Baba Amravati University, Amravati

Prof. K. S. Adhav, Former Professor in Mathematics, IGNT University, Amarkantak (M. P.**)** Contact No**.** 9011044316

Dr. V. G. Mete
Professor & Head
Department of Mathematics,
R.D.I.K. & K.D. College, Badnera-Amravati

गणित प्रात्यक्षिकातून शिकवल्यास आनंददायी होईल- कुलगुरू

अमरावती/ का.प्र. गणित विषय शिकताना, शिकविताना तसेच संशोधन करताना त्याचे प्रॅक्टिकल अप्लिकेशन विद्यार्थ्यांना घेतल्यास या विषय आनंद देणारा असल्याचे प्रतिपादन संत गाडगेबाबा अमरावती विद्यापीठाने कुलगुरू प्रा.डॉ. दिलीप मालखेडे यांनी केले. विद्यापीठाच्या गणित विभाग, आयक्यूएसी विभाग, आर.डी.आय.के महाविद्यालय बडनेरा, आदर्श महाविद्यालय धामणगावरेल्वे आणि डॉ.आर.जी राठोड कला व विज्ञान महाविद्यालय मुर्तीजापूर यांच्या संयुक्त विद्यमाने 'युनिव्हर्सिटी लेव्हल वर्कशॉप ऑन रिसर्च इन मॅथेमॅटिक्स' विषयावर कार्यशाळेचे आयोजन करण्यात आले. त्याप्रसंगी ते बोलत होते.

याप्रसंगी त्यांनी मार्गदर्शनात गणित विषयातील विविध कन्सेप्ट चे प्रॅक्टिकल ऑप्लिकेशन सुद्धा समजावून सांगितले. तसेच गणित विषय शिकताना एखादी तरी आयक्यूएसी लॅबचे विद्यार्थ्यांनी संशोधनाकरिता आत्मसात करावी, असा मौलिक सल्ला दिला. व्यासपीठावर डॉ. किशोर अढाव, सायं प्राध्यापक तथा विभागप्रमुख, गणित विभाग, केंद्रीय विद्यापीठ, अमरकंटक, प्रा.डॉ. संदीप वाघुळे, संचालक, आयक्यूएसी, संत गाडगे बाबा अमरावती विद्यापीठ, प्राचार्य डॉ. विलास राऊत, मुंगसाजी महाराज महाविद्यालय, दारव्हा, डॉ. विजय मेटे, गणित विभाग प्रमुख, आरडीआयके कॉलेज, बडनेरा उपस्थित होते. सदर कार्यशाळेत उद्घाटनपर भाषण करतांना डॉ.किशोर अढाव यांनी गणित विषयाच्या संशोधनाकरिता नवनवीन थियरी वापरण्याबाबत मार्गदर्शन केले. आयक्यूएसी संचालक प्रा.डॉ. संदीप वाघुळे यांनी इंटरनॅशनल लेव्हल विद्यार्थ्यांनी राईट (आयपीआर), डॉ.व्ही .आर. पाटील, गणित विभाग प्रमुख, कला व विज्ञान महाविद्यालय, मुखेडदरा यांनी उत्कृष्ट संशोधन लेख कसा लिहावा तसेच डॉ. संजय भोयर, फुलसिंग नाईक महाविद्यालय पुसद यांनी गुणवत्तापूर्ण संशोधन या विषयांवर मार्गदर्शन केले.

कार्यक्रमाकरिता विभाग प्रमुख डॉ.हिमलता नांदूरकर आणि सहाय्यक प्राध्यापक विनोद नागले प्राणीशास्त्र विभाग, संत गाडगेबाबा अमरावती विद्यापीठ, अमरावती तसेच संलग्नित विविध महाविद्यालयातील गणित विषय चे संशोधक, मार्गदर्शक, रिसर्च कलिंर आणि पदवीत्तर विभागातील विद्यार्थी मोठ्या संख्येने उपस्थित होते. या कार्यक्रमामध्ये डॉ. विद्या राणे, डॉ. मोहिनी उगले, मुंडे आदींनी आपले विचार व्यक्त केले. प्रास्ताविक डॉ. सुधीर वायस्कर, गणित विभाग प्रमुख, आदर्श महाविद्यालय धामणगाव रेल्वे तर आभारप्रदर्शन डॉ. अनिल निमकर, गणित विभाग प्रमुख, डॉ.आर.जी. राठोड कला व विज्ञान महाविद्यालय मुर्तीजापूर यांनी केले. कार्यक्रमाच्या यशस्वितेक रिता अक्षय देटे, चंदरशेखर काळे आणि संत गाडगेबाबा अमरावती विद्यापीठ गणित विभागातील सर्व विद्यार्थी- विद्यार्थिनी यांनी अथक परिश्रम घेतले.

LINE THE HITAVADA VIDARBHA LINE 14 AUG 2022 3

'Maths can be delightful if learnt in context of its practical application'

■ Amravati Bureau
AMRAVATI, Aug 13

"MATHEMATICS as a subject can also be delightful if its practical application is considered during the teaching-learning process and also while doing research," said Dr Dilip Malkhede, Vice-Chancellor of Sant Gadge Baba Amravati University (SGBAU).

He was speaking at the workshop on Research in Mathematics organised jointly by Department of Mathematics, Department of IQAC, RDIK College, Badnera, Adarsh College, Dhamangaon Railway, and Dr R G Rathod College of Arts and Sciences, Murtijapur.

Dr Malkhede also explained the practical application of various concepts in Maths and gave a fundamental advice that students should acquire at least one computer language for research while learning Maths.

Dr Kishor Adhav, former professor and Head of Department, Department of Mathematics, Central University, Amarkantak, Dr Sandeep Vaghule, Director of IQAC, SGBAU, Dr Vilas Raut, Principal of Mungsaji Maharaj College, Darwha, and Dr Vijay Mete, Head of Mathematics Department, RDIK College, Badnera were on the dais.

Dr Kishor Adhav gave a talk on use of new theories for research in Mathematics.

Dr Sandeep Vaghule spoke on Intellectual Property Rights (IPR) while Dr V R Patil, Head of Mathematics Department, College of Arts and Science, Chikhaldara, guided on how to write an excellent research paper. Dr Sanjay Bhoyar from Pusalingh Naik College, Pusad, spoke on qualitative research.

Dr Hemlata Nandurkar, Head of Department, and Vinod Nagle, Assistant Professor from Department of Zoology, SGBAU, as well as researchers, mentors, research callers and post-graduate students from various affiliated colleges were present in large numbers for the workshop.

Dr Vidya Sharma, Dr Nikhil Ugle, Shital Nerkar, Dr Sampadhan Mande and others expressed their views on the occasion.

Dr Sanjir Bayaskar, Head of Mathematics Department, Adarsh College, Dhamangaon Railway, delivered introductory remarks while Dr Anil Nimkar, Head of Mathematics Department, Dr R G Rathod College of Arts and Science, Murtijapur, proposed a vote of thanks.

Akshay Dete, Chandrasekhar Kale and all the students of Amravati University's Mathematics Department worked tirelessly for success of the programme.

Dr Dilip Malkhede speaking at the workshop.

This *Memorandum of Understanding (MOU)*

Is entered between

Department of Mathematics

ar.Ramrao Deshmukh Arts,Smt.Indiraji Kapadiya Commerce, Nya.
rushnarao Deshmukh Science College, Badnera Rly Dist.Amravati(M.S)

And

Department of Mathematics

Shri Dnyaneshwar Maskuji Burungale Science And Arts College, Shegaon, District Buldana. (M.S)

On

Approved by

PRINCIPAL
Bar. Ramrao Deshmukh Arts
Smt. Indiraji Kapadiya Commerce &
Nya. Krushnarao Deshmukh
Science College, Badnera.

Dr. R. D. Deshmukh

Ramrao Deshmukh Arts,Smt.Indiraji
adiya Commerce, Nya. Krushnarao
hmukh Science College, Badnera Rly
t.Amravati(M.S)

Principal 18th Jan, 2016

Dr. R. E. Khadsan

Shri Dnyaneshwar Maskuji Burungale
Science and Arts College, Shegaon,
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सहमती करार

(Memorandum of Understanding)

ज्या अर्थी प्राचार्य, प्रा. रामराव दे. देशमुख कला महाविद्यालय, नांदगांव (खंडेश्वर) जि. अमरावती आणि प्राचार्य, श्री [illegible] महाविद्यालय, [illegible] यांनी परस्पर विचारविनिमयाअंती शैक्षणिक विस्तार सेवा उपक्रम (Activities for Educational Extension Services) यासंबंधी करावयाचे सहमती करार (Memorandum of Understanding) स्विकृत व मंजूर करण्यात येत आहे.

ज्या अर्थी उपरोक्त परिच्छेदामध्ये नमूद केल्याप्रमाणे प्राचार्य, प्रा. रामराव दे. देशमुख कला महाविद्यालय, नांदगांव (खंडेश्वर) जि. अमरावती आणि प्राचार्य, श्री [illegible] महाविद्यालय, [illegible] (बेलोरा) जिल्हा अमरावती यांनी निश्चित केल्याप्रमाणे शैक्षणिक विस्तार सेवा उपक्रम अंतर्गत [illegible] विषयासंबंधी सेमिनार, परिसंवाद, परिषद, कार्यशाळा आणि व्याख्यान इत्यादी उपक्रमाचे आयोजन करण्याकरिता संयुक्त दशविण्याचा येत आहे.

सबब, उपरोक्त उल्लेखित आशयाचा सहमती करार (Memorandum of Understanding) निम्नस्वाक्षरीत पदाधिकाऱ्यांनी चर्चेतून-समजून व पूर्ण विचाराअंती संमत केला आहे.

ज्या अर्थी, उपरोक्तप्रमाणे करार शैक्षणिक सत्र २०१२-१३ पासून पुढील कालखंडाकरिता (onwards) सदर सहमती करारान्वये मंजूर करून अंमलात येत आहे.

प्राचार्य
प्रा.रामराव दे.देशमुख कला,
श्रीमती इंदिराजी कार्यदिया वाणिज्य व
वा.कृष्णराव देशमुख विज्ञान महाविद्यालय
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Bianchi type-III holographic dark energy cosmological model in $f(R, T)$ theory of gravitation

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ABSTRACT

In this paper, we have studied the spatially homogeneous and anisotropic Bianchi type-III cosmological model in the presence of pressureless matter and Holographic dark energy within the framework of $f(R, T)$ gravity. We have constructed a cosmological model with an appropriate choice of function $f(T)$. Field equations are solved using the relation between the metric potentials $A = C^n$ and using a simple power-law form of a metric potential $C = t^n$. The main objective behind this paper is to explore some physically significant discussions on the evolution of the universe. It is observed that the Hubble parameter H, scalar expansion θ and shear scalar σ diverge at the initial epoch while they approach zero for a large value of time and the anisotropic parameter A_m is constant. The negative value of the deceleration parameter indicates the present acceleration of the universe.

1. Introduction

Most recent findings from high redshift supernovae type-Ia (Perlmutter et al., 1997; Perlmutter et al., 1998; Riess et al., 1998; Bennett et al., 2003), cosmic microwave background (CMB) radiation (D.N. Spergel et al., 2003; Spergel et al., 2007) and large scale structure (Tegmark et al., 2004) show that the current universe is not only expanding but also accelerating. In view of this it is now believed that the energy constitution of the universe has 5% ordinary matter, 27% dark matter and 68% dark energy. In recent years, several modified theories of gravity have been proposed to understand presence of dark energy, dark matter and the mechanism behind late-time acceleration of the universe.

Harko et al. (Harko et al., 2011) have developed a new modified theory of gravity known as $f(R, T)$ gravity. This modified theory has attracted many researchers because this theory is supposed to provide natural gravitational alternative to dark energy. Adhav (Adhav, 2012), Sharif and Zubair (Sharif and Zubair, 2012) and Mahanta (Mahanta, 2014) have investigated Bianchi type-I cosmological model in $f(R, T)$ gravity. Naidu et al. (Naidu et al., 2013), Ahmed and Pradhan (Ahmed and Pradhan, 2014), Pawar et al. (Pawar et al., 2019) have studied the Bianchi type-V cosmological model in the framework of $f(R, T)$ gravity. Shaikh and Bhoyar (Shaikh and Bhoyar, 2015) studied plane symmetric universe in $f(R, T)$ gravity. As a result of above studies, this theory seems to be more convenient to explain the accelerating phase of the universe.

Recently, Holographic dark energy (HDE) models are inspiring many astrophysicists. The observational data can be satisfactorily explained by the holographic dark energy model. Some properties and behaviors of the Holographic dark energy cosmological model have been investigated by Samanta (Samanta, 2013), Vijaya Santhi et al. (Santhi et al., 2018), Granda and Oliveros (Granda and Oliveros, 2008), Adhav et al. (Adhav et al., 2014), Shaikh and Wankhede (Shaikh and Wankhade, 2021). The majority of these HDE models use a hybrid fluid made up of HDE and Matter; the outcomes of this research have encouraged us to investigate this hybrid fluid.

FLRW model is widely regarded as a good approximation of the present and early stages of the universe which is based on of the assumption that the universe is homogeneous and isotropic in all epochs. However, the recent observations from various experiments like CMB temperature and polarization anisotropy fundamentals (Hu, 2003), Cosmic Background Explorers (COBE) (Smoot et al., 1992), Wilkinson Microwave Anisotropy Probe (Bennet et al., 2003; D.N. Spergel et al., 2003) and Planck collaboration (Ade et al., 2016) provides evidence that

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universe might have been anisotropic in the initial phase that approaches to an isotropic phase later on. This prediction motivates us to study anisotropic universe using Bianchi model instead of FLRW model. M. Thorsruda, Ben D. Normannb and T. Pereirac (Thorsrud et al., 2020) investigated that to understand whether or not cosmological principles are supported by observational data, it is necessary to consider Bianchi models.

Katore and Hatkar (Katore and Hatkar, 2016) state that among the various models proposed to describe the anisotropies of the universe, the Bianchi type-III is the simplest anisotropic model that describes the essential features of the universe. Hence, it stimulates our interest to investigate anisotropic Bianchi type-III cosmological model. Numerous academics have investigated various aspects of Bianchi type-III cosmological model. Sahoo *et al.* (Sahoo et al., 2016), Mete et al. (Mete et al., 2018) and Elkar et al. (Elkar et al., 2020) have studied Bianchi-III cosmological models in different theories of gravitation.

Motivated by the above discussion, we have investigated a spatially homogeneous and anisotropic Bianchi type-III universe filled with modified Holographic dark energy in $f(R,\ T)$ theory of gravity. The main goal of this research is to explore this Bianchi type-III HDE model in $f(R,\ T)$ modified gravity in view of several issues concerning the late time cosmic acceleration and cosmic anisotropy. The outline of the paper is as follows: In Section 2, metric and field equations are described. In Section 3, we have obtained solutions of field equations. In Section 4, some physical aspects of model are given. Conclusions are summarized in last Section 5.

2. Metric and field equation

We consider the spatially homogeneous and anisotropic Bianchi type-III space-time

$$ds^2 = dt^2 - A^2dx^2 - B^2e^{-2mx}dy^2 - C^2dz^2, \tag{1}$$

where $A,\ B,\ C$ are functions of cosmic time t only and m is a constant.

The field equations of $f(R,\ T)$ gravity are derived from variational principle. The action of $f(R,\ T)$ gravity is given by

$$S = \frac{1}{2k}\int f(R,\ T)\sqrt{-g}\ \ d^4x + \int L_m\sqrt{-g}\ d^4x, \tag{2}$$

which can be varied with respect to the metric tensor $g_{\mu\nu}$ to obtain the gravitational field equation for $f(R,\ T)$ gravity as

$$f_R(R,T)R_{\mu\nu} - \frac{1}{2}f(R,\ T)g_{\mu\nu} + f_R(R,T)\left(g_{\mu\nu}\nabla^\mu\nabla_\mu - \nabla_\nu\nabla_\nu\right) = kT_{\mu\nu} - f_T(R,T)\ T_{\mu\nu} - f_T(R,T)\theta_{\mu\nu}, \tag{3}$$

where $\theta_{\mu\nu} = g^{\alpha\beta}\frac{\partial T_{\alpha\beta}}{\partial g_{\mu\nu}}$ and $T_{\mu\nu}$ is combined energy momentum tensor for pressureless matter $T^{'}_{\mu\nu}$ and Holographic dark energy $\overline{T}_{\mu\nu}$.

Here $f_R = \frac{\partial f(R,\ T)}{\partial R}$, $f_T = \frac{\partial f(R,\ T)}{\partial T}$, ∇_μ is covariant derivative. $k = \frac{8\pi G}{c^4}$, where G and c are the Newtonian Gravitational constant and speed of light in vacuum respectively.

The energy-momentum tensor for pressureless matter $T^{'}_{\mu\nu}$ and Holographic dark energy $\overline{T}_{\mu\nu}$ (Shaikh and Bhoyar, 2015; Sarkar and Mahanta, 2013) are respectively given by

$$T^{'}_{\mu\nu} = \rho_m u_\mu u_\nu \ and\ \overline{T}_{\mu\nu} = (\rho_\wedge + p_\wedge)\ u_\mu u_\nu + g_{\mu\nu}p_\wedge \ and\ (\mu,\ \nu = 1,\ 2,\ 3,\ 4), \tag{4}$$

where ρ_m is energy density of matter, $\rho_\wedge$ is the energy density of the Holographic dark energy. $u^\mu = (0,\ 0,\ 0,\ 1)$ is the four-velocity vector in co-moving coordinates which satisfies the condition $u^\mu u_\mu = 1$ and $u^\mu\nabla_\nu u_\mu = 0$. Now parameterizing (4), we have

$$\overline{T}^\mu_\nu = diag(-1,\ \omega_x\ ,\ \omega_y\ ,\ \omega_z\ )\rho_\wedge, \tag{5}$$

here we have used the EoS parameter ω given by

$$\omega_\wedge\rho_\wedge = p_\wedge \tag{6}$$

$\omega_x\ ,\ \omega_y\ ,\ \omega_z$ are the directional EoS parameters along $x,\ y,\ z$ axes respectively (Pawar et al., 2019). For simplicity we use $\omega_\wedge = 1$.

Three different cosmological models of $f(R,\ T)$ gravity are given by Harko et al. (Harko et al., 2011) viz. i)$f(R,\ T) = R + 2\,f(T)$, ii) $f(R,\ T) = f_1(R) + f_2(T)$ and iii) $f(R,\ T) = f_1(R) + f_2(R)f_3(T)$. In the present work, we have considered the functional as $f(R,\ T) = R + 2f(T)$, where $f(\ T)$ is an arbitrary function of the trace of the energy-momentum tensor. The corresponding field equations become,

$$R_{\mu\nu} - \frac{1}{2}Rg_{\mu\nu} = kT_{\mu\nu} + 2f_TT_{\mu\nu} + [f(T) + 2p_\wedge f_T]g_{\mu\nu}, \tag{7}$$

where f_T denotes the partial derivative of f with respect to T.

With particular choice of the function (Harko et al. 2011) $f(T) = \lambda T$, where λ is constant and using (4), field Eq. (7) for metric (1) leads to following system of equations:

$$\frac{\ddot{B}}{B} + \frac{\ddot{C}}{C} + \frac{\dot{B}\dot{C}}{BC} = \lambda(8p_\wedge + \rho_m) + p_\wedge, \tag{8}$$

$$\frac{\ddot{A}}{A} + \frac{\ddot{C}}{C} + \frac{\dot{A}\dot{C}}{AC} = \lambda(8p_\wedge + \rho_m) + p_\wedge \tag{9}$$

$$\frac{\ddot{A}}{A} + \frac{\ddot{B}}{B} + \frac{\dot{A}\dot{B}}{AB} - \frac{m^2}{A^2} = \lambda(8p_\wedge + \rho_m) + p_\wedge \tag{10}$$

$$\frac{\dot{A}\dot{B}}{AB} + \frac{\dot{B}\dot{C}}{BC} + \frac{\dot{A}\dot{C}}{AC} - \frac{m^2}{A^2} = \lambda(6p_\wedge + 3\rho_m + 2\rho_\wedge) + \rho_m + p_\wedge \tag{11}$$

$$\frac{\dot{A}}{A} - \frac{\dot{B}}{B} = 0, \tag{12}$$

here an overhead dot indicates differentiation with respect to cosmic time t.

We shall now define the physical parameters which will be useful in solving the field equations and in the physical discussion of the solution. The average scale factor of the Bianchi type-III space-time is

$$a(t) = (ABC)^{\frac{1}{3}}. \tag{13}$$

The spatial volume of the metric is

$$V = a^3(t) = ABC. \tag{14}$$

Directional Hubble parameter are

$$H_1 = \frac{\dot{A}}{A},\ H_2 = \frac{\dot{B}}{B},\ H_3 = \frac{\dot{C}}{C}. \tag{15}$$

The mean Hubble parameter

$$H = \frac{\dot{a}}{a} = \frac{1}{3}\frac{\dot{V}}{V} = \frac{1}{3}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right) \tag{16}$$

The scalar expansion

$$\theta = \left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right) \tag{17}$$

The shear scalar

$$\sigma^2 = \frac{1}{2}\sigma_{ij}\sigma^{ij} = \frac{1}{3}\left[\left(\frac{\dot{A}}{A}\right)^2 + \left(\frac{\dot{B}}{B}\right)^2 + \left(\frac{\dot{C}}{C}\right)^2 - \frac{\dot{A}\dot{B}}{AB} - \frac{\dot{B}\dot{C}}{BC} - \frac{\dot{A}\dot{C}}{AC}\right] \tag{18}$$

The mean anisotropy parameter is defined as

$$A_m = \frac{1}{3}\sum_{i=1}^{3}\left(\frac{H_i - H}{H}\right)^2 \tag{19}$$

In terms of the metric potentials, the Ricci scalar R for the Bianchi type-III is expressed as

$$R = 2\left(\frac{\ddot{A}}{A}+\frac{\ddot{B}}{B}+\frac{\ddot{C}}{C}+\frac{\dot{A}\dot{B}}{AB}+\frac{\dot{B}\dot{C}}{BC}+\frac{\dot{A}\dot{C}}{AC}-\frac{m^2}{A^2}\right). \tag{20}$$

Deceleration parameter q is known to be a measure of cosmic acceleration, it is given by

$$q = \frac{-\ddot{V}V}{\dot{V}^2} \tag{21}$$

3. Solution of field equations

Solving (12) gives$A = kB$, without loss of generality we consider $k = 1$ which gives

$$A = B. \tag{22}$$

Using (22) in (8) to (12), we get

$$\frac{\ddot{A}}{A}+\frac{\ddot{C}}{C}+\frac{\dot{A}\dot{C}}{AC} = \lambda(8p_\wedge+\rho_m)+p_\wedge, \tag{23}$$

$$2\frac{\ddot{A}}{A}+\left(\frac{\dot{A}}{A}\right)^2-\frac{m^2}{A^2} = \lambda(8p_\wedge+\rho_m)+p_\wedge, \tag{24}$$

$$\left(\frac{\dot{A}}{A}\right)^2+2\frac{\dot{A}\dot{C}}{AC}-\frac{m^2}{A^2} = \lambda(6p_\wedge+3\rho_m+2\rho_\wedge)+\rho_m+p_\wedge. \tag{25}$$

Subtracting (23) from (24), we get

$$\frac{\ddot{A}}{A}-\frac{\ddot{C}}{C}+\left(\frac{\dot{A}}{A}\right)^2-\frac{\dot{A}\dot{C}}{AC}-\frac{m^2}{A^2} = 0. \tag{26}$$

Above equation contains two unknowns A and C, thus one additional condition require to solved it. For this the relation between the metric potentials is assumed to be $A = C^n$, which corresponds to the fact that the shear scalar σ is proportional to the scalar expansion θ. In the view of obtaining a physically realistic model, we considered the power law relation (Kumari et al., 2013)$C = t^n$, where n is a positive constant i.e.

$$n > 0. \tag{27}$$

The positive nature of n is in accordance with the observational findings which predict an expanding universe.

Multiplying (26) by A^2C, we get

$$\frac{d}{dt}\left(-A^2\dot{C}+AC\dot{A}\right) = m^2C. \tag{28}$$

Integrating above equation, we get

$$-A^2\dot{C}+AC\dot{A} = m^2\left(\int Cdt+k_1\right) \tag{29}$$

where k_1 is constant of integration.

Above equation can be written as

$$\frac{d}{dt}(A^2)-\frac{2\dot{C}}{C}A^2 = F(t), \tag{30}$$

where

$$F(t) = \frac{2m^2}{C}\left(\int Cdt+k_1\right). \tag{31}$$

Now, (30) gives

$$A^2 = C^2\left(\int\frac{F(t)}{C^2}dt+k_2\right) \tag{32}$$

k_2 is constant of integration.

Using (27) in (31) and (32), we get

$$A^2 = \frac{m^2t^2}{1-n^2}+\frac{2k_1m^2t^{1-n}}{1-3n}+k_2t^{2n},\ where\ n \neq 1 \tag{33}$$

The deceleration parameter (21) can now be obtained as

$$q = -\frac{\left[\frac{m^2t^{2+n}}{1-n^2}+\frac{2k_1m^2t}{1-3n}+k_2t^{3n}\right]\left[\frac{(n+1)(n+2)m^2t^n}{1-n^2}+3n(3n-1)k_2t^{3n-2}\right]}{\left[\frac{(n+1)m^2t^{1+n}}{1-n^2}+\frac{2k_1m^2}{1-3n}+3nk_2t^{3n-1}\right]^2}. \tag{34}$$

We want model explaining an accelerated expansion of universe, for which a suitable choice of k_1, k_2 and n gives the negative constant deceleration parameter. The current SNe Ia and CMBR observations also favours accelerating models($q < 0$). In view of this, we consider $k_1 = k_2 = 0$.Thus from (33), we get

$$A^2 = \frac{m^2t^2}{1-n^2},\ where\ n \neq 1 \tag{35}$$

From (34), we obtained

$$q = -\frac{n+1}{n+2}. \tag{36}$$

It is obvious from (35) that, a physically acceptable scale factor can be obtained for $0 < n < 1$. In this range of the n, the deceleration parameter assumes a constant negative value as we desired an accelerating universe.

The metric (1) now becomes

$$ds^2 = dt^2-\frac{m^2t^2}{1-n^2}\left(dx^2-e^{-2mx}dy^2\right)-t^{2n}dz,\ where\ n \neq 1\ moreover\ 0 < n < 1 \tag{37}$$

4. Physical parameters of model

The directional Hubble parameters are

$$H_1 = H_2 = \frac{1}{t},\quad H_3 = \frac{n}{t} \tag{38}$$

The mean Hubble parameter H is given by

$$H = \frac{n+2}{3t} \tag{39}$$

The volume V is obtained as

$$V = \frac{m^2}{1-n^2}t^{n+2} \tag{40}$$

The anisotropy parameter A_m obtained as

$$A_m = 2\left(\frac{1-n}{2+n}\right)^2 \tag{41}$$

The scalar expansion θ is given by

$$\theta = \frac{n+2}{t} \tag{42}$$

The shear scalar σ for the model obtained as

$$\sigma = \frac{1-n}{\sqrt{3}\,t} \tag{43}$$

From (39), (42) and (43) we observed that the physical parameters H, θ and σ are diverge at the initial epoch while they approach zero for large value of time. From (41) we have observed that the anisotropic parameter A_m = constant.

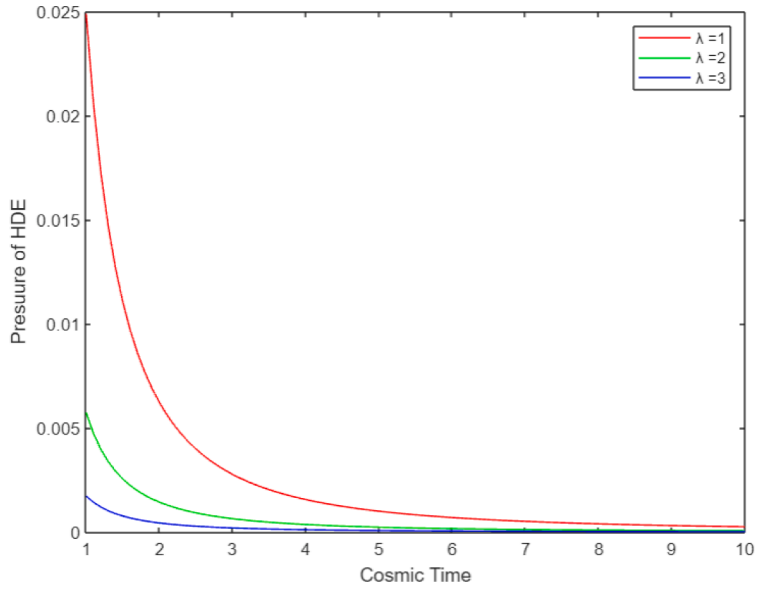

Fig. 1. Variation of Holographic dark energy pressure against cosmic time with varying constant $\lambda = 1,\ 2,\ 3$ and $n = 0.95$.

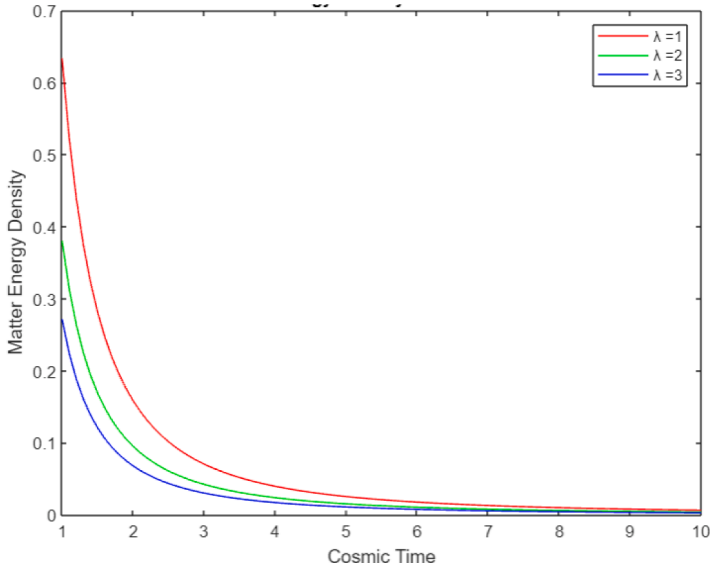

Fig. 2. Variation of matter energy density against cosmic time with varying constant $\lambda = 1,\ 2,\ 3$ and $n = 0.95$.

Now (6), (24), (25) and (27) gives

$$\rho_m = \frac{2n}{(2\lambda+1)t^2} \tag{44}$$

$$p_\wedge = \frac{1}{(8\lambda+1)}\left[\frac{(2\lambda+1)n^2 - 2n\lambda}{t^2(2\lambda+1)}\right] = \rho_\wedge \tag{45}$$

From Figs. 1 and 2, we observed that the energy density and pressure of Holographic dark energy and the energy density of matter diverge at the initial epoch and tend to 0 for large values of cosmic time t. Fig. 3 shows that the Hubble parameter H diverges at the initial epoch while it approaches zero for large value of time.

5. Conclusion

In this paper, we have studied Holographic dark energy cosmological model in $f(R,\ T)$ theory of gravity by using spatially homogeneous and anisotropic Bianchi type-III space-time. From (37), we conclude that the obtained accelerated model of the Bianchi type-III universe has a singularity at $n = 1$ and model corresponds to $0 < n < 1$. From (40), we conclude that the spatial volume V for the model is zero at $t = 0$ and it increases with increase in cosmic time, which shows that the universe starts expanding with zero volume and expands with cosmic time t. All cosmological physical parameters such as Hubble parameter H, scalar expansion θ, shear scalar σ, anisotropy parameter A_m are derived. From (39), (42) and (43), we conclude that the physical parameters H, θ and σ diverge at the initial epoch while they approach zero for large value of time. From (36) and (39), we observe negative value of the deceleration parameter and positive value of Hubble parameter throughout the evolution, which shows that the universe is under accelerated expansion. Hence we can infer that universe expands in the influence of dark energy.

From (41), we have observed that the anisotropic parameter $A_m =$ constant and from (42) and (43), we have the isotropy condition $\frac{\sigma}{\theta} =$ constant, it shows that the model is anisotropic throughout the evolution of universe. From figures (1) and (2), we conclude that the energy

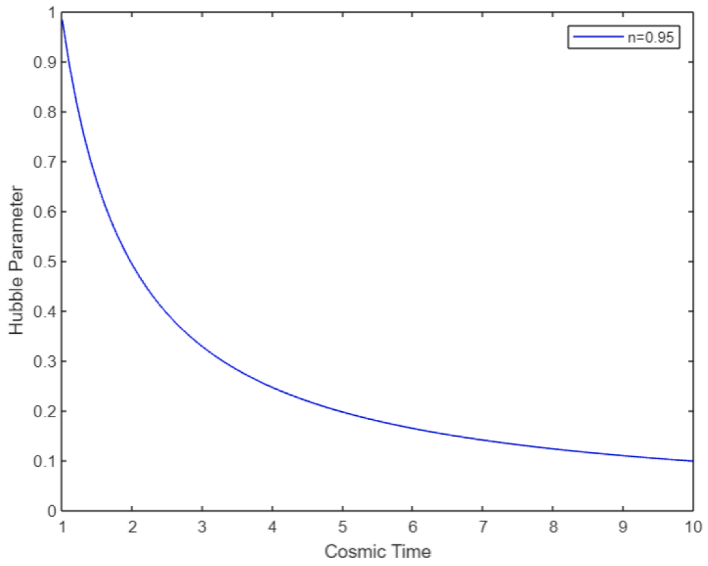

Fig. 3. Variation of Hubble parameter against cosmic time with $n = 0.95$.

density and pressure of Holographic dark energy and the energy density of matter diverge at the initial epoch and tend to 0 for large values of cosmic time t.

Declaration of Competing Interest

The author whose name is listed admittedly below certify that they have No affiliation with involvement in any organization or entity with any fractional interest (such as honoraria, educational grants, participation in speakers bureaus, membership, employment, consultancy, stock ownership, or other equity interest, and expert testimony or patent-licensing, arrangements) or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discuss in manuscript.

Data availability

Data will be made available on request.

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Vidarbha Youth Welfare Society's
Bar.Ramrao Deshmukh Arts, Smt. Indiraji Kapadia Commerce &
Nya. Krishnarao Deshmukh Science College,Badnera-Amravati (Maharashtra) 444 701
(Accredited by NAAC - 2004)
Ph. 0721-2681232, FAX : 0721- 2681232,
email : rdlk128@sgbau.ac.in, web site : www.rdikandnkd.org

Dr. N.R. Dhande, President | Prof. V.P. Gohad, Vice President | Mr.P.S. Deshmukh, Treasurer | Mr. Y.V. Choudhary, Secretary | Dr. R.D. Deshmukh, Principal

No.

Date : / /201

Memorandum Of Understanding

Participating Parties

Party no. 1- Barrister Ramrao Deshmukh Arts, Indiraji Kapadiya Commerce and Nyay. Krushnarao Deshmukh College of Science, Badnera

Party no. 2- Unix Compuers, Rest House Road, New Town, Badnera

In the year 1972 Bar. Ramrao Deshmukh Arts, Indiraji Kapadiya Commerce and Nyay. Krushnarao Deshmukh Science College was established by Vidarbha Youth Welfare Society, Amravati for the purpose of providing higher education opportunities to the students of rural areas adjoining to Badnera city. Initially the college used to run Arts and Commerce Courses and later on the science branch and Postgraduate courses were commenced. Today, the college provides all kind of advance facilities ranging from labs to classroom to its students studying in senior and junior college wings. The student taking admission in this college comes from lower strata of the society including major percentage from agricultural background and socio-economically backward classes.

The business firm titled as Uniex Comupters was established in the year 2007 in Badnera city. The said institute is a recognized official centre of MKCL and MS-CIT, Tally, Advanced Tally, DTP, Photoshop, Data Entry operator, Soft skill and English Communication.

Both the institutions have decided to enter in to a Memorandum of Understanding with the Aim and objective of providing technical skill courses and employment opportunities to the students of this college along with traditional education.

Under this MOU, the party number 1 hereinafter referred as Bar, Ramrao Deshmukh Arts, Smt. Indiraji Kapadiya Commerce and Nyay. Krushnarao Deshmukh Science Badnera Sets following objectives and goals

1] Students studying in the institution of Party no. 1 are provided with all online services as per university and Government guidelines in moderate rates by party number 2.

2] Party Number 1 shall provide infrastructure in the college to Party no. 2 without charging any fees for the easy access of online services to the students.

3] Party number 1 shall encourage the students studying in its college to enroll in the technical Courses available with party number 2 and Party number 2 shall provide teaching and training in its courses at concessional rates to the students studying in the institution of Party number 1.

4] Party No.1 and Party No. 2 will jointly implement social activities related to literacy.

5] The students of Party number 1 who will be completing technical courses and training programmes run by Party number 2 will be given priority in the employment opportunities available in the capacities of Party number 2.

6] To organise various workshops regarding computer literacy in the college run by Party Number 1, Party number 2 is bound to provide technical support and trained teachers without any fees or remuneration. While the other expenditures will be given by the Party number 1

As mentioned above, the MoU along with the terms and conditions of MoU previously done in the year 2013 -14 is being renewed for the above mentioned purpose and will come in effect from this date of sign by both parties and will remain valid for the next ten years. Violation of the above terms / conditions by either party shall result in termination of the Agreement.

Date: 02/05/2017

Place: Badnera

(Dr. R. D. Deshmukh)
For Party No. 1
PRINCIPAL
Bar. Ramrao Deshmukh Arts
& Smt. Indiraji Kapadiya Commerce &
Nyaymurti Krushnarao Deshmukh
Science College, Badnera.

(Shri. Vishal Dongare)
For Party No. 2
02/05/2017

UNIX COMPUTERS 52210130 BADNERA

1. Name of Organizing Committee : **Career Counseling and Guidance Cell**
2. Name of Activity : **TRAINING & PLACMENT**
3. No. Of Participation : Students 176 Teacher 05.
4. Date of Activity : 22nd October, 2022

Details of the Program (in Brief):

Unix Computer Centre in collaboration with R.D.I.K. And K.D. College, Badnera under the MOU made an advertisement for all the vacant seats in Unix Computer unit.

The Advertisement was published on 27 Sapt.2022 and all the interested students were asked their resume, and as the interview for the same was scheduled on 22 oct. 2022 to prepare the registered students a training session was conducted in the college. In that training students were trained and guided for interview they were taught the pattern of interview and how to face it. A positive attitude was developed among them. They were made were about the things which are taken in consideration in interview. The final interview panel consist of Dr. Shobha Rokade, Dr. V.G. Mete, Shri V.M. Dongre, Prof B.N. Dayavate, Dr. A. R. Patil and Principal the college Dr. R.D. Deshmukh

Outcome of the Programme:

- It helped students to face the interviews positively
- It encouraged students to earn and learn and to be self- employment
- It boosted the confidence level of students
- Training helped to aware the student about professional ethics.

Name & contact No. Of Expert:**Shri. Vishal Dngare** Contact No.9271220572

Dr. Atul R. Patil
DIRECTOR
Physical Edu. & Sports
R.D.I.K. & K. D.College
BADNERA


Latitude: 20.856713
Longitude: 77.7271
Elevation: 338.03±19 m
Accuracy: 35.6 m
Time: 10-22-2022 12:40
Powered by NoteCam


Latitude: 20.856717
Longitude: 77.727085
Elevation: 384.53±173 m
Accuracy: 12.6 m
Time: 10-22-2022 11:28
Powered by NoteCam

Attendance Sheet

Career Counseling and Guidance Cell

TRAINING & PLACMENT

Guest Speaker- Shri Vishal Dongare

Venue-, Prof Ram Meghan Hall R.D.I.K. college, Bandera

Date – 22 oct. 2022

Sr.No	Name of Students	Class	Signature
1	SAKSHI GANESH WAWGAR	B Com II	
2	Tanuja Vinod chude	B.Sc II	
3	Shraddha Ramdas Thakare	B.A III	
4	Samiksha Raju Bhakare	B.com I	
5	Janvi vijay Radke.	B com I	
6	Nayana R. chambat	B.A. III	N.R.chambat.
7	Roshani A. Dhanclar	B.com II	
8	Ishvari V. Shevatkar	B. Com II	
9	Kushish M. shevatkar	B Com I	
10	Vanita S. Shinde	B A I	
11	Humera Kauser	B A I	
12	Saniya Khan	B.A.I	Saniya
13	Komal chambat	B.A.III	K.V. chambat
14	Swati joge	B.A.III	S.n. Joge.
15	Ranjana D. Kushwaha	B.A.I	
16	Liladhar Geoyal.	B.A. III	L.R Geoyal
17	Dhanshree Rithe.	B.A. III	D.S. Rithe
18	Darshana Bajad	B.A III	D. g Bajad.
19	Suraj Bhalekar	B.A. III	
20	Arpit Meshram	B. A. III	
21	Payal Bharti	B A I	
22	mohini Raut	B.com	

	Sr.No	Name of Students	Class	Signature
23		Mayuri santosh Rokade	B.A	M.S. Rokade
24	12	kalyani purkan Ahuk		Ahuk
25	13	Pallavi kailas Nevase	B.A.I	P.K.Nevase
26	14	Swadi Rajiv Jadhade	B.A.I	S.R.Jadhade
27	15	Sakshi Ravindra Kamble	B.A.I	Kamble
28	16	Dipaksha S. Bhosale	B.A.I	D.S.Bhosale
29	17	mayuri S. Gulhane	M.Sc II	M.S.Gulhane
30	18	Shweta P. Thorpe	M.Sc II	
31	19	Ankita R. Thakare	M.Sc - II	A.Thakare
32	20	Iffat Khan	M.Sc-II	
33	21	Mayuri B. Ringanlage	M.Sc II	M.Ringanlage
34	22	Neha. P. Godling	BA II	N.P.Godling
35	23	Pallavi. A Tarcare	B.A. II	Pallavi
36	24	yash S. Bhalchakray	B.A. I	
37	25	Ashish V. Agham	B.A-I	A.Agham
38	26	Om S. Gurai	B.A-I	
39	27	A.R. Gaikwad	BA I	A.R.Gaikwad
40	28	A S. Rajmalkar	BA I	A.S.Rajmalkar
41	29	Shivam P. Shevatkar	BA I	
42	30	Pradnya G. Nanhawade	B.A.I	
43	31	Tejas D. Shende	B.A.I	T.D.Shende
44	32	Mahe Sh. A. Nawale	B.A.I	Mahe Works
45	33	Ranjana D. Kushwaha	B.A-I	
46	34	Payal Bhojkunje	B.A.I	Payal
47	35	Radika P. Ramwar	B.A.I	Ramwar
48	36	Kiran kaware	B.A.I	Kiran
49	37	Radha D. Kushwaha	B.A.I	
50	38	Vanita S. Shinde	BA I	

	Sr.No	Name of Students	Class	Signature
51	39	Mahevish Firoz khan	B.A.I	Mheivh
52	40	Mayuri santosh Rokade	B.A.I	m S. Rokade
53	41	kalyani pupan Anak	B.A.I	K Anak.
54	42	Pooja R. BhaBhuje	B.A.I	Payel.
55	43	Pallavi k. Newase.	B.A.I	P.k.Newase
56	44	swati R. Durbude	B.A.I	S.R. Durbude
57	45	DiPasha S. Bhosale	B.A.I	D.S.Bhosale
58	46	Sakshi Pravin Kamble	B.A.I	Skamble.
59	47	Kiran Ravindra Kawade	BA-I	KKawade
60	48	Suhani P. munde	B.A.I	Munde
61	49	Shravani R. Kale	B.A.I	SRkale
62	50	Nayukas S Nakashe	BAI	Nakashe.
63	51	Anilzet R. Gadelkar	B.A.I	
64	52	Mohit B. Gaikwade	B.A.I	
65	53	Palvavi R. Salunke	B.A.I	
66	54	Hemlesh Panchare	B.A.I	
67	55	Pardip S. Tirpude	B.A.I	
68	56	Shivam P. shevkarkale	B.A.I	
69	57	Ashish V Agham	BAI	
70	58	Piyush M. Khandare	B.A.I	
71	59	Vishal O. Dondkar	B.A.I	Vishal
72	60	Rutvik A. BOEKar	B.A.I	
73	61	Samyak J. Motghare	B.A.I	Samyak
74	62	Om S. Gorait	B.A.I	
75	63	Anubhav S. Ramteke	B.A.I	
76	65	Shubham Kushwaha	B.A-I	
77	66	Priyank G. Gathe	B.A-I	
78	67	Payal Raut	B.A-I	

	Sr.No	Name of Students	Class	Signature
79	68	Jayeshri Rajendra Bagade	B.A [II]	J. R. Bagade
80	69	Huzefa Anam	B.A II	Huzefa
81	70	Ranjana D. Kushwaha	B.A - I	
82	71	Swati R. Dudhade	B.A. I	S. R. Dudhade
83	72	Dipasha S. Bhosale	B.A. I	D. S. Bhosale
84	73	Kalyani P. Atak	B.A I	P. Atak
85	74	Jayat P. Bhabhale	B.A I	Jayat
86	75	Pallavi K. Nemade	B.A. I	P. K. Nemade
87	76	Sakshi Pravin Kamble	B.A I	Sakshi
88	77	Kiran Ravindra Kawade	B.A - I	K. Kawade
89	78	Nayka S. Nakashe	B.A - I	Nakashe
90	79	Suhani P. munde	B.A - I	Suhani
91	80	Shashi R. Kale	B.A. I	Kale
92	81	Aniket D. Gadekar	B.A I	
93	82	Mohit B. Gawande	B.A I	
94	83	Pawan P. Salunke	B.A I	
95	84	Mangesh Pancharne	B.A I	
96	85	Pardip C. Tirpude	B.A I	
97	86	Anubhav S. Rajurkar	B.A I	A. S. Rajurkar
98	87	Om S. Gaikwad	B.A I	O. S. Gaikwad
99	88	Mayuri S. Gulhane	M.Sc - II	M. S. Gulhane
100	89	Shweta P. Charpe	M.Sc II	
101	90	Ankita R. Thakare	M.Sc II	A. Thakare
102	91	Iqbal khan	M.Sc - II	
103	92	Mayuri B. Hingankar	M.Sc II	
104	93	Neha P. Gadling	BA II	N. Gadling
105	94	Pallavi A. Takale	B.A. II	Pallavi Takale
106	95	Gyaneshwari Kapende	B.A I	

Sr.No	Name of Students	Class	Signature
107	Mayuri Mohan Raut	M.Sc. I	
108	Ku. Ashwini Sudhakar Gomase	M.Sc I	
109	Ku Achal Vinodrao Akhare	M.Sc I	
1100	Ku Akanksha Manohar Sahare	M.Sc I	
111	Ku. Jayashri Dhanraj Wanaskar	M.Sc I	
112	Ku. Divya Ghanshyam Mavande	MSC I	D. G. Mavande.
113	Ku. Aachal Sahu Belsad	B.A III	A. S. Belsad
114	Sachin Ramesh Khadse	BA II	
115	Aniket Ravindra Gaddekar	B.A I	
116	Mohit B. Gajbhiye	B.B	
117	Kalyani R. Kirsdak	BSc - I	KRKirsdak
118	Gayatri G. Panzade	BSc - I	Gpanzade
119	Komal B. Bhejav	BSc - I	
120	Radha B. Khadse	B.H I	
121	Mahevish F. Khan	B.A I	
122	Dipasha S. Bhosale	B.A. I	D.S.Bhosale
123	Payal S Raut		
124	Sakshee B. Khandaree	B.A. I	Skhandaree
125	Sakshi P Kakade	B.A I	Pakade
126	Pallavi A. Tekade	B.A II	Pallavi Tekade
127	Radha R. Kushwaha	B.A. II	
128	Neha. P Gaidhiny	BA II	
129	Aarti W. Milkhe	M.Sc. II	
130	Aditya D. Thakur	B.A. II	A Thakur
131	Pranav. S. Rithe	B.A II	
132	Rahul D. Gawai	B.A. II	
133	Gayatri D. Sabale	B.A II	
134	Huzefa Rham	BA II	

Sr.No	Name of Students	Class	Signature
135	Ku. Achal Vinodrao Akhare	M.Sc I sem	
136	ku. Ashwini Sudhakarrao More	M.Sc. I	
137	Mayuri Mohan Raut	M.Sc. I	
138	Akanksha Manohar Sahare	M.Sc I	
139	divya Ghanshyam Mavande	M.Sc I	D.G Mavande.
140	Aachal Sunil Bekad	B.A III	A.S. Bekad
141	Sachin Umesh khadse	BA II	
142	Mohit B. Govarande	B.A I	
143	Aniket R. Gadekar	BA. I	
144	komal B. shejav	B.Sc I	
145	Gayatri G. panzade.	B.Sc I	Granzade.
146	kalyani R. Kakde	B.Sc - I	
147	Mahevish F. khan	B. A. I	
148	Radha B. khadse	B.A I	
149	Dipasha S. Bhosale	B.A. I	D.S. Bhosale
150	Payal S. Raut	B.A - I	
151	Sakshee B. khandaree	B.A. - I	Skhandaree
152	sakshi P kakade	B.A - I	
153	Radha R Kushwaha	BA - II	
154	Neha. P. Gadling	B.A I	
155	Pallavi A. Tarare	B.A. II	
156	Aarti w. Milkhe	M.Sc - II	
157	Pranav. s. Rithe	B.A. II	
158	Rahul D. Gawai	B.A. II	
159	Aditya D. Thakur	B.A. II	
160	Mayatai D. sahale	B.A. II	
161	Jayashri R. Bagade	B.A (III)	
162	Muzafar imam	BA II	

NO	Name of Students	Class	Signature
163	Sakshi P Pokale	BA I	S. P. Pokale
164	Sonam J. meshram	B.A. I	(Sram)
165	Priyal P. Pathane	B.A I	Pathane
166	Samiksha S. Meshram	B.A. I	~~Meshram~~
167	Anuja Vijay mule	B.A. I	Amule.
168	Rupali Bharat Bhatkar	B.A - I	R. B. Bhatkar
169	Radha S. Kashatri	B.A I	R.S. Kashatri.
170	Devjani M. waghmare	B.A I	D.M. waghmare
171	Kalyani P Abak	B.A - I	~~K.Abak~~
172	Sakshi Pravin Kamble	B.A - I	Skamble.
173	Ranjana D. Shashwale	B.A I	~~Ranjana~~
174	Vanita S. Shinde	BA I	~~Vanita~~
175	Arpita Belsare	B.Com III	~~Arpita~~
176	Akansha Bhure	B Com III	A Bhure

Name of Organising Committee	:	**Career Counseling and Guidance Cell**
Name of Activity	:	Workshop on Personality Development
No. Of Participation	:	Students 141 Teachers 08
Date of Activity	:	7th June, 2022

Details of the Program (in Brief):

Dr. Pravin Khandve, Vice Principal Prof. Ram Meghe College of Engineering and Management, Badnera,emphasized on Importance of psychometric test, need of improving employability, developing communication in three language, English communication, enhancement of Information technology competency, Aptitude level, Interview Skills, Resume Writing, Computer Typing, etc

Outcome of the Programme:

- Workshop provided guidance on various skills required for the development of personality

Name & contact No. Of Expert: Dr. Pravin Khandve, Vice Principal PRMCEAM,

BADNERA Contact No.9822641081

Dr. Atul R. Patil
DIRECTOR
Physical Edu. & Sports
R.D.I.K. & K. D.College
BADNERA

(Name & Signature of Concern teacher)

Workshop on Personality Development Date- 7th June, 2022

युनिक्स कंप्युटर्स बडनेरा

आणि

आर.डी.आय.के. ॲन्ड एन.के.डी. कॉलेज बडनेरा

यांच्या संयुक्त विद्यमाने आयोजित

कार्यशाळा

विषय : - करिअर मार्गदर्शन

दिनांक :- ०७/०६/२०२२ सकाळी १० वा.

प्रमुख वक्ते

श्री. प्रवीण खांडवे

उपप्राचार्य , विभाग प्रमुख स्थापत्य
अभियांत्रिकी PRMCEAM

Attendance Sheet

Career Counseling and Guidance Cell

Workshop on Personality development.

Guest Speaker- Dr. Pravin khandve, Vice Pri. PRMCEAM BADNERA

Venue- Prof Ram Meghan Hall R.D.I.K. college, Bandera

Date-07 JUN 2022

Sr.No	Name of Students	Class	Signature
1)	Nayana R. chambat	B.A. III	N.R.chambat
(2)	SAKSHI G. Wawge	B.Com I	
(3)	Tanuja Vinod Chude	B.Sc II	
(4)	Samiksha Raju Bhakare	B.Com I	
(5)	Janvi Vijay Tadke	B.Com I	
(6)	Shraddha Ramdas Thakare	B.A II	
(7)	Kashish Manoj Shevalkar	B.Com II	
(8)	Roshani A. Dhandar	B.com II	
9)	Ishvari V. Shevalkar	B.Com II	
10)	Vanita S. Shinde	BA-I	Vanita
11)	Saniya Khan	11th Art	Saniya
12)	Humera Kouser	B.A. I	
13)	Rajanee D. Kushwaha	B.A.I	
14)	Payal Ghodeshar	B.A.I	
15)	Mahvish khan	B.A.I	
16)	Shubham H. Kushwaha	B.A.I	
17)	Radha K. Kushwaha	B.A.I	
18)	Chedilal R. Kushwaha	B.A.I	
19)	Komal V. chambat	B.A. III	K.V. chambat
20)	Suraj Bhalekar	B.A. III	
21)	Lilaahar R. Goyal	B.A III	L.R. Goyal.

Sr.No	Name of Students	Class	Signature
22)	Prakhar Dinesh Tembhurne	B.A. I	P.D. Tembhurne
23)	Dareshika M. Bhosale	B.com III	D. Bhosale
24)	Pratiksha .U. Aakhare	B.A. I	PU. Akhare
25)	Vikash A. Gondane	B.com III	V.Gondane
26)	Harshal Shivraj Bagade	B.A I	H Bagade
27)	Gauri B. Mohase	B.com III	Gmohase
28)	Neha Pankaj Gadling	B.A.I	N Gadling
29)	Kajal N Chopade	B.Com III	Kchopade
30)	Vaishnavi A. Kamble.	B.A I	VAKamble.
31)	Ashwini S. Chinchakhede	B.com III	A Chinchakhede
32)	Kajal Dnyaneshwar. Charade	B.A I	KDCharade
33)	Dareshika M. Bhosale	B.com III	DBhosale
34)	Bhavika Vilas Bharade	B.A I	BVBharade
35)	Diksha A. Gondane	B.com III	DGondane
36)	Ayush Ashok Waghmare	B.A.I	AAWaghmare
37)	Bhavana V. Vitivale	B.com. III	B Vitivale
38)	Aniket Raju Dhurve	B.A I	A. R. Dhurve
39)	Gauri B. Mohase	B.A I	Gmohase
40)	Priti Gajanan Maluwar	B.A.I	Pmaluwar
41)	Kajal .N. Chopade	B.A I	K Chopade.
42)	Pratiksha .U. Chokhat	B.A.I	PChokhat
43)	Kalyani R. Kamble	B.A I	K.R. Kamble.
44)	Prajakti .V. Sultane	B.A.I	P. V. Sultane
45)	Kanchan P. Bisane	B.A I	K.P Bisane.
46)	Vaishnavi .S. Kirdak.	B.A.I	VKirdak.
47)	Komal R. Gawai	B.A I	KR Gawai.
48)	Damini W. Bendre	B.A I	DWBendre
49)	Krishna P. Kushwaha	B.A I	KP Kushwaha

Sr.No	Name of Students	Class	Signature
50	Tejas Sudhir Shevalkar	B.A.I	TSshevalkar
51	Radhika .S. wagh	B.A.I	R.S.wagh
52	Pratika Vijaykar	B com II	
53	Aniket Ankar Jagdambe	B.A.I	AAJagdambe
54	Shivani Vishwanath Zunjad	B.A. II	
55	Neha Purushottam Dhangar	B.A.I	N.P. Dhangar
56	[illegible]	B.A III	N. Waine
57	Urmila . N. Khandare	B.A.I	UNkhandare
58	Gauri Pramodrao Lawange	m.sc.	
59	Aehal . Sanjay. Khandare	B.A.I	Aehal K.
60	Dipak Vinod Burkar	B.com.II	
61	Khushi Chhatrapati Akhare	B.A.I	KCAkhare
62	[illegible]	B.Sc II	
63	Laxmi Dnyaneshwar Ugale	B.A.I	LDUgale
64	Priyanka Niranjan Thorat	B.A.II	
65	Gayatri Dilip Rao. Bhakare	B.A.I	GDBhakare
66	Dhanshri Santosh Thakre	B.com.II	
67	Tejaswini Prakash Atkarle	B.A.I	TPAthakle
68	Dhanshri Ramesh Turak	B.A.I	Dhanshri
69	mayuri Suresh meshram	B.A.I	Mshm
70	Hemant Ravindra Gurnule	B.Sc II	Hemant
71	Dolly. Jayshankar. Kaitha	B.A.I	DJK.
72	Kapil Devakar Pathare	B.Com I	Kapil
73	Pallavi Gajanan Tathod	B.A.I	PGTathod
74	Kavita Ajay Raut	B com I	Kavita
75	Sapana Rameshwar Tidke	B.A.I	SRTidke
76	Kunal Prabhakar Kakade		Kunal
77	Rathod Dipak. Ingle	B.A.I	RD.Ingle

78	Pavan B. Solanke		BA I
79	Sakshee B. Khandare	B.Khandare	BA. II
80	Radhika. P. Shirsamwar	Radhika	BA. II
81	Pradhay G. Nakhawarе		B.A. II
82	Rasika D Gawai	Gawai	B.A II
83	Shravani R. Chavhan	Chavhan	B.A. II
84	Khushi V. Bawane	K.V. Bawane	B.A. II
85	Tejasajini. K. Parihar		B.A II
86	Arif Khan Raza Khan	Arif Khan	BA II
87	Roshikash. K. Parihar.		BA II
88	Adil Shak Anis Shak	Ashak	BA I
89	Mohini. B. Routh	M Routh	BA III
90	Payal B. Kothe		BA I
91	Vivek M. Bajde		B.A III
92	Swati N Jogе		B.A IV
93	Pramod Vidya		B.A II
94	kalyani D Raut		BA II
95	Vishakha P. Shrirangwar	P.Shrirangwar	B.A III
96	mayuri G tale		BA - III
97	Gauri S. Sahare	G.S. Sahare	BA - I
98	Sakshi D. Javarkar	Sakshi	B.A II
99	Vaishnavi U Upalkar	UPalkar	B.A II
100	Upakatri ag gughane	U.U Ughane	A AII
101	yogida Vi Nandane	Nandane	B.A. I
102	Payal S. Bharti	P.S Bharti	B.A. II
103	Rasika. Gawai		B.A. I
104	Adeeba Shahezadi	Ash.	B.Sc II
105	Simran Mirza		B.Sc II
106	Jayesha Anjum		B.Sc II
107	Adiba Anjum		B.Sc II
108	Faizul Dulhani	Fzul.	B.Sc - II
109	Shibal Rahin		B.Sc - II
110	Shumaila Arham		B.Sc - II
111	Munazza fatima		B.Sc II
112	Salma Khatoon		B.Sc II
113	Zoyeba Aiman		B.Sc II
114	Tarannum K Shaikh	Kasaz	B.Sc II
115	Rahul Rajulkale	R.	B.Sc II
116	Mohammad Ausaf		B.Sc II

117	Sneha Madhukar Raut		B.Sc II
118	Rinku Sonkakke		B.S.C II
119	Ashwini Bhage		B.S.C II
120	Shreya G. Meshram		B.S.C II
121	Pooja mehasare		B.Sc-II
122	Adeba Anum		B.Sc-II
123	Safiskai Ayaz		B.Sc-II
124	Pratik Sairse		B.Sc-II
125	Harsh Khobragade		B.Sc-II
126	Bajrang Pawar		B.Sc-II
127	Rohit Jawanjal		B.Sc-II
128	Aziyan Tawheed		B.Sc-II
129	Sadd Shakil		B.Sc-II
130	Vaishnavi Dhepe		B.Sc-II
131	Sakshi Kirdak		B.Sc-II
132	Pawan Ghode		B.Sc-II
133	Ahfaz Khan		B.Sc-II
134	Abdul Sohail		B.Sc-II
135	Tejas Gawai		B.com I
136	Gaurav Khandkare		B.A. III
137	Vaibhav Wasanik		B.A III
138	Prashant Tale		B.com I
139	UJWAL CHOPADE		B.com I
140	Akshay Gomase		B.A. III
141	Harshal Jawanjal		B.com I
142			
143			
144			

Vidarbha Youth Welfare Society's
Bar.Ramrao Deshmukh Arts, Smt. Indiraji Kapadia Commerce &
Nya. Krishnarao Deshmukh Science College,Badnera-Amravati (Maharashtra) 444 701
(Re-accredited by NAAC with B++ grade)
Ph. 0721-2681232, FAX : 0721- 2681232,
email : rdik128@sgbau.ac.in, website : www.rdikandnkd.org

Ref.No. 249-A/2223

Date : 11 / 7 /2022

MEMORANDUM OF UNDERSTANDING (MOU) ON ESTABLISHMENT OF ACADEMIC CO-OPERATION

BETWEEN

R. D. I. K. and K. D. College, Badnera

AND

NARAYANRAO RANA MAHAVIDYALAYA BADNERA

Dr. Ramrao Deshmukh Arts, Smt. Indiraji Kapadia Commerce & Nyak K. D. Science College, Badnera and Narayanrao Rana Mahavidyalaya Badnera desire to collaborate for the purpose of promoting sports culture and to improve the sports performance for the benefit of the students of the college and the nearby areas.

The director of physical education of our college will provide training to the members of the club, they can use the infrastructure, Ground and volunteers of our college for any of their sports programmes and in return our students will use their playground / sports facilities for practice.

We commit our institution to be of service to each other and pledge our support to this programme of social and professional exchange.

Signed on 10 July 2022

PRINCIPAL
Bar. Ramrao Deshmukh Arts
Smt. Indiraji Kapadiya Commerce
Nyaymurti Krushnarao Deshmukh
Science College, Badnera

Principal
Narayanrao Rana Mahavidyalaya
BADNERA. Dist. Amravati.

Sharing of ground and coaching

The students of the R.D.I.K. &K. D. college were trained by the Director of Physical Education and Sports, Narayan Rana College. He played the role of a coach and trained the team in various competitions.

Director OF Physical Education Dr. Atul Patil gave athletic training. One of them won a gold medal in Inter Collegiate Athletic Meet and was selected in the SGBAU University team. The athlete participated in the All-India Athletics Championships. She won a three color coat in University competition.


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uracy: 12.1 m
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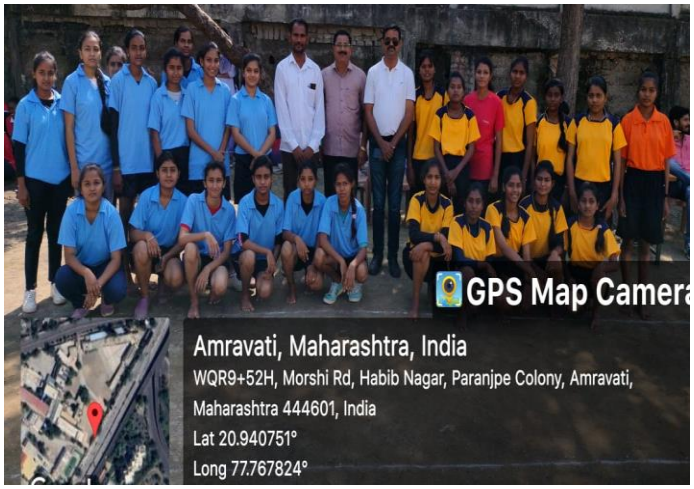
GPS Map Camera
Amravati, Maharashtra, India
VP4G+C6C, Nai Basti, Amravati, Maharashtra 444701, India
Lat 20.856082°
Long 77.725357°
05/10/23 01:40 PM GMT +05:30
Google


GPS Map Camera
Amravati, Maharashtra, India
WQR9+52H, Morshi Rd, Habib Nagar, Paranjpe Colony, Amravati,
Maharashtra 444601, India
Lat 20.940751°
Long 77.767824°

SANT GADGE BABA AMRAVATI UNIVERSITY

CERTIFICATE 0000978

This is to certify that

KU.SAKSHI GHULE D/O PRAKASH & SMT LATA

of *NARAYANRAO RANA MAHAVIDYALAYA, BADNERA (RLY.)*

is awarded the colour in **ATHLETIC**

for representing this University team in the **ALL INDIA** *Inter - University Tournament held at*

TAMIL NADU PHYSICAL EDUCATION AND SPORTS UNIVERSITY

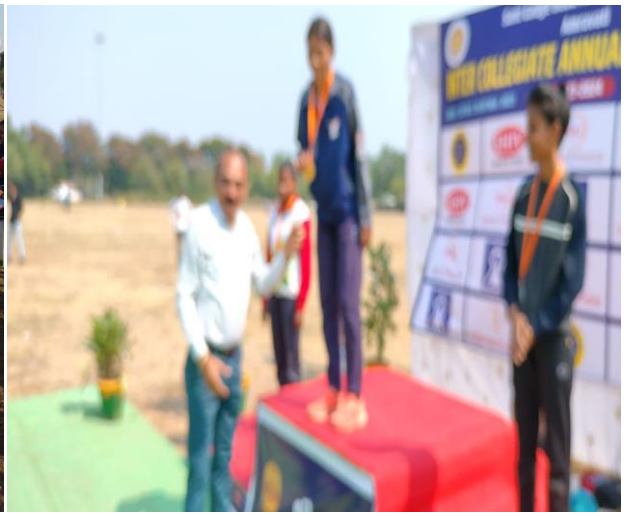
during the year 2022-2023

The Team secured **NIL** *place in this tournament.*

Date:05/08/23

Chairman
Board of Sports & Physical Education
Sant Gadge Baba Amravati University Amravati

Director
Sports & Physical Education
Sant Gadge Baba Amravati University Amravati



Dr. Atul R. Patil
DIRECTOR
Physical Edu. & Sports
R.D.I.K. & K. D.College
BADNERA

MEMORANDUM OF UNDERSTANDING

Between

DEPARTMENT OF PHYSICAL EDUCATION,

BAR. RAMRAO DESHMUKH ARTS, SMT. INDIRAJI KAPADIYA COMMERCE,
NYA. KRUSHNARAO DESHMUKH SCIENCE COLLEGE, BADNERA (RLY)
DIST. AMRAVATI (M.S.)

AND

SHRI SHIVAJI COLLEGE OF PHYSICAL EDUCATION,
Shivaji Nagar Amravati 444 603

MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding (MOU)

Is entered into on

BY AND BETWEEN

DEPARTMENT OF PHYSICAL EDUCATION

BAR. RAMRAO DESHMUKH ARTS, SMT. INDIRAJI KAPADIYA COMMERCE, NYA. KRUSHNARAO DESHMUKH SCIENCE COLLEGE, BADNERA (RLY) DIST. AMRAVATI (M.S.)

Affiliated to Sant Gadge Baba Amravati University, Amravati

AND

SHRI SHIVAJI PHYSICAL EDUCATION COLLEGE,AMRAVATI

Affiliated to Sant Gadge Baba Amravati University, Amravati

1. Preamble

It is our need to work in collaboration to achieve and maintain the Education and Research in any institute. The individual academicians from R.D.I.K. & K.D. Arts, Commerce and Science College Badnera (Rly) Dist. Amravati should joint their hands in academics and research. This helps to increase academic standards, student quality. This also helps in taking particularly the local problem and work together for the sustainable development of the area.

DEPARTMENT OF PHYSICAL EDUCATION AND SPORTS,
BAR. RAMRAO DESHMUKH ARTS,SMT. INDIRAJI KAPADIYA COMMERCE, NYA.
KRUSHNARAO DESHMUKH SCIENCE COLLEGE, BADNERA (RLY) DIST. AMRAVATI (M.S.)

R.D.I.K. & K.D. Arts, Commerce and Science college Badnera Dist. Amravati was founded on 1972. The college is affiliated to Sant Gadge Baba Amravati Univrsity, Amravati. The college is located in the backward area with scheduled castes with scarce facility of higher education. It offers courses at undergraduate level in the faculty of Science , Arts and Commerce & some P.G. courses. R.D.I.K. and K.D. Arts, Commerce and Science college Badnera , Dist, Amravati has been envisioned as Quality Education to Rural Masses with main focus on building capabilities of students for holistic development of their personality. Prof. Atul Patil, Physical director of the college is renowned personality sport specially in Athletics in Maharashtra. He is secretary of Amravati district Athletics association. He has coached of students in this era under his able guidance number of students of college are successfully sparking in many games at university, State and national levels. College equipped with Archery, Cricket, Volleyball, Fancing, Taekwondo, Mallakhamb etc. ground of Volleyball, Mallakhamb Fancing, and Kabbadi etc.

SHRI SHIVAJI PHYSICAL EDUCATION COLLEGE, AMRAVATI.

Under the auspicious guidance of shri Shivaji education society, Shri shivaji college of physical education started in 1975-76 to provide Teachers Training Programme to the students in region & around. The institution in recognized &approved by NCTE, New Delhi & State Govt. of Maharashtra & affiliated to Sant Gadge Baba Amravati University, Amravati (M.S.). The institution is accredited with B++ Grade by NAAC, Banglore, in the year 2005

It is spread over about 18 acres of land with 22128-64 Sq. Ft. built up area in healthy and beautiful environment. Auditorium having capacity of 200 participants with LCD Projector and public address system.

About 15,000Sq.Ft. area for the specious administrative Instructional area is available. Separate instructional area is dedicated for each courses.

LIBRARY

Library Building of Total 1500 Sq. Mtr. Area with a separate reading room for the students and Teachers. About 6656 numbers of Books of renowned authors are available in the library .Subscribing different national and international Journals and periodicals.

SPORTS AND GAMES FACILITIES

Following Indoor & outdoor sports facilities are available in the institution.

Indoor :- Bandminton Hall with Illumination, Table Tennis, Gymnacium, Wrestling & Judo Hall, Yoga & Meditation Centre , Ultra modern Multy Gym with Steam & Sauna bath Facility etc.

Outdoor: - 400 Mtrs. Cynder Track with Pavelion facilities for Jumping and Throwing Events., Concrete Basket Ball Court. Volley Ball, Hand Ball , Football ,Hockey, Kabaddi, kho- kho, Standards Swimming Pool etc.

LABORATORY

Sports Science laboratory with all modern equipment and Testing Apparatus are available.

RESEARCH CELL

Separate Research Lab is approved By Sant Gadge Baba Amravati University for the Students and Faculty members those who are engaged in research activities in the field of Physical Education and Sports. All modern facilities and computer facilities are available in Research Cell.

2) Collaboration

R.D.I.K. & K.D. College Badnera, Dist. Amravati and Shri Shivaji Physical education college, Amravati have mutually agreed to collaboration with each other in following areas.

* Exchange sports Equipments.
* Exchange expertization for coaching and other activities.
* To carry out sports awareness programs in society.
* To use Sport Facility of each others.

3) Terms of collaboration

a) R.D.I.K. & K.D. College Badnera Dist. Amravati and Shri Shivaji Physical education college, Amravati agreed to enter into detailed agreement on case-to-case basis, with a defined objective, specifying the scope of work and mutual obligation, terms and condition, financial agreements, intellectual Property Rights and similar contractual obligation.

b) R.D.I.K. & K.D. college Badnera, Dist. Amravati and Shri Shivaji Physical education College, Amravati agrees to obtain prior permission from each other to state in any project proposal that the project would be carried out by using each other infrastructure or intellectual facilities.

4. Disclaimer

This MOU is not intended by R.D.I.K. & K.D. college, Badnera Dist. Amravati and Shri Shivaji Physical education College, Amravati. To constitute, create and give effect to, or otherwise recognize a joint venture, agency, partnership, or formal business organization of any kind. Each party here to shall act as an agent of either organization for other purposes. Neither party has the authority to bind the other party.

5. Non-exclusivity

The agreement reflected by the provisions of this MOU is non-exclusive in nature and both the parties can enter into cooperative arrangement with other parties to suit their organizational needs.

6. Confidentiality

The parties understand that in the course of their association, they have access to confidential information provided by the other party. Accordingly, the parties agree that such information shall be maintained in the strictest confidence and trust, expect such information which is by its nature, not confidential or which is in the public domain or which the party comes to know about other than through violation of any law of legal obligation, provided that such party may be entitled to disclose such information if legally required to be disclosed to competent authority. Failure to maintain confidentiality shall entitle the affected party to terminate the MOU.

7. Validity

The MOU would remain valid for a period of ten years from the date it is signed by the parties and is renewable on mutual consent for such further period as agreed upon.

8. Term and Review

The MOU shall be continued from the date of signing of this MOU. Either party can terminate the MOU after giving one month's notice to the other party subject to fulfillment of commitments already agreed upon.

9. Amendments

This MOU constitutes the entire understanding between the parties hereto. Except as otherwise provided herein, no addition, amendments to or modification of this MOU shall affected unless it is in writing a signed by on behalf of both parties by their respective authorized signatories.

10. Any dispute

Any dispute arising out of this MOU will be settled by mutual negotiations between the two parties.

In witness where of each of the parties has caused this MOU to be executed in two originals one has been retained. R.D.I.K. & K.D. college, Badnera, Dist. Amravati and Shri Shivaji Physical education college, Amravati on this day the _____

This Memorandum Of Understanding

Is entered between

Department of Physical Education,

Bar. Ramrao Deshmukh Arts,Smt. Indiraji Kapadiya Commerce &Nya. Krushnarao Deshmukh Science College, Badnera Rly, Dist. Amravati (M.S.)

AND

SHRI SHIVAJI PHYSICAL EDUCATION COLLEGE,AMRAVATI.(M.S.)

02/01/17

On

Approved by

Dr. R. D. DESHMUKH
Principal
R.D.I.K. &K.D. college
Badnera Dist. Amravati

PRINCIPAL
Bar. Ramrao Deshmukh Arts
Smt. Indiraji Kapadiya Commerce &
Nyaymurti Krushnarao Deshmukh
Science College, Badnera.

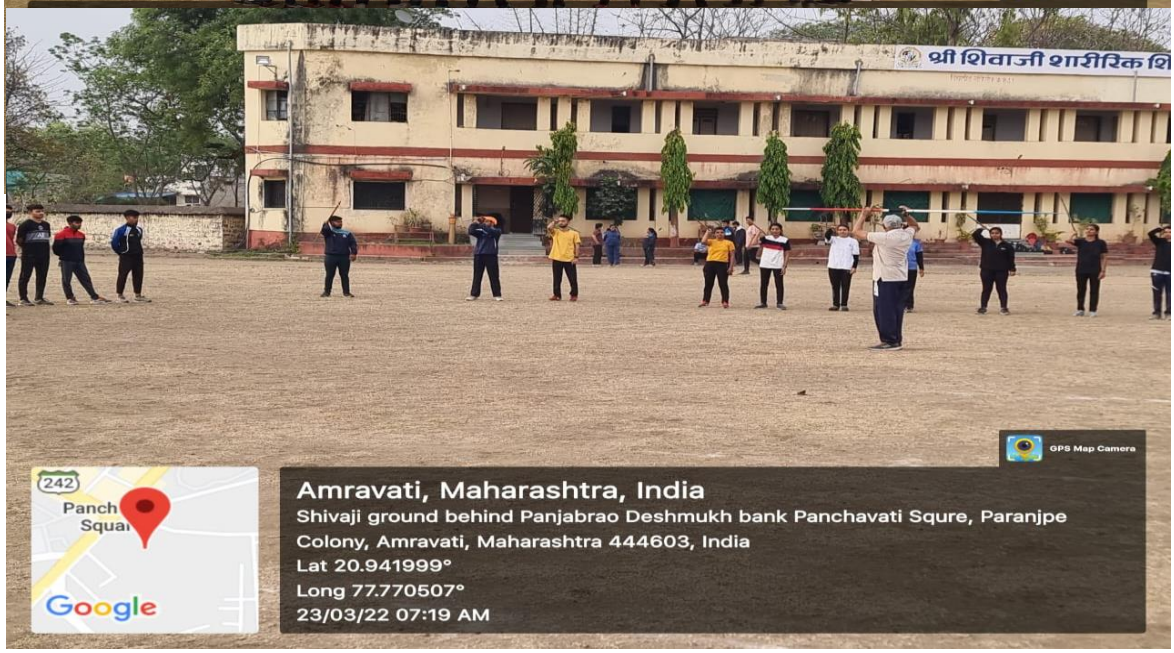
Shri Shivaji College of Physical Education Amravati

Dr. R. M. KADU
Principal
Shri Shivaji Physical Education
College, Amravati

PRINCIPAL
Shri Shivaji College of
Physical Education,Amravati

Competition Organization and Training

The students of the R.D.I.K. &K. D. college were trained by the Coach of Shri Shivaji College of Physical Education College. Director OF Physical Education Dr. Atul Patil gave athletic training and support to organize various competitions like cross country, athletic meet also Coach of Shri Shivaji College of Physical Education College support for organizing various competitions.



Dr. Atul R. Patil
DIRECTOR
Physical Edu. & Sports
R.D.I.K. & K. D.College
BADNERA

1.	Name of Organising Department	:	**Department of Physical Education**
2.	Name of Activity	:	Run for Leprosy
3.	No. Of Participation	:	252 Students (Which include 34 students of the college)
4.	Date of Activity	:	12/02/2023
5.	Route of Run	:	Start-IMA Hall -Girls High Schools Square Shivaji Education Society District Stadium Ervin Square Finish IMA Hall.

Details of Activity:

Leprosy, also known as Hansen's disease (HD), is a long-term infection by the bacteria Myco bacterium leprae or Mycobacterium lepromatosis. Infection can lead to damage of the nerves, respiratory tract, skin, and eyes. India is running leprosy eradication programs, the National Leprosy Eradication Program (NLEP)for so many years. Despite this, 120,000 to 130,000 new cases of leprosy are reported every year in India. This is 58.8% of the global total of new cases. This run was organised with the aim to create awareness against the stigma attached to the disease, by making the general community aware that it is a disease spread by a type of bacteria and it can be easily cured. All over the world, people have incorrect and harmful beliefs about leprosy. These beliefs are based on myths and they lead to discrimination against people affected by leprosy. They cause people to hide their symptoms and delay treatment. Superstition like this disease is curse, the result of sin, or punishment from God. You shouldn't touch to leprosy patient because it's highly contagious. Leprosy is incurable Etc. to Eradicate such superstitions from the minds of people and to reduce the rate and eradicate this disease such programs are undertaken by the health mission run by State Government. R.D.I.K. college, Badnera in collaboration with department of health service (Leprosy) Amravati organized **"Run for Leprosy"** of 5 km. on 12th February 2023. Along with 34 students of our college, Men and women of all age groups from the district run participated in. Dr Dilip Pandharpate Revenue Commissioner, Amravati, Dr Manish Rathi President IMA, Amravati. and Dr. R.D. Deshmukh Principal R.D.I.K. college, Badnera, Amravati were present as the chief guests of the program. Total 252 people participated in this event.53 man and 139 women participated in this run. After the run all the participants were given information about leprosy and about the habits one should

inculcate in their day-to-day life to prevent this disease and the measures one should take to cure this disease. The Caps with health mission logo on it were distributed among the people.

Outcome of program.

- It helped to spread awareness about Leprosy.
- It helped in destroying the fear and superstition about the disease from the minds of people.
- It spread information about the availability of the treatment of disease.

Dr. Atul R. Patil
DIRECTOR
Physical Edu. & Sports
R.D.I.K. & K. D.College
BADNERA


Latitude: 20.935249
Longitude: 77.766654
Elevation: 364.58±3 m
Accuracy: 106.5 m
Time: 02-12-2023 08:05
Note: Nss
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Latitude: 20.935252
Longitude: 77.766538
Elevation: 364.58±2 m
Accuracy: 3.9 m
Time: 02-12-2023 08:08
Note: Nss
Powered by NoteCam


स्पर्श कुष्ठरोग जनजागृती अभियान-२०२३
Run for Leprosy Marathon
M.D.T. खाओ
कुष्ठरोग मिटाओ


Latitude: 20.935174
Longitude: 77.766058
Elevation: 363.88±4 m
Accuracy: 77.8 m
Time: 02-12-2023 08:01
Note: Nss
Powered by NoteCam

महाराष्ट्र शासन आरोग्य सेवा
सहाय्यक संचालक, आरोग्य सेवा, (कुष्ठरोग), अमरावती
श्रीकृष्णपेठ, जिल्हा स्त्री रुग्णालय परिसर, अमरावती

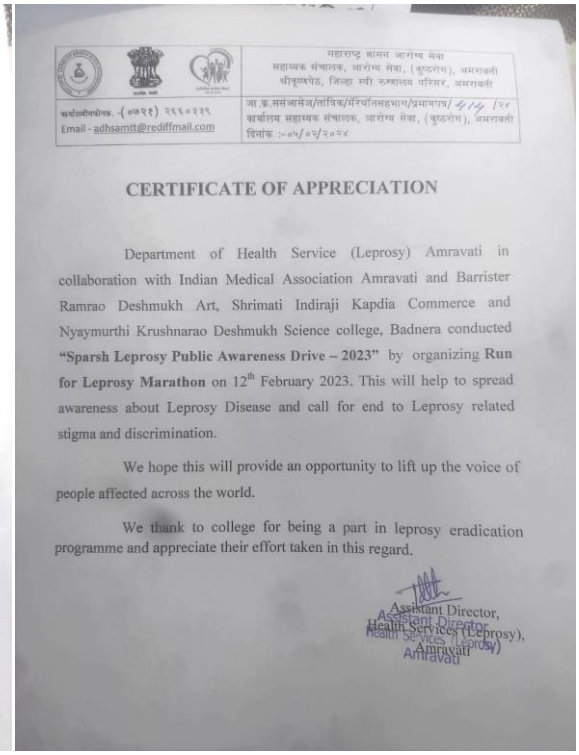
कार्यालयीनदोनक. -(०७२१) २६६०३३९
Email - adhsamtt@rediffmail.com

जा.क्र.ससंआसेअ/तांत्रिक/मेरिथॉनसहभाग/प्रमाणपत्र/413 /२०२४
कार्यालय सहाय्यक संचालक, आरोग्य सेवा, (कुष्ठरोग), अमरावती
दिनांक :-०५/०२/२०२४

CERTIFICATE

This is to certify that 34 student of Barrister Ramrao Deshmukh Art, Shrimati Indiraji Kapdia Commerce & Nyaymurthi Krushnarao Deshmukh Science college, Badnera actively participated in **"Run for Leprosy Marathon"** on 12/02/2023 organized by this department.

Assistant Director,
Health Services (Leprosy),
Amravati



महाराष्ट्र शासन आरोग्य सेवा
सहाय्यक संचालक, आरोग्य सेवा, (कुष्ठरोग), अमरावती
श्रीकृष्णपेठ, जिल्हा स्त्री रुग्णालय परिसर, अमरावती

कार्यालयीनदोनक. -(०७२१) २६६०३३९
Email - adhsamtt@rediffmail.com

जा.क्र.ससंआसेअ/तांत्रिक/मेरिथॉनसहभाग/प्रमाणपत्र/414 /२०२४
कार्यालय सहाय्यक संचालक, आरोग्य सेवा, (कुष्ठरोग), अमरावती
दिनांक :-०५/०२/२०२४

CERTIFICATE OF APPRECIATION

Department of Health Service (Leprosy) Amravati in collaboration with Indian Medical Association Amravati and Barrister Ramrao Deshmukh Art, Shrimati Indiraji Kapdia Commerce and Nyaymurthi Krushnarao Deshmukh Science college, Badnera conducted **"Sparsh Leprosy Public Awareness Drive – 2023"** by organizing **Run for Leprosy Marathon** on 12th February 2023. This will help to spread awareness about Leprosy Disease and call for end to Leprosy related stigma and discrimination.

We hope this will provide an opportunity to lift up the voice of people affected across the world.

We thank to college for being a part in leprosy eradication programme and appreciate their effort taken in this regard.

Assistant Director,
Health Services (Leprosy),
Amravati

स्पर्श कुष्ठरोग जनजागृती अभियान - २०२३

Date:- 12/02/2023

Run for Leprosy Marathon

॥ प्रमाणपत्र ॥

प्रमाणित करण्यात येते की

श्री./श्रीमती _____

यांनी स्पर्श कुष्ठरोग जनजागृती अभियान २०२३ अंतर्गत कुष्ठरोग जनजागृती करिता आयोजित मॅरेथॉन स्पर्धेत सहभागी होवून _____ क्रमांक पटकविल्याबद्दल व राष्ट्रीय कुष्ठरोग निर्मुलन कार्यक्रमाला दिलेल्या सहकार्य व योगदानाबद्दल हे प्रशस्तीपत्र देऊन गौरविण्यात येत आहे.

डॉ.अंकुश सिरसाट
सहाय्यक संचालक
आरोग्य सेवा (कुष्ठरोग)
अमरावती

डॉ.मनिष राठी
अध्यक्ष
आय.एम.ए.
अमरावती

डॉ. राजेश देशमुख
प्राचार्य
बॅ.आर. डी. आय. के. व
के. डी. महाविद्यालय, बडनेरा

1. Name of Organizing Department : **Chemistry**

2. Name of Activity : "Hands on training on Chemi-informatics lab"

3. No. of Participants : Teachers – 04

4. Date of Activity : 5th October, 2021

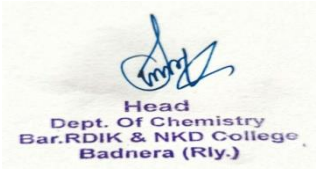
Details of Activity:

Department of Chemistry organized "Hands on training on Chemi informatics" dated 05/10/2021. Dr. Vijay Masand explained how to 1) establish a computational chemistry lab by installing several free and open-source software. 2) Use of free and open-source software among faculty members and students of undergraduate and post graduate degree courses. 3) Handle various free chemistry software by giving live demonstration.

Outcome of the Programme:

- A computational chemistry lab is developed by installing several free and open software's.
- The new computational chemistry lab will help the college to start new courses like cheminformatics, pharmacoinformatic etc.
- Use of free and open-source software among faculty members and students of undergraduate and post graduate degree courses will be a long-term solution to costly licensed software's.
- Student got aware about the application of several software in chemistry.

Name of Expert: 1) Dr. Vijay Masand (9403312628)
Associate Professor
Department of Chemistry Vidyabharti
Mahavidyalaya Amravati



Bar.Ramrao Deshmukh Arts Smt. Indiraji Kapadiya Commerce & Nya. Krishnarao Deshmukh Science College, Badnera (Rly).

Programe Name: Hands on training practice on Chemi informatics

Date: 05/10/2022

Attendance

Sr.NO.	Teacher's Name	Singnature
1.	Dr.S.D.Thakur	
2.	Dr.B.P.Khobragade	
3.	Miss.S.G.Pimple	
4.	Miss.J.N.Panjwani	

Demonstration of Chemi -informatics lab
Date:05/10/2021

Report on

Student Exchange Program

conducted under MoU with RDIK & NKD College, Badnera-Amravati

Session: 2021-22

Vidya Bharati Mahavidyalaya, Amravati and RDIK & NKD College, Badnera-Amravati have an active and functional MoU in existence for the mutual benefits of students and teachers for optimum utilization of available resources for holistic development of learners. The objective of the MoU is to facilitate the holistic development of the learners of the two institutions. In this regard, the two institutions have made good joint efforts to provide students and faculty the necessary atmosphere and facilities for the promotion of skill enhancement. In the session 2021-22, the Department of chemistry, RDIK & NKD College, Badnera-Amravati deputed five students pursuing M.Sc. (Chemistry) to accomplish their research projects, which are a part of their curriculum. Further, details are as following:

Sr. No.	Name of students/Beneficiaries	Class	Supervisor/Head	Duration
1.	Ms. Aparna V. Jawarkar	M.Sc. (Chemistry)	Dr. S.D. Thakur, RDIK &NKD College, Badnera-Amravati	January 2022 to May 2022
2.	Ms. Ankita R. Lad	M.Sc. (Chemistry)	Dr. S.D. Thakur, RDIK &NKD College, Badnera-Amravati	January 2022 to May 2022
3.	Ms. Nikita Kadu	M.Sc. (Chemistry)	Dr. S.D. Thakur, RDIK &NKD College, Badnera-Amravati	January 2022 to May 2022
4.	Ms. Pranjali G Tayade	M.Sc. (Chemistry)	Dr. S.D. Thakur, RDIK &NKD College, Badnera-Amravati	January 2022 to May 2022
5.	Ms. Yogita Netanrao	M.Sc. (Chemistry)	Dr. S.D. Thakur, RDIK &NKD College, Badnera-Amravati	January 2022 to May 2022

The students were training for using 'Microscale techniques', handling different advanced instruments like FT-IR, UV-Vis spectrophotometer, pH-meter, Rotary evaporator, a few to mention. Dr. V. V. Parhate, Head, Department of Chemistry, Prof. Dr. M. M. Rathore, and Dr. C.

N. Deshmukh continuously took efforts and supervised for the successful accomplishment of the projects. The students were present all the time in the college for the project. The students revealed their satisfaction after competing their project.

Outcome: The students were benefitted by the expertise of the subject experts. They learned handling advanced instruments. They developed a high level of interest in doing research. They acquired new skills, which could help them to secure a bright career in the field of chemistry.

Head
Department of Chemistry
Vidya Bharati Mahavidyalaya,
Amravati

Head, Deptt. of Chemistry
Vidya Bharati Mahavidyalaya,
AMRAVATI - 444602

Principal
Vidya Bharati Mahavidyalaya,
Amravati

Principal
Vidya Bharati Mahavidyalaya
Amravati.

Head
Department of Chemistry
RDIK & NKD College, Amravati

Head
Dept. Of Chemistry
Bar.RDIK & NKD College,
Badnera (Rly.)

Principal
RDIK & NKD College, Badnera
Amravati

PRINCIPAL
Bar. Ramrao Deshmukh Arts,
nt. Indiraji Kapadiya Commerce
Nay. Krushnarao Deshmukh,
Science College, BADNERA.

Vidya Bharati Shaikshanik Mandal, Amravati's
VIDYA BHARATI MAHAVIDYALAYA, AMRAVATI.
C. K. Naidu Road, Camp, Amravati - 444 602 (M.S.) India
* Re-accredited with 'A' Grade by NAAC (Second Cycle)
* CPE Status by UGC * Lead College by S.G.B. Amravati University Amravati * Mentor College under Paramarsh Scheme of UGC
☎ 0721-2662740, Fax No. 0721-2662621 Website : www.vidyabharatimahavidyalaya.org e-mail : vbm126@sify.com
President
Mr. R. D. Shekhawat
☎ 2662866, 2662783 (R)
Founder President
Dr. D. R. Shekhawat
☎ 2662866, 2662783 (R)
Principal
Dr. Pradnya Yeole
☎ 2662740 (O), 2664... (R)

Certificate

This is to certify that Ms./Mr Ms. **Aparna V. Jawarkar** studying in M.Sc.II (Chemistry) Semester-IV at Department of Chemistry, RDIK & NKD College, Badnera-Amravati has accomplished his/her P.G. project during the session 2021-22 at Vidya Bharati Mahavidyalaya, Amravati under the joint MoU. His/her performance was found to be satisfactory.

Date: 21\05\2022

Place: Amravati

Head
Department of Chemistry
Vidya Bharati Mahavidyalaya,
Amravati

Head
Department of Chemistry
Vidya Bharati Mahavidyalaya,
AMRAVATI - 444602

Principal
Vidya Bharati Mahavidyalaya,
Amravati

Principal
Vidya Bharati Mahavidya...
Amravati.

Certificate

This is to certify that Ms./Mr Ms. **Ankita R. Lad** studying in M.Sc.II (Chemistry) Semester-IV at Department of Chemistry, RDIK & NKD College, Badnera-Amravati has accomplished his/her P.G. project during the session 2021-22 at Vidya Bharati Mahavidyalaya, Amravati under the joint MoU. His/her performance was found to be satisfactory.

Date: 21/03/2022

Place: Amravati

Head
Department of Chemistry
Vidya Bharati Mahavidyalaya,
Amravati

Head, Deptt. of Chemistry
Vidya Bharati Mahavidyalaya,
AMRAVATI - 444602

Principal
Vidya Bharati Mahavidyalaya,
Amravati

Principal
Vidya Bharati Mahavidyalaya
Amravati

Vidya Bharati Shaikshanik Mandal, Amravati's
VIDYA BHARATI MAHAVIDYALAYA, AMRAVATI.
C. K. Naidu Road Camp, Amravati - 444 602 (M.S.) India
* Re-accredited with 'A' Grade by NAAC in Third Cycle Consecutively
* CPE Status by UGC - Three * Mentor College under Paramarsh Scheme of UGC
* Lead College by S.G.B. Amravati University, Amravati * ISO Certified 9001:2015 * Green Award Certificate
☎ 0721-2662740, Fax No. 0721-2552012 | Website : http://www.vbmahavidyalaya.ac.in
President
Mr. R.D. Shekhawat
☎ 2662866, 2662783 (R)
Founder President
Dr. D. K. Shah (Agra)
☎ 2662866, 2662783 (R)
Principal
Dr. Pradeep Kumar Gupta
☎ 2662740 (O), 2664015 (R)

Certificate

This is to certify that Ms./Mr Ms. **Nikita Kadu** studying in M.Sc.II (Chemistry) Semester-IV at Department of Chemistry, RDIK & NKD College, Badnera-Amravati has accomplished his/her P.G. project during the session 2021-22 at Vidya Bharati Mahavidyalaya, Amravati under the joint MoU. His/her performance was found to be satisfactory.

Date: 21/03/2022

Place: Amravati

Head
Department of Chemistry
Vidya Bharati Mahavidyalaya,
Amravati

Head, Dept. of Chemistry
Vidya Bharati Mahavidyalaya,
AMRAVATI - 444602

Principal
Vidya Bharati Mahavidyalaya,
Amravati

Principal
Vidya Bharati Mahavidyalaya
Amravati

Vidya Bharati Shaikshanik Mandal, Amravati's
VIDYA BHARATI MAHAVIDYALAYA, AMRAVATI.
C. P. Naidu Road Camp, Amravati - 444 602 (M.S.) India
* Re-accredited with 'A' Grade by NAAC in Three Cycles Consecutively
* CPE Status by UGC - Since * Mentor College under Paramarsh Scheme of UGC
* Lead College by S.G.B. Amravati University, Amravati * ISO Certified 9001:2015 * Green Award Certified
0721-2662740 Fax No. 0721-2662812 Website: http://www.vbm.org.in mail: principal@vbm.org.in
President
Mr. R. D. Shekhawat
2662866, 2662783 (R)
Founder President
Mr. B. R. Shekhawat
2662866, 2662783 (R)
Principal
Dr. Pradipsinh Vaidya
2662740 (O), 2664013 (R)

Certificate

This is to certify that Ms./Mr Ms. **Pranjali G Tayade** studying in M.Sc.II (Chemistry) Semester-IV at Department of Chemistry, RDIK & NKD College, Badnera-Amravati has accomplished his/her P.G. project during the session 2021-22 at Vidya Bharati Mahavidyalaya, Amravati under the joint MoU. His/her performance was found to be satisfactory.

Date: 21/03/2022

Place: Amravati

Head
Department of Chemistry
Vidya Bharati Mahavidyalaya,
Amravati

Head, Dept. of Chemistry
Vidya Bharati Mahavidyalaya,
AMRAVATI - 444602

Principal
Vidya Bharati Mahavidyalaya,
Amravati

Principal
Vidya Bharati Mahavidyalaya
Amravati.

Vidya Bharati Shaikshanik Mandal, Amravati's
VIDYA BHARATI MAHAVIDYALAYA, AMRAVATI.
C. K. Naidu Road, Camp, Amravati - 444 602 (M.S.) India
* Re-accredited with 'A+' Grade by NAAC (Third Cycle) * CPE Status by UGC - Third * Mentor College under Paramanu Yojana
* Lead College by S.G.B. Amravati University, Amravati * ISO Certification
☎ 0721-2662740, Fax No. (0721-2662783) Website : http://www.vbm...
President
Mr. R. D. Shekhawat
☎ 2662866, 2662783 (R)
Founder President
Dr. D. K. Shekhawat
☎ 2662866, 2662783 (R)
Principal
Dr. Pradnya Tenkar
☎ 2662740 (O), 2664013 (R)

Certificate

This is to certify that Ms./Mr Ms. **Yogita Netanrao** studying in M.Sc.II (Chemistry) Semester-IV at Department of Chemistry, RDIK & NKD College, Badnera-Amravati has accomplished his/her P.G. project during the session 2021-22 at Vidya Bharati Mahavidyalaya, Amravati under the joint MoU. His/her performance was found to be satisfactory.

Date: 21/03/2022

Place: Amravati

Head
Department of Chemistry
Vidya Bharati Mahavidyalaya,
Amravati

Head, Deptt. of Chemistry
Vidya Bharati Mahavidyalaya
AMRAVATI - 444602

Principal
Vidya Bharati Mahavidyalaya,
Amravati

Principal
Vidya Bharati Mahavidyalaya
Amravati.

1. Name of Organising Department	:	**Mathematics**
2. Name of Activity	:	Mathematical charts and Models Competition
3. Place of Activity	:	PGTD (Mathematics), SGBAU, Amravati
4. No. of Participant	:	Students: 84, Teachers: 26
5. Dateof Activity	:	21/12/2021

Details of Activity (In Brief):

As per MOU, on December **21, 2021**, the Department of Mathematics, organizedone-day University Level "Mathematical Charts and Models Competition" in collaboration with Sant Gadge Baba Amravati University, Amravati, Adarsha Mahavidyalaya, Dhamangaon Rly.and Shri.Dr.R.G.Rathod Arts,Science College, Murtizapur.The examiners Dr. M.V.Dawande, Dr. P.P. Khade, and Dr. Ashwina Rangari were all prominently present at this event. About **110** P.G. students, along with faculty members from affiliated colleges, took part in this event.

Outcome of the Programme:

- To motivate the students to participate in the inter-collegiate level competitions.
- To build different mathematical skills and concepts.
- To help the students to learn best when presented with a concept they can visualize.
- Students will be to use language creatively and imaginatively in text transaction and performance of activities.
- All students participated in all the events enthusiastically and it was a great learning experience for all of them.
- Student received E-certificate of participation.

Name & Contact No. of Expert (if any):

Dr. M.V.Dawande, Professor, Bhartiya Mahavidyalaya, Amravati, Contact No.9421743937
Dr. P.P. Khade, Associate Professor, Vidyabharati Mahavidyalaya, Amravati,
Contact No.9421829832
Dr. Ashwina Rangari, Assistant Professor, Adarsha Mahavidyalaya, and Dhamangaon Rly.
Contact No.9403116400

Dr. V. G. Mete
Professor & Head
Department of Mathematics,
R.D.I.K. & K.D. College, Badnera-Amravati

Photo Gallery








Sant Gadge Baba Amravati University, Amravati

NAAC Re- accredited with 'B++' grade

on the eve of Nantional Mathematics Day - 2021

Rajiv Gandhi Science & Technology Commission, Govt. of Maharashtra Sponsored

UNIVERSITY LEVEL EXHIBITION

ON

MTHEMATICAL CHARTS AND MODELS COMPETITION

CERTIFICATE

This is to certify that Prof./Dr./Mr./Ms. _____

of _____

has actively participated in the Exhibition on "Mathematical Charts and Models Competition for P.G. Students", organized by the Department of Mathematics & IQAC, Sant Gadge Baba Amravati University, Amravati, in collaboration with Department of Mathematics, R.D.I.K. & K.D. College, Badnera (Rly.), Adarsha Science, J.B. Arts & Birla Commerce Mahavidyalaya, Dhamangaon (Rly.) and Shri Dr. R.G. Rathod, Arts and Science College Murtizapur, held on December, 21, 2021. He / She stood at _____position.

Dr. P.A. Pawar — Dr. R . D . Deshmukh — Dr. Y.B. Gandole — Dr. A . P. Charjan — Dr. T.R. Deshmukh

1. Name of Organising Department	:	**Mathematics**
2. Name of Activity	:	Workshop on NET/SET Guidance in Mathematical Sciences
3. Place of Activity	:	Dr.K.G.Deshmukh Hall, SGBAU, Amravati
4. No. of Participant	:	Students: 165, Teachers: 25 Resource persons: 06
5. Date	:	22nd December,2021

Details of Activity (In Brief):

As per MOU, on the occasion of 'National Mathematics Day' one day workshop on NET/SET guidance in mathematical sciences under the best practices in university was organized on **22nd Dec., 2021** in collaboration with department of mathematics, Sant Gadge Baba Amravati University, Amravati, Adarsha Mahavidyalaya, Dhamangaon Rly.and Shri. Dr .R.G.Rathod Arts and Science College, Murtizapur. About **196** members including Faculty members and Research Scholars, PG students from various colleges participated in the workshop. Key Note address was given by Dr. G.S.Khadekar , Dean Science and Technology, RTM ,Nagpur University, Nagpur. In this workshop, the resource persons guided the students byg iving various examples and tricks. This programe was carried out in three sessions.

Outcome of the Programme:

- This workshop will help the students to make them ready to face the challenging questions, thereby crack the examination.
- Participants got motivated to clear the CSIR-UGC NET / SET Exams.
- Studentswill be motivated to organize such type of useful workshops in future.

Name & Contact No. of Expert (if any):

Dr. G.S. Khadekar , Dean Science and Technology, RTM ,Nagpur University, Nagpur
Contact No. 9011323123
Dr. Sahare, Assistant Professor,Institute of Science,Nagpur, Contact No.8055156130
Dr. G.L.Gulhane, Professor,SGBAU, Amravati, Contact No.9527360926
Dr.S.P.Kandalkar,GVISH,Amravati, Contact No.9423426316
Dr.V.B.Raut,Principal Mungsaji Maharaj Mahavidyalaya, Darwha, Contact No.9284767627

Dr. V. G. Mete
Professor & Head
Department of Mathematics,
R.D.I.K. & K.D. College, Badnera-Amravati


Workshop
on
NET/SET GUIDANCE IN
MATHEMATICAL SCIENCE
Wednesday, Dec. 22, 2021
संत गाडगेबाबाअमरावतीविद्यापीठ


Workshop
on
NET/SET GUIDANCE IN
MATHEMATICAL SCIENCE
Wednesday, Dec. 22, 2021


National Mathematics Day-2021
Workshop
on
NET/SET GUIDANCE IN
MATHEMATICAL SCIENCE
Wednesday, Dec. 22, 2021


National Mathematics Day-2021
Workshop
on
NET/SET GUIDANCE IN
MATHEMATICAL SCIENCE
Wednesday, Dec. 22, 2021


Accredited by NAAC with 'A' Grade


Accredited by NAAC with 'A' Grade


On the occasion of
National Mathematics Day-2021
Govt. of Maharashtra Sponsored
on


Workshop
on
NET/SET GUIDANCE IN
MATHEMATICAL SCIENCE


Workshop
on

To Commemorate the 134th Birth Anniversary of Srinivasa Ramanujan Iyenger National Mathematics Day - 2021

UNIVERSITY LEVEL WORKSHOP
ON
NET/SET GUIDANCE IN MATHEMATICAL SCIENCE

Dec . 22 , 2021

Inaugural function

Sir / Madam,
You are cordially invited to grace the inaugural function of Workshop on NET / SET Guidance in Mathematical Science

Chairperson
Dr. T.R. Deshmukh
Registrar, SGBAU, Amravati.

Chief guest
Dr. G.S. Khadekar
Associate Dean, Faculty of Science & Technology RTM, Nagpur University, Nagpur

Chief guest
Dr. G.L. Gulhane
HOD, Deptt. of Education SGBAU, Amravati

Guest of Honour
Dr. S.D. Katore
Former HOD, Mathematics SGBAU, Amravati.

Dr. V.B. Raut
Principal, M.M. College Darwha.

Dr. P.A. Pawar
I/c, HOD, Mathematics SGBAU, Amravati

Dr. R . D . Deshmukh
Principal , R.D.I.K & K.D College Badnera.

Dr. Y.B. Gandole
Principal , Adarsha Science , J.B Arts & Birla Commerce Mahavidyalaya, Dhamangaon Rly.

Dr. A . P . Charjan
Principal , Shri. R.G. Rathod Arts & Science College, Murtizapur

Date : Dec. 22, 2021 Time : 10:00 a.m.

Venue
Dr. K.G. Deshmukh Hall
Sant Gadge Baba Amravati University, Amravati.

RSVP
Dr. V. G. Mete
Head, Department of Mathematics R.D.I.K & K.D College Badnera.

Dr. S. N. Bayaskar
Head, Department of Mathematics Adarsha Science , J.B Arts & Birla Commerce Mahavidyalaya Dhamangaon Rly.

Dr. A.S. Nimkar
Head, Department of Mathematics Shri. R.G. Rathod Arts & Science College,Murtizapur

INVITATION

To Commemorate the 134th Birth Anniversary of Srinivasa Ramanujan Iyenger National Mathematics Day - 2021

UNIVERSITY LEVEL WORKSHOP
ON
NET/SET GUIDANCE IN MATHEMATICAL SCIENCE

Dec . 22 , 2021

Valedictory Function

Sir / Madam,
You are cordially invited to grace the Valedictory function of Workshop on NET / SET Guidance in Mathematical Science

Chairperson
Dr. P.A. Pawar
I/c, HOD, Mathematics SGBAU, Amravati.

Chief guest
Dr. S. P. Kandalkar
Former Head, Department of Mathematics, Govt.Vidarbha Institute of Science and Humanities, Amravati.

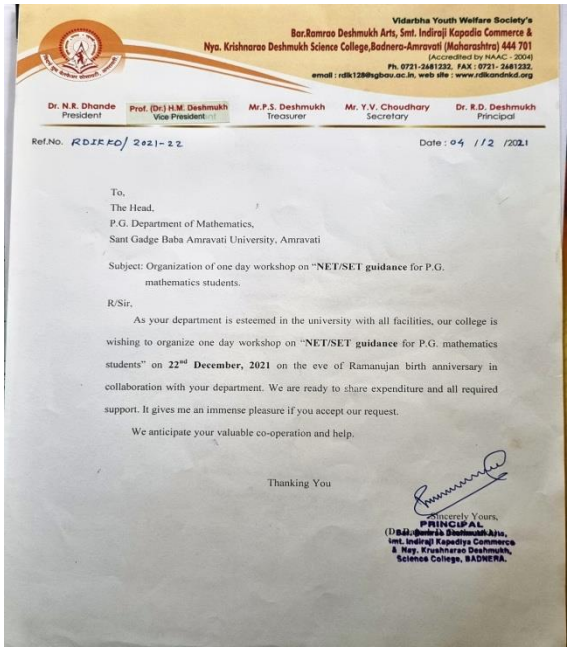
Guest of Honour
Dr. V. G. Mete
Head, Department of Mathematics R.D.I.K & K.D College Badnera.

Dr. S. N. Bayaskar
Head, Department of Mathematics Adarsha Science , J.B Arts & Birla Commerce Mahavidyalaya Dhamangaon Rly.

Dr. A.S. Nimkar
Head, Department of Mathematics Shri. R.G. Rathod Arts & Science College,Murtizapur

Date : Dec. 22, 2021 Time : 5:00 p.m.

Venue
Dr. K.G. Deshmukh Hall
Sant Gadge Baba Amravati University Amravati.



Vidarbha Youth Welfare Society's
Bar.Ramrao Deshmukh Arts, Smt. Indiraji Kapadia Commerce & Nya. Krishnarao Deshmukh Science College,Badnera-Amravati (Maharashtra) 444 701
(Accredited by NAAC - 2004)
Ph. 0721-2681232, FAX : 0721- 2681232,
email : rdk128@sgbau.ac.in, web site : www.rdkandnkd.org

Dr. N.R. Dhande, President | Prof. (Dr.) H.M. Deshmukh, Vice President | Mr.P.S. Deshmukh, Treasurer | Mr. Y.V. Choudhary, Secretary | Dr. R.D. Deshmukh, Principal

Ref.No. RDIEFO/ 2021-22 Date : 04 /12 /2021

To,
The Head,
P.G. Department of Mathematics,
Sant Gadge Baba Amravati University, Amravati

Subject: Organization of one day workshop on "**NET/SET guidance** for P.G. mathematics students.

R/Sir,

As your department is esteemed in the university with all facilities, our college is wishing to organize one day workshop on "**NET/SET guidance** for P.G. mathematics students" on **22nd December, 2021** on the eve of Ramanujan birth anniversary in collaboration with your department. We are ready to share expenditure and all required support. It gives me an immense pleasure if you accept our request.

We anticipate your valuable co-operation and help.

Thanking You

Sincerely Yours,
PRINCIPAL,
(Dr. R. D. Deshmukh)
Smt. Indiraji Kapadiya Commerce & Nya. Krishnarao Deshmukh, Science College, BADNERA.

Sant Gadge Baba Amravati University, Amravati
NAAC Re- accredited with 'B++' grade
on the eve of Nantional Mathematics Day - 2021
Rajiv Gandhi Science & Technology Commission, Govt. of Maharashtra Sponsored
WORKSHOP
ON
NET / SET GUIDANCE IN MATHEMATICAL SCIENCE

CERTIFICATE

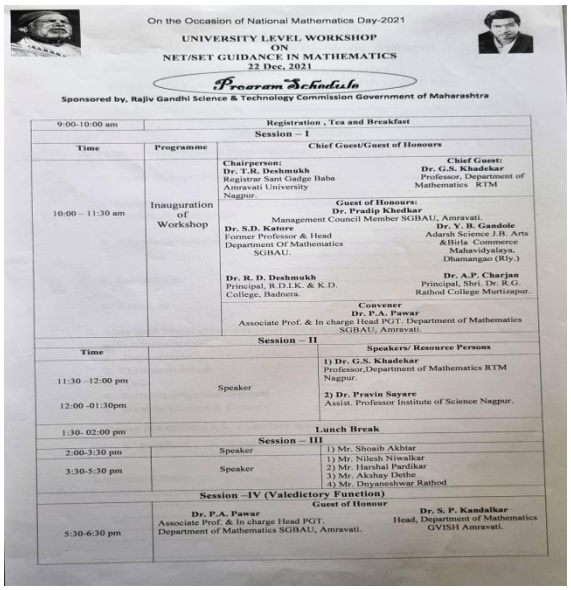
This is to certify that Prof./Dr./Mr./Ms. _____

of _____

has actively participated in the workshop on NET /SET guidance in mathematical science, organized by the Department of Mathematics, Sant Gadage Baba Amravati University, Amravati, in collaboration with Department of Mathematics, R D I K & K D College Badnera, Adarsh Science, J.B. Arts & Birla Commerce Mahavidyalaya, Dhamangaon (Rly.) and Shri. Dr. R.G Rathod Arts & Science College, Murtizapur, held on December 22, 2021.

He/ She has delivered a Lecture on _____

Dr. P.A. Pawar, I/c, HOD, Mathematics SGBAU, Amravati
Dr. R . D . Deshmukh, Principal , R.D.I.K & K.D College Badnera.
Dr. Y.B. Gandole, Principal , Adarsha Science , J.B Arts & Birla Commerce Mahavidyalaya, Dhamangaon Rly.
Dr. A . P . Charjan, Principal , Shri. R.G. Rathod Arts & Science College, Murtizapur
Dr. T.R. Deshmukh, Registrar, Sant Gadge Baba Amravati University, Amravati.



On the Occasion of National Mathematics Day-2021

UNIVERSITY LEVEL WORKSHOP
ON
NET/SET GUIDANCE IN MATHEMATICS
22 Dec, 2021

Program Schedule

Sponsored by, Rajiv Gandhi Science & Technology Commission Government of Maharashtra

9:00-10:00 am	Registration , Tea and Breakfast	
	Session – I	
Time	Programme	Chief Guest/Guest of Honours
10:00 – 11:30 am	Inauguration of Workshop	**Chairperson:** Dr. T.R. Deshmukh, Registrar Sant Gadge Baba Amravati University Nagpur. **Chief Guest:** Dr. G.S. Khadekar, Professor, Department of Mathematics RTM **Guest of Honours:** Dr. Pradip Khedkar, Management Council Member SGBAU, Amravati. Dr. S.D. Katore, Former Professor & Head Department Of Mathematics SGBAU. Dr. Y. B. Gandole, Adarsh Science J.B. Arts &Birla Commerce Mahavidyalaya, Dhamangao (Rly.) Dr. R. D. Deshmukh, Principal, R.D.I.K. & K.D. College, Badnera. Dr. A.P. Charjan, Principal, Shri. Dr. R.G. Rathod College Murtizapur. **Convener** Dr. P.A. Pawar, Associate Prof. & In charge Head PGT. Department of Mathematics SGBAU, Amravati.
	Session – II	
Time		Speakers/ Resource Persons
11:30 –12:00 pm	Speaker	1) Dr. G.S. Khadekar, Professor,Department of Mathematics RTM Nagpur.
12:00 -01:30pm		2) Dr. Pravin Sayare, Assist. Professor Institute of Science Nagpur.
1:30- 02:00 pm	Lunch Break	
	Session – III	
2:00-3:30 pm	Speaker	1) Mr. Shoaib Akhtar
3:30-5:30 pm	Speaker	1) Mr. Nilesh Niwalkar 2) Mr. Harshal Pardikar 3) Mr. Akshay Dethe 4) Mr. Dnyaneshwar Rathod
	Session –IV (Valedictory Function)	
	Guest of Honour	
5:30-6:30 pm	Dr. P.A. Pawar, Associate Prof. & In charge Head PGT, Department of Mathematics SGBAU, Amravati.	Dr. S. P. Kandalkar, Head, Department of Mathematics GVISH Amravati.

Vidarbha Youth Welfare Society`s

Bar. Ramrao Deshmukh Arts, Smt. Indiraji Kapadia Commerce &
Nyayamurti Krishnarao Deshmukh Science College, Badnera-Amravati.
Department of Computer Science

And

Pune Academy of Advance Computer Technologies

Keep You Ahead

CERTIFICATE

This is to certify that

Mr./Mrs. Pratiksha S. Khandar

has successfully completed 5 days Short Term Course on

"Web Development"

from 17 Feb. to 25th Feb 2020

Pune Academy of Advance Computer Technologies Amravati

Mr. S. S. Lakde
(Center Co-Ordinator)
(PACT, Amravati)

Prof. S. G. Choudhary
(Convener & Head)
(Department of Computer Science)

Dr. R. D. Deshmukh
(Principal)
(RDIK& NKD College, Badnera- Amravat)

Matoshree Vimalabai Deshmukh Mahavidyalaya
Shivaji Nagar, AMRAVATI - 444 603 (M.S.)
Re-Accredited with 'B' Grade By NAAC
Index No. J-02-01-044 • Pay Unit No.-036 • Udise No. 27071505414
☎ 0721-2660355 (Off.), 2664929 (Fax)
e-mail : clg_amt_mvd@ssesa.org website : www.mvdcollege.org

Outward No. MVDM/.....

Date : 21/03/21

MEMORANDUM OF UNDERSTANDING

THIS MEMORANDUM OF UNDERSTANDING IS MADE ON 21 MARCH 2021 BETWEEN:

1. Shri Shivaji Education Society's, through its Principal (here in referred to as "Matoshree Vimalabai Deshmukh Mahavidyalaya, Amravati which expression shall, unless repugnant to the context, be deemed to include its successors and permitted assigns) of the FIRST PART.
2. Vidharbha Youth welfare Society's R.D.I.K & K.W.College, Badnera through its principal (here in referred to as "RDIK" which expression shall, unless repugnant to the context, be deemed to include its successors and permitted assigns) of the SECOND PART.

NOW IT IS HEREBY AGREE BY AND BETWEEN THE PARTIES HERE TO AS FOLLOWS:

1. This MOU shall commence from the date of execution and shall remain in force for the period of three calendar years from the date of this execution.
2. Upon the expiry of the term this MOU shall, be Renewed for the period of three years on the terms and conditions to as may be naturally agreed.
3. Either party will not pay any amount for the said MOU.
4. Both the parties shall collaborate to provide students and teachers the necessary atmosphere and facilities for the promotion of:

   i. Publication of research works in various disciplines.

   ii. Inter-disciplinary and multi-disciplinary studies.

   iii. Participation and support in various academic and extension activities.

FIELD OF COOPERATION:

Both the institution shall evolve a mutually acceptable schedule to develop programme hold seminar and exchange visits. It also includes

1. Conducting Seminars, Conferences and Workshops.

2. Collaboration and sharing of Academic Data, Scientific Information, Intellectual Property, Articles and Publication.

3. Quiz, Essay, Poetry, Elocution etc. Competition

4. Arranging Guests Lectures.

Dispute, if any, arises relating to execution and implementation of the present MOU, as well as working under present MOU, shall be amicably settled by discussion primarily by the then Principal of Matoshree Vimalabai Deshmukh Mahavidyalaya, Amravati and the then Principal of R.D.I.K & K.D. along with one authorized representative of both the parties. This shall from the grievance committee whose decision shall be final and binding on both the parties.

SIGNED BY THE PRINCIPAL

Dr. R. D. Deshmukh

R.W.I. K & K. W. College,
Badnera

Principal

Matoshree Vimalabai Deshmukh
Mahavidyalaya Amravati

PRINCIPAL
Matoshree Vimalabai Deshmukh
Mahavidyalaya, Amravati.

IN THE PRESENCE OF:

Dr. Shobha Rokade

Head, Department of Marathi
R.W.IK. & K.W. College
Badnera

Dr. Manda M. Nandurkar

Head, Department of Marathi
Matoshree Vimlabai Deshmukh
Mahavidyalaya, Amravati

1. Name of Organising Department : **Department of Marathi**
2. Name of Activity : State level Poet Festival
3. Date of Activity : 23/07/2021

Details of Activity:

Marathi Literature Society, Department of Marathi, Bar. R.D.I.K. & K.D. college, Badnera was arranged Online poetry festival on the theme **"PawusDhara"** (Rain Water) on 23/07/2023 at 2:30p.m.

Dr. R. D. Deshmukh, Principal Bar. R.D.I. K. & K.D. College, Badnera was the chairperson of the festival and Dr.SangeetaArbune (Mumbai) was the chairperson of the poetry presentation.

Raining in Rainy season have important in human lives and for nature. Rain in Literature and poetry has been a vivid symbol to express complex emotion. It symbolizes renewal and cleansing sorrow and joy. It also expresses the emotion of Romanticism. The rain symbolizes regeneration and growth, the full spectrum of life and the heartaches and laughter that nourish us and make us who we are.

Dr.UrmilaChakurkar, Dr.ChhayaVidhale, VrushaliVivek, Sau. VaishaliDande, ChitraKshirsagar, RasikaDeshmukh, Dr.MandaNandurkar were presented their poems on rain and interpreted the importance of rain in their lives.

Dr.ShobhaRokade H.O.D., Marathi Department talk on the theme 'Pawus' and introduced the participated renowned poets. Dr.SangeetaAbuneaddress the poets. The whole programme was conducted by MandaNandurkar.

Associate Professor
Br.R.D.I.K. & K.D.College,Badnera,
Amravati

पाऊसधारा

राज्यस्तरीय काव्य महोत्सव संपन्न

दि. 23 जुले 2021

श्री शिवाजी शिक्षण संस्था अमरावती द्वारा संचालित, मातोश्री विमलाबाई देशमुख महाविद्यालय व आर .डी. आय.. के महाविद्यालय बडनेरा यांच्या संयुक्त विद्यमाने इकश्राव्य प्रणालीद्वारे राज्यस्तरीय पाऊस धारा या काव्य महोत्सवाचे आयोजन करण्यात आले . या काव्य महोत्सवाच्या अध्यक्षस्थानी डॉ उर्मिला चाकूरकर सुप्रसिद्ध कवयित्री या होत्या. प्राचार्य डॉ आर. डी. देशमुख तसेच प्राचार्य डॉ.छाया विधळे उपस्थित होते. या राज्यस्तरीय काव्य महोत्सवात वृषाली विवेक श्रीकांत वैशाली दंडे चित्रा क्षीरसागर रसिका देशमुख, डॉ शोभा रोकडे, डॉ.मंदा नांदुरकर या कवयित्री सहभागी झाल्या होत्या. प्राचार्य डॉ. आर .डी. देशमुख यांनी या राज्यस्तरीय काव्य संमेलनाच्या आयोजनाला शुभेच्छा व्यक्त केल्या. पाऊस आणि मानवी जीवन ही सांगड घालून आपले विचार व्यक्त केले. प्राचार्य डॉ छाया विधळे ,मातोश्री विमलाबाई देशमुख महाविद्यालय यांनी पावसाचे अलवार रूपे रेखाटली त.. पाऊस हा प्रत्येकाला उल्हासित करणारा आहे यावेळी पावसा वरील कविता त्यांनी सादर केली. कवी संमेलनाच्या अध्यक्ष सुप्रसिद्ध कवयित्रीडॉ.

उर्मिला चाकूरकर यांनी पावसाची विविध रूपे उलगडून दाखवली तसेच पावसाची अप्रतिम कविता सादर करुन कविसंमेलनाला शुभेच्छा दिल्या.

पाऊस गंधाचा

पाऊस फुलझडी चा

पाऊस राघेचा

गोकुळीचा गोवळीया

अशा सुंदर शब्दात पावसाची गुंफण पाऊसधारा या काव्य महोत्सवात गोवा येथून सुप्रसिद्ध कवयित्री चित्रा क्षीरसागर यांनी आपली कविता सादर केली.

पाऊस.. कधी धुक्याच्या कुशीत कुंद होऊन हळुवार बरसणारा...

कधी धो..धो.. कोसळणारा..

कधी धारांबरोबर तुडुंब भरून येणारा...

तर कधी ढगांच्या काळोखातून मुक्त बरसणारा..

पाऊस... असाही..

पाऊस.. अलवार.. रिमझिम..

पाऊस...धसमुसळा... धुंवाधार

पाऊस..मुग्ध.. अंतर्मुख...

पाऊस.. चिंतनशील... तत्ववेता..

पाऊस असाही...

पाऊस असाही एक कविता वृषाली विवेक श्रीकांत यांनी सादर केली.

वैशाली दंडे यांनी

कुठेतरी दूरवर

निनादे एकतार

अंतस्थ एक लहर

उदास कुटीर

आतुर चकोर

गतिमान लकेर

हि कविता सादर केली.

कवयित्री रसिका देशमुख यांनी

तुझ्या येण्याची चाहूल

माझे नादात पाऊल

मना रे ही कोणती भूल

रिमझिमत आलेली।।

माझे गंधाळती श्वास

की अतराचे भास

खोलवर भिडते लय

तनुमन लिंपलेली।।

चाहूल कविता सादर केली

सर्व कवयित्रींनी पाऊस धारा या काव्यमहोत्सवात पावसावरील का वी कविता सादर करून पावसाची विविधांगी रूपे उलगडून दाखवली.

पाऊस धारा या इकश्राव्य प्रणालीद्वारे आयोजित राज्यस्तरीय काव्य महोत्सवाचे आयोजन शोभा रोकडे मराठी विभाग प्रमुख आयटीआय के महाविद्यालय बडनेरा तसेच मंदा नांदुरकर मराठी विभाग प्रमुख , राष्ट्रीय सेवा योजना कार्यक्रमअधिकारी, जिल्हा समन्वयक राष्ट्रीय सेवा योजना,मातोश्री विमलाबाई देशमुख महाविद्यालय यांनी केले . या राज्यस्तरीय काव्य महोत्सवाचा आस्वाद विविध महाविद्यालयातील प्राध्यापक वृंद व विद्यार्थ्यांनी घेतला,या काव्य महोत्सवाचे प्रास्ताविक व आभार या राज्यस्तरीय काव्य महोत्सवाच्या आयोजक महाराष्ट्राला परिचित असणाऱ्या कवयित्री डॉ शोभा रोकडे मराठी विभाग प्रमुख आर.डी.आय. के महाविद्यालय बडनेरा यांनी व सूत्रसंचालन डॉ मंदा नांदुरकर मराठी विभाग प्रमुख मातोश्री विमलाबाई देशमुख महाविद्यालय यांनी केले

'पाऊसधारा' राज्यस्तरीय काव्य महोत्सव संपन्न

अमरावती दि. २ : पाऊस धरतीला प्रफुल्लित करणारा... पाऊस म्हणजे प्रत्येक मनाला उल्हासित करणारा.. पावसाच्या रिमझिम सरी प्रत्येकाचे मन सुखावणाऱ्या.... [illegible]

[illegible]

पाऊस गंधाचा
पाऊस फुलझाडी चा
पाऊस रानीचा
गो कुळीचा गोकुळीचा

[illegible]

वैशाली दंडे यांनी
[illegible]

Memorandum Of Understanding(MoU)

Between

Bar. RamraoDeshmukh Arts, Smt. Indiraji Kapadia Commerce and NyaymurtiKrushnaraoDeshmukh Science College, Badnera Amravati.

And

Pune Academy of Advance Computer Technologies(PACT),

Amravati

Sub : Conduction of Continuing Education Program at this Institute.

Ref : Proposal submitted for starting of 30 days Project Guidance Training for the students of Computer Science Department, RDIK College Badnera.

MISSION:

PACT Amravati is company inspired and motivated by innovation and deliverance. We believe in building unique, different and solid products. Our experience and enthusiasm runs deep in our veins and is seen in the polyglot staff.

Purpose of MOU:

- To create Multi-Skilled Technical manpower to satisfy the local requirements
- To strengthen Entrepreneurship Development Activities.
- To promote self employment.

Both agree mutually on the following points :

- **Publicity and Promotion**: PACT Amravati will promote training program & workshops.
- **Faculty** :PACT Amravati will provide highly skilled and experience faculty.

  Venue: The training program shall be conducted at RDIK and NKD College, Badnera
- **Expenses**: PACT Amravati will provide all the necessary software toolkit and printed material required for training.

- **Workshop Fees** : Rs 1500 per student.
- **Workshop Duration** : 2nd March 2022 To 31st May 2022.
- **Software and reference material**:- PACT Amravati will undertake the responsibility of providing the software and reference material to the training program mention into the para.
- **Monitoring** : Coordinator of EDP cell of RDIK and NKD College, Badnera and EDP assistant wll monitor the training programmers by frequently by visiting the training centers.
- Change in training program mentioned in the para 6 can be made mutual understanding with respect to contents, duration and fees, any training programs can be cut and new training program can be introduced as per need of society.
- **Examination**: Separately Certification will be issued for successful candidate by PACT Amravati and College.
- **Validation of MOU** :MOU period will be One year from the date of sign the agreement and renewed and renegotiated at the end of period on demand from either both sides. The agreement is being executed for promotion of mutual goals through co-operation and trust. However in case of any conflicts, the conflicts shall be resolved amicably by sitting across the table or otherwise the agreement stand terminated by the end of month notice from either side.
- The share of M/s. PACT Amravati , will be distributed in 2 installments i.e. First installment will be paid at the start of training after completion of the commencement of course. And Second & final installments at the end of final evaluation of the course will be paid in 7 days from finishing date of respective training.

Date : 22/2/22

Agreed to signed by

Managing Director

(Prashant Narkhede)

PACT Amravati

Agreed to signed by

Principal

Dr. PRINCIPAL Deshmukh
Bar. Ramrao Deshmukh Arts
Smt. Indirai Kendiya Comm.
Nyaymurti Krushnarao Deshmu...
Science College, Badnera- Amravati.

RDIK and NKD College, Badnera-Amravati

Bar. Ramrao Deshmukh Arts, Smt. Indiraji Kapadiya Commerce, &
Nya. Krushnarao Deshmukh Science College, Badnera
Academic Year 2021-22

1.Name of Organizing Department / Committee: Department of Computer Science

2. Name of Activity : M.Sc. Project (under MoU)

3. No. of Participants : Students 15 Teachers 03 Other

4. Details of Activity (In Brief):

The project duration will be from 12/3/2022 to31/5/2022.The training language in ASP.Net and MySQL Server.

Outcome of the Program:

- To understand the navigation control and standard control.
- To develop web application program using ASP.Net.
- To get introduce C# programming and understand ASP.Net.
- Dept knowledge of CLR and .Net Framework.

Name & Contact No. of Expert:

Prashant Narkhede (9552781708)

Pune Academy of Advance Computer Technologies (PACT)

Head
Department Of Computer Science
Bar. R.D. Arts,Smt. I.k.Commerce
& Nay. K.D. Science College
Badnera-Amravati

1. Name of Organising Department	:	**Mathematics**
2. Name of Activity	:	Online University Level EssayCompetition
3. Nature of Activity	:	Co-curricular Activity
4. No. of Participant	:	Students: 199, Teachers: 15
5. Date of Activity	:	Feb. 5-15, 2021

Details of Activity (In Brief):

As per MOU, The Department of Mathematics organized **an** online university-level essay competition for UG and PG students in collaboration with the Department of Mathematics and IQAC, SGB Amravati University, Amravati, Adarsha Science, J.B. Arts & Birla Commerce Mahavidyalaya, Dhamangaon (Rly), and Shri. Dr. R.G. Rathod Arts & Science College, Murtizapur, from **February 5–15, 2021**. **199 students participated in this event.** All winners have been felicitated online by sending certificates and prizes.

The competition is divided into junior and senior divisions. For the essay competition, **161** junior division participants and 38 senior division participants from different Sant Gadge Baba Amravati University, Amravati affiliated colleges participated. Out of the 29 essays in junior division, 27 essays in senior division were selected for the final round.

In this event, Dr. P.P. Khade, Dr. A.P. Wasnik, and Mr.Mahesh Netneskar were subject experts for the evaluation of the essay for the final round of the essay competition. Also, Mr. Dhore, Ms. G.R. Jaju, Ms. R.M. Thakare,Mr. A.B. Khokale, and Ms. V.M. Wankhade worked as subject experts for the evaluation of essays under the guidance of Dr. S.D. Katore, Dr. V.G. Mete, Dr. S.N. Bayaskar, and Dr. A.S. Nimkar. Also, Dr. V.N. Mahalle, Dr. A.N. Rangari, and Mr. A.O. Dhore worked hard for the success of the essay competition.

Outcome of the Programme:

- students will be able to communicate mathematical ideas, reasoning and findings.
- student will be able to use appropriate mathematical language (notation, symbols, terminology) in both oral and written explanations
- use different forms of mathematical representation (formulae, diagrams, tables, charts, graphs and models)
- Students can "think outside the box" or from diverse perspectives by participating in competition.
- Student received certificate of participation.

Name & Contact No. of Expert (if any):

Dr. P.P. Khade, Associate Professor, Vidyabharati Mahavidyalaya,Amravati,
Contact No. 9421829832
Dr. A.P. Wasnik, Associate Professor,Bharatiya Mahavidyalaya,Amravati,
Contact No. 9860011484
Mr.Mahesh Netneskar , Assistant Professor, Bapumiya Science College, Pimpalgaon Kale
Dist. Buldana, Contact No. 9604335210

Dr. V. G. Mete
Professor & Head
Department of Mathematics,
R.D.I.K. & K.D. College, Badnera-Amravati


UNIVERSITY LEVEL ESSAY COMPETITIONS

Organized by

The Department of Mathematics & IQAC,
Sant Gadge Baba Amravati University, Amravati
in Collaboration with
Department of Mathematics,
* R. D. I. K. & K. D. College, Badnera, Amravati.
* Adarsha Science, J. B. Arts & Birla Commerce Mahavidyalaya, Dhamangaon (Rly)
* Shri. Dr. R .G. Rathod Arts and Science College, Murtizapur, Dist,Akola

About Essay Competitions

Knowledge has become the main wealth of nations, society and people. Hence, investing in research, innovation and education is now the key-leverage for competitiveness and prosperity in country. At the heart and foundation of this challenge, mathematics plays a crucial role as it provides a logically coherent framework to society or mathematical community. The role of mathematical sciences in civilization has been of central importance for centuries. The current trend to a global economy and a knowledge society has placed information and innovation technologies , increasingly dependent on scientific research driven by Mathematics. In order to increase the knowledge of the subject of Mathematics as well as to apply the knowledge gained in Mathematics in all fields , it has been decided to organize an essay competition on some of the topics of Mathematics. The Competition is divided into Junior and Senior divisions.

CHIEF PATRON

Dr. M. G. Chandekar
Hon'ble Vice-Chancellor,
SGBAU Amravati

Dr. Rajesh Jaipurkar
Hon'ble Pro-Vice Chancellor,
SGBAU Amravati

PATRON

Dr. S. D. Katore
Prof. & Head
Department of
Mathematics
SGBAU Amravati

Dr. Y. B. Gandole
Principal
Adarsha Science
J.B. Arts & Birla
Commerce Mahavidyalaya,
Dhamangaon Rly.

Dr. R. D. Deshmukh
Principal
R.D.I.K. & K.D. College,
Badnera, Amravati.

Dr. A. P. Charjan
Principal
Shri Dr. R.G. Rathod
Arts & Science College,
Murtizapur, Dist. Akola

Topic

* Mathematics - Base of Human life

* Contribution of Ramanujan in Mathematics
* Role of Mathematics in Sport Field
* Role of Mathematics in Life Sciences
* Role of Mathematics in Technology of 21st Century

Eligibility Criteria

The participant must be enrolled as a student in a graduate /postgraduate /M.Phil / Ph.D from affiliated colleges and Post Graduate Department of Mathematics, SGBAU, Amravati for the session 2020-2021.

Importance Dates:

All Essays should be send to mathsgenius2021@gmail.com and google form up to 15th February 2021

Awards

Junior Division Enrolled in U.G. Level 1000 Words	Senior Division Enrolled in P.G. /M.Phil /Ph.D. Level 1500 Words
• 1st prize- Rs.1501/-	• 1st prize- Rs. 2101/-
• 2nd prize- Rs.1101/-	• 2nd prize- Rs. 1501/-
• 3rd prize Rs. 901/-	• 3rd prize Rs. 1101/-
• Consolation Prizes: Rs. 501/-	• Consolation Prizes: Rs. 701/-

• All Participants Will be Awarded a Certificate of Participation .

Organizing Committee

Dr. V. G. Mete
Professor & Head,
Department of Mathematics,
R.D.I.K. & K.D. College,
Badnera, Amravati.

Dr. S. N. Bayaskar
Assistant Professor & Head,
Department of Mathematics,
Adarsha Science, J. B. Arts & Birla
Commerce Mahavidyalaya,
Dhamangaon (Rly), Dist. Amravati.

Dr. A. S. Nimkar
Assistant Professor & Head,
Department of Mathematics,
Shri. Dr. R .G. Rathod Arts and
Science College,
Murtizapur, Dist, Akola

Dr. V. N. Mahalle
Assistant Professor,
Department of Mathematics,
R.D.I.K. & K.D. College,
Badnera, Amravati.

Dr. A. N. Rangari
Assistant Professor,
Department of Mathematics,
Adarsha Science, J. B. Arts & Birla
Commerce Mahavidyalaya,
Dhamangaon (Rly), Dist. Amravati.

Dr. A. O. Dhore
Assistant Professor,
Department of Mathematics,
Shri. Dr. R .G. Rathod Arts and
Science College,
Murtizapur, Dist,Akola

For Enquiries Contact

8956252244, 9423621627, 9420834291

List of Participants: Junior Division

Sr No	Name of the Students	Class	College/Institute	Contact Number and email
01	Jaykishan Ashok Sardar	B.Sc-III	G.S.College,Khamgaon	7350117115
02	Sakshi Tukaram Bobade	B.Sc-III	Shri.Dr.R.G.Rathod Arts and Science College,Murtizapur	9420384219
03	Shreya Ramrao Gulhane	B.Sc-III	Shri.Dr.R.G.Rathod Arts and Science College,Murtizapur	9322756791 Gulhaneshreya14@gmail.com
04	Reshma Anant Tale	B.Sc-II	Shri.Dr.R.G.Rathod Arts and Science College,Murtizapur	Reshmatale19@gmail.com
05	Shivani Vijay Kakode	B.Sc-II	Shri.Dr.R.G.Rathod Arts and Science College,Murtizapur	Shivanikakode47@gmail.com
06	Saurabh Ramesh Manmode	B.Sc-III	G.S.College ,Khamgaon	8459639407 Saurabhmanmode717@gmail.com
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List of subject Expert For First Round Evaluation of essay

Sr. No.	Name of Teacher	Designation	Name of College
01	Mr.A.O.Dhore	Assistant Professor	Shri.Dr.R.G.Rathod Arts and Science College,Murtizapur
02	Ms.G.R.Jaju	Assistant Professor	Shri.Dr.R.G.Rathod Arts and Science College,Murtizapur
03	Ms.R.M.Thakare	Assistant Professor	Shri.Dr.R.G.Rathod Arts and Science College,Murtizapur
04	Mr.A.B.Khokale	Assistant Professor	Shri.Dr.R.G.Rathod Arts and Science College,Murtizapur
05	Ms.V.M.Wankade	Assistant Professor	Shri.Dr.R.G.Rathod Arts and Science College,Murtizapur

List of Subject Expert for Final Evaluation

Sr. No.	Name of Teacher	Designation	Name of College
01	Dr.P.P.Khade	Assistant Professor and Head	Vidya Bharti Mahavidyalaya, Amravati
02	Dr.A.P.Wasnik	Assistant Professor	Bhartiya Mahavidyalaya,Amravati
03	Mr.Mahesh Netneskar	Assistant Professor and Head	Bapumiya Sirojaddin Patel Arts,Commerce and Science college.Pimpalgaon Kale Ta Jalgaon Jamod Dist Buldhana

List of Winner Participants: Junior Division

Sr. No.	Name of Participant	College	Rank
01	Ku.Dipti B.Wasnik	Nehru Mahavidyalaya,Ner (P)	I
02	Mr.Bhushan D Deulkar	Indira Gandhi Kala Mahavidyalaya, Ralegaon Kale	II
03	Ku.Jidnyasa A Bartiya	B.S.Patel Arts c,Commerce and Science College,Pimpalgaon Kale	III
04	Ku.Avantika A Suryawanshi	Pulsing Naik College,Pusad	IV
05	Ku.Sakshi N Dicke	RDIK & KD College,Badnera	V

List of Winner Participants: Senior Division

Sr. No.	Name of Participant	College	Rank
01	Ku.Minakshi B Muwal	PGTD,Sant Gadge Baba Amravati University,Amravati	I
02	Ku.Maitreyee K.Pathak	Adarsha Science, J.B. Arts & Birla Commerce Mahavidyalaya, Dhamangaon (Rly)	II
03	Ku.Rohini M.Wankhade	RLT College of science,Akola	III
04	Mr.Atharva D.Saraf	Narsama Hirayya Arts Commerce and Science College,Amravati	IV
05	Ku.Ankita Satinge	Shri Dr.R.G.Rathod Arts and Science College ,Murtizapur	V

Cash Prizes

Prizes	Junior Division Amount (Rs.)	Senior Division Amount (Rs.)
First Prize	1501	2101
Second Prize	1101	1501
Third Prize	901	1101
Consolation Prize	501	701
Total Amount	4004	5404

Place:-Murtizapur
Date :-28/02/2021

Dr.A.S.Nimkar
In-Charge Essay Competition

1. Name of Organising Department	:	**Mathematics**
2. Name of Activity	:	Workshop on NET/SET Guidance in Mathematical Sciences
3. Place of Activity	:	AV Theatre, SGBAU,Amravati
4. No. of Participant	:	Students: 180, Teachers: 2Resource persons: 13
5. Date of Activity	:	22nd December,2020

Details of Activity (In Brief):

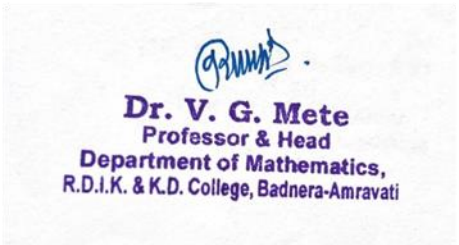
As per MOU, on the occasion of 'National Mathematics Day' one day workshop on NET/SET guidance in mathematical sciences was organized on **22nd Dec., 2020** in collaboration with department of mathematics, Sant Gadge Baba Amravati University, Amravati, Adarsha Mahavidyalaya, Dhamangaon Rly.and Shri. Dr. R.G.RathodArtsandScienceCollege,Murtizapur. About **180** members including Faculty members and Research Scholars, PG students from various colleges participated in the workshop. KeyNoteaddresswasgivenbyDr. G.S.Khadekar , DeanScienceandTechnology, RTM ,NagpurUniversity,Nagpur.Inthisworkshop, the resource persons guidedthestudentsbygivingvariousexamplesandtricks. This programe was carried out in three sessions.

Outcome of the Programme:

- This workshop will help the students to make them ready to face the challenging questions, thereby crack the examination.
- Participants got motivated to clear the CSIR-UGC NET / SET Exams.
- Studentsare motivated to organize such type of useful workshops in future.

Name & Contact No. of Expert (if any):

Dr. J.N.Choudhari, Professor, M.J.Mahavidyalaya, K.B.C.N.M.U.,Jalgaon,
Contact No. 9404490800
Dr. S.R.Choudhari , Director , School of Mathematical Sciences, K.B.C.N.M.U., Jalgaon,
Contact No. 9420129704
Dr. Kunal Ingale,Associate Professor, M.J.College, Jalgaon, Contact No. 9960779422
Dr. U.S.Thool, Professor, Department of Mathematics, Institute of Science, Nagpur
Contact No. 9422835707



Vidarbha Youth Welfare Society's
Bar.Ramrao Deshmukh Arts, Smt. Indiraji Kapadia Commerce &
Nya. Krishnarao Deshmukh Science College,Badnera-Amravati (Maharashtra) 444 701
(Re-accredited by NAAC with B++ grade)
Ph. 0721-2681232, FAX : 0721- 2681232,
email : rdik128@sgbau.ac.in, website : www.rdikandnkd.org

Dr. N.R. Dhande, President | Adv. U.S. Deshmukh, Vice President | Prof. (Dr.) H.M. Deshmukh, Treasurer | Mr. Y.V. Choudhary, Secretary | Dr. R.D. Deshmukh, Principal

Ref.No. RDIKND/2020-21 Date : 15 / 12 /2020

To,
The Head,
P.G. Department of Mathematics,
Sant Gadge Baba Amravati University, Amravati

Subject: Organization of workshop on "NET/SET guidance for P.G. mathematics students and Quiz competition.

It gives me an immense pleasure that your department is esteemed in the university with all facilities; you always organized various activities in the interest of people of mathematics.

Therefore you are requested to organize one day workshop on "**NET/SET guidance** for P.G. mathematics students" and Quiz competition on **22nd December, 2020** on the eve of Ramanujan birth anniversary in collaboration with our institute, we are ready to provide financial help and co-operation.

We anticipate your valuable co-operation and help.

Thanking You

Sincerely Yours,

PRINCIPAL
Bar. Ramrao Deshmukh Arts
Smt. Indiraji Kapadiya Commerce
Nyaymurti Krushnarao Deshmukh
Science College, Badnera.

University Level Workshop on NET/SET Guidance in Mathematics

Organized by

Department of Mathematics,
Sant Gadge Baba Amravati University, Amravati
in Collaboration with

- R. D. I. K. and KD College, Badnera.
- Adarsh Science, J. B. Arts and Birla Commerce Mahavidyalaya, Dhamangaon Rly.
- Dr. R. G. Rathod Arts & Science College, Murtizapur Dist. Akola.

22nd December, 2020

About Workshop

December 22, the birth anniversary of India's famous mathematician Srinivasa Ramanujan, is celebrated as National Mathematics Day. Srinivasa Ramanujan was born in 22 December 1887 in Erode, Tamil Nadu. At age 12, despite lacking a formal education, he had excelled at trigonometry and developed many theorems by himself. Srinivasa Ramanujan is a name to reckon among pioneers in Mathematics. Srinivasa Ramanujan became a Fellow of the prestigious Royal Society in 1918. Though he passed away aged just 32, his talent and research left an indelible mark on Mathematics. The loss of Ramanujan at such a young age was certainly a blow to the scientific community.

So to develop Mathematical and Analytical temperament, Problem solving skills and positive attitude towards learning the Mathematics among the students our University has started a program of National Mathematics Day from 2012 for the Development of Mathematical culture in our region. To prepare the students for competitive examinations such as NET and SET this workshop has been organised. The organisation of this workshop has been a regular activity on National Mathematics Day since last 5 years by Department of Mathematics Sant Gadge Baba Amravati University, Amravati in collaboration with various colleges. During the National Mathematics Day celebration we are organising web National Conference, National workshop as well as Essay competition and Quiz competition for P.G. Mathematics students of various colleges of Sant Gadge Baba Amravati University, Amravati.

Registration :

Link : https://forms.gle/TpfED91QoAeGCHBa6

For Students You Tube Link https://youtu.be/EDTmggzVLxE

ORGANIZING COMMITEE

Dr. V. G. Mete, RDIK & KD College Badnera.
Dr. S. N. Bayaskar, Adarsh Mahavidyalaya, Dhamangaon Rly.
Dr. A. S. Nimakar, Dr. R. G. Rathod Arts & Science College, Murizapur
Dr. V. N. Mahalle, RDIK & KD College Badnera.
Dr. A. N. Rangari, Adarsh Mahavidyalaya, Dhamangaon Rly.
Mr. A. O. Dhore, Dr. R. G. Rathod Arts & Science College, Murizapur

Workshop Scheduled

Time	Event	Speaker
11.00 to 12.00 noon	Inauguration of WorkShop	-
12.00 to 01.00 pm	First Session	Dr. S. R. Chaudhari
01.00 to 02.00 pm	Second Session	Dr. J. N. Chaudhari
	Break	
2.30 to 3.30 pm	Third Session	Dr. Kunal Ingle
3.30 to 4.30 pm	Fourth Session	Dr. Uday Thul
4.30 to 5.30 pm	Valedictory	-

CHIEF PATRON

Dr. M. G. Chandekar
Vice-Chancellor
SGBAUAmravati

Dr. Rajesh Jaipurkar
Pro-Vice Chancellor
SGBAUAmravati

PATRONS

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Dr. Y. B. Gandole
Principal, Adarsh College
Dhamangaon Rly

Dr. R. D. Deshmukh
Principal,
RDIK College, Badnera

Dr. A. P. Charjan
Principal, Dr. R. G. Rathod
College, Murtizapur

Speaker / Resource Person

Dr. J. N. Chaudhari
Professor & Head,
Department of Mathematics,
M. J. Mahavidyalaya,
N.M.U., Jalgaon

Dr. U. S. Thool
Professor
Deptt. of Mathematics
Institute of Science, Nagpur

Prof. S. R. Chaudhari
Director, School of
Mathematical Sciences,
K.B.C.N.M.U., Jalgaon

Dr. Kunal Ingle
Department
of Mathematics
M. J. College, Jalgaon

Contact: 9423621627, 9403116400, 8956252244, 9420834291

1. Name of Organising Department	:	**Mathematics**
2. Name of Activity	:	University Level Quiz Competition on Mathematics
3. Place of Activity	:	Online
4. No. of Participant	:	Students: 282 , Teachers: 12
5. Date of Activity	:	22nd Feb.,2021

Details of Activity (In Brief):

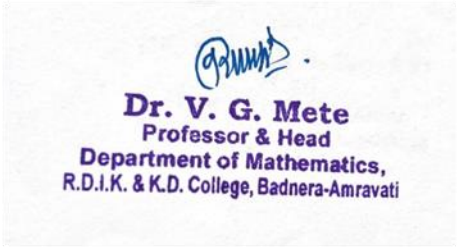
To improve the reasoning and logical thinking as well as the confidence of our students, we analyze how well one understands a subject and correlate the theoretical knowledge with its practical application in real life. To encourage the students, as per MOU, university-level quiz competition on mathematics was organized on February 22, 2021, by the Department of Mathematics in collaboration with the Department of Mathematics and IQAC, SGB Amravati University, Amravati, Adarsha Science, J.B. Arts, Birla Commerce Mahavidyalaya, Dhamangaon (Rly.), and Shri. Dr. R.G. Rathod Arts and Science College, Murtizapur.

This quiz competition was organized for UG and PG students of the Department of Mathematics of all affiliated colleges and postgraduate departments of Mathematics at Sant Gadge Baba Amravati University, Amravati. **282 students from various affiliated colleges participated in the quiz competition.**

All winner participants have felicitated by giving an e-certificate and giving cash prizes of Rs. 1500, Rs. 1100, and Rs. 700 for the first, second, and third winners, respectively.

Outcome of the Programme:

- Quizzes are intended to encourage fun learning methods while also enhancing general knowledge.
- Students can "think outside the box" or from diverse perspectives by participating in quiz competition.
- quizzes build student's general knowledge and also boost their confidence.
- To motivate the students to participate in the inter-collegiate level competitions.
- Student received E-certificate of participation.




UNIVERSITY LEVEL QUIZ COMPETITION ON MATHEMATICS

Organized by

Department of Mathematics & IQAC
Sant Gadge Baba Amravati University, Amravati
in Collaboration with
Department of Mathematics

- **R. D. I. K. and K.D. College, Badnera Amravati.**
- **Adarsh Science, J. B. Arts and Birla Commerce Mahavidyalaya, Dhamangaon Rly.**
- **Dr. R. G. Rathod Arts & Science College, Murtizapur Dist. Akola.**

22nd February, 2021

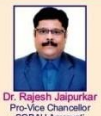
ABOUT QUIZ COMPETITION

As we know that Mathematics is all about learning numbers and concepts with fun and enjoyment. "Mathematics as an expression of the human mind reflects the active will the contemplative reason and desire for aesthetic perfection". To inculcate the value of facing challenges and expressing their understanding of calculations and equations, a Mathematics Quiz competition is organized for UG and PG students of Department of Mathematics of Sant Gadge Baba Amravati University, Amravati on the eve of 133th Birth Anniversary of India's famous mathematician Srinivasa Ramanujan.

As we all know mathematics improves the reasoning and logical thinking of our students. Through this activity we want to give our students the confidence and ease with age appropriate mathematical operations. Quiz competition is a great way of analyzing how well one understands a subject and correlates the theoretical knowledge with its practical application in real life. It encourages students to stretch their knowledge horizons and look beyond what they are taught in class. Mathematics quiz is an excellent way of finding how well the students understand its concepts, and use them in their regular life. To promote and encourage a fun way of learning among students.

CHIEF PATRON

Dr. M. G. Chandekar
Vice-Chancellor
SGBAU Amravati



Dr. Rajesh Jaipurkar
Pro-Vice Chancellor
SGBAU Amravati

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Principal,
R.D.I.K. & K. D. College,
Badnera, Amravati.

Dr. A. P. Charjan
Principal,
Dr. R. G. Rathod
Arts & Science College,
Murtizapur, Dist. Akola

PATTERN OF QUIZ COMPETITION

1) The quiz will be taken by Google form whose link will be providing on 22nd February, 2021 before 1 hour of quiz.
2) The quiz will contain 50 (10+5+35) Multiple Choice questions.
3) Students will require to solve all 50 questions
4) 10 questions will be on General mathematical aptitude.
5) 5 questions will be on Life of famous mathematicians.
6) Remaining 35 questions will be on Basic concepts in Mathematics.
7) Each question will carry Two Marks.
8) Time for solving quiz will be 1:30 Hour.
9) There will be no Negative marking for wrong answers.
10) Quiz will start at 12:30 pm. Sharp and closed at 2:00 pm. Sharp on 22nd February, 2021.

ELIGIBILITY CRITERIA

The participants must be enrolled as a student in a Graduate / Postgraduate from affiliated colleges and post Graduate Department of Mathematics, SGBAU, Amravati for the session 2020-2021.

AWARDS

1st Prize Rs.1500 /-
2nd Prize Rs. 1100 /-
3rd Prize Rs. 700 /-

All Participants will be Participation.

REGISTRATION

Students who are interested to participate in quiz competition should confirm their registration by filling online registration form on the following link on or before 21 February, 2021.

Registration is free

Link for Registration
https://docs.google.com/forms/d/e/1FAIpQLScVy27fvkKOlgB09kgh036KfHB5FGZOKsrQPsX6cq6OMHp6RA/viewform?usp=sf_link

Whatsapp Group Link:- For Technical Help and Quick communication join the Whatsapp group by the Link

ORGANIZING COMMITTEE

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Dr. A. O. Dhore
Assistant Professor
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Dist. Akola

ENQUIRIES CONTACT

9403116400, 9423621627, 9420834291

Bianchi Type-VIII Universe with Scalar and Electromagnetic Field in Theory of Gravity with Deceleration Parameter

K.R.Mule[1],V.G.Mete[2] , V.S.Bawane[3]
1Department of Mathematics, S.D.M.B.Science& Arts College,Shegaon, Dist.Buldana.
2Department of Mathematics, R.D.I.K. & K.D. College, Badnera-Amravati ,India.
3Department of Mathematics, Mahatma FuleMahavidyalaya, Warud.Dist. Amravati.

Abstract:

This paper deals with the study of scalar and electromagnetic field in Bianchi type-VIII space time by considering the case of .We consider the modified theory of gravity, where the Lagrangian is given by an arbitrary function of the Ricci scalar and of the trace of the stress-energy .Some physicalparameters are also analyzed.

Keyword:Bianchi Type-VIII, electromagnetic field, theory of gravity, isotropy , constant vector potential.

1. Introduction

In recent years, modified gravity theories have gained serious attention for their capabilities in describing the observed accelerated expansion of the present day universe. The important modified theories of gravity which are drawing attention during the last decade,are [Carollet .al (2004)]and theory of gravity[Harko et .al (2011)].

In the modified theory of gravity, now a days there has a lot of interest of cosmologists in the view of the direct evidence of late time accelerated the expansion of the universe which comes from high redshift supernova experiment[Riesset.al,(2004)].One is negative pressure known as dark energy (DE) which induces a late-time accelerating cosmic expansion. The other one is the modified gravity, which originates from the idea that the general relativity is inadequate in the cosmic scale and therefore needs to be modified.

In order to explain the nature of the DE and accelerated expansion, a variety of theoretical models have been proposed in the literature. In our opinion, one of theinteresting and prospective version of modified gravity theories is the gravity proposed by Harkoet. al.,(2010,2011). In theory of gravity, cosmic acceleration may result not only due to geometrical contribution to the total cosmic energy density but it also depends on matter contents.The interesting feature of this theory is that it may explain the current acceleration without involving dark energy. Many authors have investigated different problems within the scope of theory. The exact solutions of field equations for locally rotationally symmetric Bianchi type-I cosmological model discussed by Adhav,(2012),Samanta, (2013) has studied the universe filled with dark energy from a wet dark fluid in theory of gravity.Bijan Saha,(2015) explored the interacting scalar and electromagnetic fields in Bianchi type-I universe. Solanke and Karade, (2016) have studied plane symmetric universe filled with a combination of a perfect fluid and scalar field with electromagnetic fields in .

The Magnetic field plays a vital role in the description of energy distribution in the universe as it contains highly ionized matter. Strong magnetic fields can be created due to adiabatic compression in a cluster of galaxies. The presence of magnetic fields in galactic and intergalactic spaces is evident from recent observations by Grasso and Rubinstein (2001). The large scale magnetic field can be detected by observing their effects on the cosmic microwave background (CMB) radiation. These fields would enhance anisotropies in the CMBsince the expansion rate will be different depending on the direction of field lines by Madson(1989).
Melvin, (1975)in his cosmological solution for dust and electromagnetic field, has suggested that the presence of magnetic field is not unrealistic as it appears to be because, during the evolution of the universe, matter was in highly ionized state, smoothly coupled with the field subsequently form neutral matter due to universe expansion.Tikekar and Patel (1992) have obtained some Binchi-III type cosmologicalsolution of massive string in presence of a magnetic field.Sharma et.al (2014) have investigated Bianchi Type-IIstring cosmological model in presence of a magnetic field in the context of theory of gravity.Sarita Rani et.al (2014) have investigated Bianchi Type-III magnetized string cosmological model for perfect fluid distribution in gravity.
Mete and Mule (2017) have investigatedBianchi-VI0 magnetized cosmological model in gravity.

2. The Metric and Field Equations

We consider the Bianchi type- VIII universe specified in the form

$$ds^2 = dt^2 - A^2dx^2 - [A^2\cosh^2 x + B^2\sinh^2 x]dy^2 - B^2dz^2 - 2B^2\sinh xdydz \text{ ,(2.1)}$$

where A and B are functions of time t.

The field equation of $f(R,T)$, theory (Harko *et.al*, 2011) are deduced by varying the action

$$S = \int f(R,T)\sqrt{-g}d^4x + \int L_m\sqrt{-g}d^4x, \qquad (2.2)$$

where $f(R,T)$is an arbitrary function of Ricci scalar R ,T is a the trace of the stress energy matter and L_m is the matter of Lagrangian

$$T_{ij} = L_m g_{ij} - 2\frac{\partial L_m}{\partial g^{ij}} \qquad (2.3)$$

Varying the action (2.2) with respect to g^{ij} which yields as

$$\delta = \frac{1}{2x}\int\left\{f_R(R,T)\frac{\partial R}{\partial g^{ij}} + f_T(R,T)\frac{\partial T}{\partial g^{ij}} + \frac{f(R,T)}{\sqrt{-g}}\frac{\partial\sqrt{-g}}{\partial g^{ij}} + \frac{2\chi}{\sqrt{-g}}\frac{\partial\left(L_m\sqrt{-g}\right)}{\delta g^{ij}}\right\}\sqrt{-g}d^4x \quad , \quad (2.4)$$

Here ,we obtain

$$\theta_{ij} = g^{\alpha\beta}\frac{\partial T_{\alpha\beta}}{\partial g^{ij}} \qquad (2.5)$$

where $f_R(R,T) = \frac{\partial f(R)}{\partial R}$, $f_T(R,T) = \frac{\partial f(R)}{\partial T}$ and ∇_i is the covariant derivative.

Defining the generalizedkroneker symbol $\frac{\delta g^{\alpha\beta}}{\delta g^{ij}} = \delta_i^\alpha\delta_j^\beta$

We can deduced $\frac{\delta g^{\alpha\beta}}{\delta g^{ij}}T_{\alpha\beta} = T_{ij}$

Using above equation we can write

$$\frac{\delta T}{\delta g^{ij}} = \frac{\delta(g^{\alpha\beta}T_{\alpha\beta})}{\delta g^{ij}} = \frac{\delta(g^{\alpha\beta})}{\delta g^{ij}}T_{\alpha\beta} + \frac{\delta(T_{\alpha\beta})g^{\alpha\beta}}{\delta g^{ij}} = T_{ij} + \theta_{ij}$$

Considering $\delta S = 0$ from equation (2.3) upon integration we obtain

$$f_R(R,T)R_{ij} - \frac{1}{2}f(R,T)g_{ij} + \left(g_{ij}\Box - \nabla_i\nabla_j\right)f_R(R,T) = \chi T_{ij} - f_T(R,T)\left[T_{ij} + \theta_{ij}\right], \text{(2.6)}$$

Taking trace of equation (2.6), we get

$$\Box f_R(R,T) = \frac{2}{3}f(R,T) - \frac{1}{3}f_R(R,T)R + \frac{1}{3}\chi T - \frac{1}{3}f_R(R,T)[T+\theta]. \qquad (2.7)$$

We consider the case $f(R,T)$ given by

$$f(R,T) = R + \lambda T.$$

In this case, we have

$$f_R(R,T) = \frac{\partial f(R,T)}{\partial R} = 1 \text{ and } f_T(R,T) = \frac{\partial f(R,T)}{\partial T} = \lambda (\qquad (2.8)$$

Hence equation (2.6), leads to

$$R_{ij}-\frac{1}{2}f(R+\lambda T)g_{ij}=\chi T_{ij}-\lambda\left[T_{ij}+\theta_{ij}\right]. \quad (2.9a)$$

From equations (2.8) and (2.7), we get

$$R+\lambda T=\lambda\theta-\chi T. \quad (2.9b)$$

Using equations (2.9a) and (2.9b), we obtain the field equation as

$$R_j^i=\chi\left[T_j^i-\frac{1}{2}Tg_j^i\right]-\lambda\left[T_j^i+\theta_j^i\right]+\frac{1}{2}\lambda\theta g_j^i, \quad (2.10)$$

Let us now calculate Tensor θ_{ij} .Varying the equation (2.3) with respect to metric tensor g^{ij} and using the definition (2.5), we obtain

$$\theta_{ij}=-T_{ij}+2\left[\frac{\partial L_m}{\partial g^{ij}}-g^{\alpha\beta}\frac{\partial^2 L_m}{\partial g^{ij}\partial g^{\alpha\beta}}-\frac{\partial L_m}{\partial g^{ij}}\right]. \quad (2.11)$$

3. Matter Field Lagrangian:

The electromagnetic field tensor is given by

$$F_{ij}=\frac{\partial A_i}{\partial x^j}-\frac{\partial A_j}{\partial x^i}. \quad (3.1)$$

Where A_i is ectromagnetic four potential.

$$\text{Let } L_m=\left[\frac{1}{4\pi}F_{ij}F^{ij}-\frac{1}{2}\phi_{,i}\phi^{,i}\varphi\right], \quad (3.2)$$

where $\varphi=\varphi(I)$

The matter tensor in (2.3) canconvenientlyexpressed in mixed tensor form as

$$T_i^j=\left[F_\alpha^i F_j^\alpha+\frac{1}{4}g_j^i F_{\alpha\beta}F^{\alpha\beta}\right]-\left[\frac{1}{2}\varphi g_j^i-\dot{\varphi}A^i A_j\right]\phi_{,\eta}\phi^{,n}+\varphi\phi^{,i}\phi_{,j}. \quad (3.3)$$

Similarly equation (2.11), can be written as

$$\theta_i^j=-T_i^j-(\varphi I\dot{\varphi})\phi^{,i}\phi_{,j}+I\dot{\varphi}\phi_{,n}\phi^{,n}A^i A_j \quad (3.4)$$

The equations(3.3) and (3.4), after contraction yield

$$T=-(\varphi-I\dot{\varphi})\phi_{,n}\phi^{,n} \quad (3.5)$$

$$\theta=I^2\ddot{\varphi}\phi_{,n}\phi^{,n} \quad (3.6)$$

4.Electromagnetic field tensor:

We assume electromagnetic vector potential in the form

$$A_i=\left[u(x)v_1(t),\ v_2(t),\ v_3(t),\ v_4(t)\right] \quad (4.1)$$

From equations (3.1) and (4.1), yields

$$F_{14}=u\dot{v}_1, F_{24}=\dot{v}_2,\ F_{34}=\dot{v}_3, \quad (4.2)$$

$$F^{14}=F_4^1=\frac{-u\dot{v}_1}{A^2}, F^{24}=F_4^2=\frac{-\dot{v}_2}{A^2\cosh x^2}+\frac{\sinh x}{A^2\cosh x^2}\dot{v}_3, \quad (4.3)$$

$$F^{34}=F_4^3=\frac{\sinh x}{A^2\cosh x^2}\dot{v}_2-\left(\frac{1}{B^2}+\frac{\tanh^2 x}{A^2}\dot{v}_3\right), \quad (4.4)$$

From equations (4.2) and (4.3), we write

$$F_{ij}F^{ij}=-2\left[\frac{u^2\dot{v}_1^2}{A^2}+\frac{\dot{v}_2^2}{A\cosh^2 x}-2\frac{\sinh x}{A^2\cosh^2 x}\dot{v}_2\dot{v}_3+\left(\frac{1}{B^2}+\frac{\tanh^2 x}{A^2}\right)\dot{v}_3^2\right]. \quad (4.5)$$

$$\phi^{,i}\phi_{,j}=\dot{\phi}^2 \quad (4.6)$$

From equation (3.3), we deduced the nonzero components of the energy momentum tensor of material fields.

$$T_1^1 = \frac{1}{2}\frac{u^2\dot{v}_1^2}{A^2} - \frac{1}{2}\frac{\dot{v}_2^2}{A\cosh^2 x} - \frac{1}{2}\left(\frac{1}{B^2} + \frac{\tanh^2 x}{A^2}\right)\dot{v}_3^2 + \frac{\sinh x}{A^2\cosh x^2}\dot{v}_2\dot{v}_3 - \frac{1}{2}\varphi\dot{\phi}^2 - \dot{\varphi}\dot{\phi}^2\frac{u^2 v_1^2}{A^2} \quad (4.7a)$$

$$T_2^1 = \frac{u\dot{v}_1\dot{v}_2}{A^2} - \dot{\varphi}\dot{\phi}^2\frac{uv_1v_2}{A^2}, \quad (4.7b)$$

$$T_3^1 = \frac{u\dot{v}_1\dot{v}_3}{A^2} - \dot{\varphi}\dot{\phi}^2\frac{uv_1v_3}{A^2}, \quad (4.7c)$$

$$T_2^2 = -\frac{1}{2}\frac{u^2\dot{v}_1^2}{A^2} + \frac{1}{2}\frac{\dot{v}_2^2}{A\cosh^2 x} - \frac{1}{2}\left(\frac{1}{B^2} + \frac{\tanh^2 x}{A^2}\right)\dot{v}_3^2 - \frac{1}{2}\varphi\dot{\phi}^2 - \dot{\varphi}\dot{\phi}^2\left[\frac{v_2^2}{A^2\cosh^2 x} - \frac{\sinh x}{A^2\cosh x^2}v_2v_3\right] \quad (4.7d)$$

$$T_3^2 = \frac{\dot{v}_2\dot{v}_3}{A^2\cosh^2 x} - \frac{\sinh x}{A^2\cosh^2}\dot{v}_3^2 - \dot{\varphi}\dot{\phi}^2\left[\frac{v_2v_3}{A^2\cosh^2 x} - \frac{\sinh x}{A^2\cosh x^2}v_3^2\right] \quad (4.7e)$$

$$T_3^3 = -\frac{1}{2}\frac{u^2\dot{v}_1^2}{A^2} - \frac{1}{2}\frac{\dot{v}_2^2}{A\cosh^2 x} + \frac{1}{2}\left(\frac{1}{B^2} + \frac{\tanh^2 x}{A^2}\right)\dot{v}_3^2 - \frac{1}{2}\varphi\dot{\phi}^2 - \dot{\varphi}\dot{\phi}^2\left[\frac{\sinh x}{A^2\cosh^2 x}v_2v_3 - \left(\frac{1}{B^2} + \frac{\tanh^2 x}{A^2}\right)v_3^2\right] \quad (4.7f)$$

$$T_4^4 = \frac{1}{2}\frac{u^2\dot{v}_1^2}{A^2} + \frac{1}{2}\frac{\dot{v}_2^2}{A\cosh^2 x} + \frac{1}{2}\left(\frac{1}{B^2} + \frac{\tanh^2 x}{A^2}\right)\dot{v}_3^2 - \frac{\sinh x}{A\cosh^2 x}\dot{v}_2\dot{v}_3 + \frac{1}{2}\varphi\dot{\phi}^2 + \frac{1}{2}\dot{\varphi}\dot{\phi}^2 + \dot{\varphi}\dot{\phi}^2 v_4^2 \quad (4.7g)$$

$$T = g^{ij}t_{ij} = -(\varphi - 1\dot{\varphi})\dot{\phi}^2 \quad (4.7h)$$

From equation (3.3), we can deduced the tensor θ_i^j as

$$\theta_1^1 = -T_1^1 - I\dot{\varphi}^2\dot{\phi}^2\frac{u^2v_1^2}{A^2} \quad (4.8a)$$

$$\theta_2^1 = -T_2^1 - I\dot{\varphi}^2\dot{\phi}^2\frac{uv_1v_2}{A^2} \quad (4.8b)$$

$$\theta_3^1 = -T_3^1 - I\ddot{\varphi}^2\dot{\phi}^2\frac{uv_1v_3}{A^2} \quad (4.8c)$$

$$\theta_2^2 = -T_2^2 - I\ddot{\varphi}^2\dot{\phi}^2\left[\frac{v_2^2}{A^2\cosh^2 x} - \frac{\sinh x}{A^2\cosh^2 x}v_2v_3\right] \quad (4.8d)$$

$$\theta_3^2 = -T_3^2 - I\ddot{\varphi}^2\dot{\phi}^2\left[\frac{v_2v_3}{A^2\cosh^2 x} - \frac{\sinh x}{A^2\cosh^2 x}v_3^2\right] \quad (4.8e)$$

$$\theta_3^3 = -T_3^3 - I\ddot{\varphi}^2\dot{\phi}^2\left[\left(\frac{1}{B^2} + \frac{\tanh^2 x}{A^2}\right)v_3^2 - \frac{\sinh x}{A^2\cosh^2 x}v_2v_3\right] \quad (4.8f)$$

$$\theta_4^4 = -T_4^4 - (\varphi - I\dot{\varphi})\dot{\varphi} + I\ddot{\varphi}^2\dot{\phi}^2 v_4^2 \quad (4.8g)$$

$$\theta = g^{ij}\theta_{ij} = I^2\ddot{\varphi}^2\dot{\phi}^2 \quad (4.8h)$$

Following Bijan Saha(2015) variation of Lagrangian L_m with respect to electromagnetic field gives

$$\frac{1}{\sqrt{-g}}\frac{\partial}{\partial x^j}\left(\sqrt{-g}F^{ij}\right)-\left(\phi^{,i}\phi_{,j}\right)\dot{\varphi}A^i=0, \quad (4.9)$$

$$\left(\frac{\dot{v}_1}{v_1}\right)^{\bullet}+\frac{\dot{v}_1^2}{v_1^2}+\frac{\dot{v}_1}{v_1}\left[\frac{\dot{B}}{B}\right]=\dot{\varphi}\dot{\phi}^2, \quad (4.9a)$$

$$\left(\frac{\dot{v}_2}{v_2}\right)^{\bullet}+\frac{\dot{v}_2^2}{v_2^2}+\frac{\dot{v}_2}{v_2}\left[\frac{\dot{B}}{B}\right]=\dot{\varphi}\dot{\phi}^2, \quad (4.9b)$$

$$\left(\frac{\dot{v}_3}{v_3}\right)^{\bullet}+\frac{\dot{v}_3^2}{v_3^2}+\frac{\dot{v}_3}{v_3}\left[2\frac{\dot{A}}{A}-\frac{\dot{B}}{B}\right]=\dot{\varphi}\dot{\phi}^2, \quad (4.9c)$$

$$u=c_1\sec hx, \quad (4.9d)$$

where c_1 is constant of integration.

Consider the components of Ricci tensor R_2^1, R_3^1, R_3^2 in the filed equation (2.10), we can deduce

$$\frac{\dot{v}_1\dot{v}_2}{v_1v_2}=\dot{\varphi}\dot{\phi}^2-\frac{\lambda}{\chi}I\ddot{\varphi}\phi^2 \quad (4.10a)$$

$$\frac{\dot{v}_1\dot{v}_3}{v_1v_3}=\dot{\varphi}\dot{\phi}^2-\frac{\lambda}{\chi}I\ddot{\varphi}\phi^2 \quad (4.10b)$$

$$\frac{\dot{v}_2\dot{v}_3}{v_2v_3}=\dot{\varphi}\dot{\phi}^2-\frac{\lambda}{\chi}I\ddot{\varphi}\phi^2 \quad (4.10c)$$

From equations(4.10a,b,c), we can write

$$\frac{\dot{v}_1\dot{v}_2}{v_1v_2}=\frac{\dot{v}_1\dot{v}_3}{v_1v_3}=\frac{\dot{v}_2\dot{v}_3}{v_2v_3}=\dot{\varphi}\dot{\phi}^2-\frac{\lambda}{\chi}I\ddot{\varphi}\phi^2 \quad (4.11)$$

$$\frac{\dot{v}_1}{v_1}=\frac{\dot{v}_2}{v_2}=\frac{\dot{v}_3}{v_3}=\frac{\dot{h}}{h}, \quad (4.12)$$

where h is some function of t

From equations(4.12) and (4.11), we get

$$\left(\frac{\dot{h}}{h}\right)^2=\left(\frac{\dot{h}}{h}\right)^2=\left(\frac{\dot{h}}{h}\right)^2=\dot{\varphi}\dot{\phi}^2-\frac{\lambda}{\chi}I\ddot{\varphi}\phi^2 \quad (4.13)$$

Integrating equations (4.12),we get

$$v_1=c_2h,\ v_2=c_3h,\ v_3=c_4h. \quad (4.14)$$

Where c_2 c_3 c_4 are constant of integration

Consider the expression and using equation (4.13), yields

$$\frac{u^2\dot{v}_1^2}{A^2}+\frac{\dot{v}_2^2}{A\cosh^2x}+\left(\frac{1}{B^2}+\frac{\tanh^2x}{A^2}\right)\dot{v}_3^2-\frac{2\sinh x}{A\cosh^2x}\dot{v}_2\dot{v}_3=$$

$$\left(\frac{u^2v_1^2}{A^2}+\frac{v_2^2}{A\cosh^2x}+\left(\frac{1}{B^2}+\frac{\tanh^2x}{A^2}\right)v_3^2-\frac{2\sinh x}{A\cosh^2x}v_2v_3\right)\left(\frac{\dot{h}}{h}\right)^2$$

$$=-I\left(\frac{\dot{h}}{h}\right)^2$$

$$= \frac{\lambda}{\chi} I^2 \ddot{\varphi}\phi^2 - \ddot{\varphi} I \dot{\phi}^2 \qquad (4.15)$$

For simplicity we convert $T_j^{\ i}$ in (4.7) in terms of $T_4^{\ 4}$ as

$$T_4^{\ 4} = \frac{1}{2}\frac{\lambda}{\chi} I^2 \ddot{\varphi}\phi^2 - \ddot{\varphi} I \dot{\phi}^2 - \frac{1}{2} I \ddot{\varphi}\phi^2 \qquad (4.16a)$$

$$T_1^{\ 1} = -T_4^{\ 4} - \frac{\lambda}{\chi} I \ddot{\varphi}\dot{\phi}^2 \frac{u^2 v_1^{\ 2}}{A^2} \qquad (4.16b)$$

$$T_2^{\ 2} = -T_4^{\ 4} - \frac{\lambda}{\chi} I \ddot{\varphi}\phi^2 \left[\frac{v_2^{\ 2}}{A^2 \cosh^2 x} - \frac{\sinh x}{A^2 \cosh^2 x} v_2 v_3 \right] \qquad (4.16c)$$

$$T_3^{\ 3} = -T_4^{\ 4} - \frac{\lambda}{\chi} I \ddot{\varphi}\phi^2 \left[\left(\frac{1}{B^2} + \frac{\tanh^2 x}{A^2} \right) v_3^{\ 2} - \frac{\sinh x}{A^2 \cosh^2 x} v_2 v_3 \right] \qquad (4.16d)$$

$$T = -(\varphi - I\dot{\varphi})\dot{\phi}^2 \qquad (4.16e)$$

5.Solution of Field Equations:

The field equation (3.1) for the metric equations (4.16) with help of equations and (4.8), can be written as

$$\frac{\dot{A}^2}{A^2} + \frac{\ddot{A}}{A} + \frac{\dot{A}\dot{B}}{AB} - \frac{B^2}{2A^4} - \frac{1}{A^2} = 0, \qquad (5.1a)$$

$$\frac{\dot{A}^2}{A^2} + \frac{\ddot{A}}{A} + \frac{\dot{A}\dot{B}}{AB} - \frac{1}{A^2} = 0, \qquad (5.2b)$$

$$\frac{\ddot{B}}{B} + 2\frac{\dot{A}\dot{B}}{AB} + \frac{B^2}{A^4} = 0, \qquad (5.3c)$$

With the help of (4.12), we can write equation (4.9) as

$$\left(\frac{\dot{h}}{h}\right) + \left(\frac{\dot{h}}{h}\right)^2 + \frac{\dot{h}}{h}\left(\frac{\dot{B}}{B}\right) = \dot{\varphi}\dot{\phi}^2 \qquad (5.4a)$$

$$\left(\frac{\dot{h}}{h}\right) + \left(\frac{\dot{h}}{h}\right)^2 + \frac{\dot{h}}{h}\left(2\frac{\dot{A}}{A} - \frac{\dot{B}}{B}\right) = \dot{\varphi}\dot{\phi}^2 \qquad (5.4b)$$

Equating the equations (5.4a) and (5.4b), we get

$$\frac{\dot{A}}{A} = \frac{\dot{B}}{B} \qquad (5.5)$$

which on integration yield

$$A = B \qquad (5.6)$$

For existing solution the constant of integration is absorbed in A and B.

With the aid of equation (5.6) the equations (5.1) reducing to

$$\frac{\ddot{A}}{A} + 2\frac{\dot{A}^2}{A^2} - \frac{1}{A^2} = 0 \qquad (5.7a)$$

$$\frac{\ddot{A}}{A} + 2\frac{\dot{A}^2}{A^2} + \frac{1}{A^2} = 0 \qquad (5.7b)$$

Ussing equations (5.7a)and(5.7a), we get

$$\frac{\ddot{A}}{A} + 2\frac{\dot{A}^2}{A^2} = 0 \qquad (5.8)$$

Integrating equation (5.8), we get

$$A = B = (3c_5 + 3c_6)^{\frac{1}{3}} \tag{5.9}$$

From equations (5.4) and (5.9), we get

$$\left(\frac{\dot{h}}{h}\right) + \left(\frac{\dot{h}}{h}\right)^2 + \frac{\dot{h}}{h}\left(\frac{c_5}{3c_5 + 3c_6}\right) = \dot{\varphi}\dot{\phi}^2 . \tag{5.10}$$

But from equation (4.13), we obtain

$$\dot{\varphi}\dot{\phi}^2 = \left(\frac{\dot{h}}{h}\right)^2 + \frac{\lambda}{\chi} I\ddot{\varphi}\phi^2 , \tag{5.11}$$

$$\left(\frac{\dot{h}}{h}\right)^{\bullet} + \left(\frac{\dot{h}}{h}\right)^2 + \frac{\dot{h}}{h}\left(\frac{c_5}{3c_5 + 3c_6}\right) = \left(\frac{\dot{h}}{h}\right)^2 + \frac{\lambda}{\chi} I\ddot{\varphi}\phi^2$$

$$\left(\frac{\dot{h}}{h}\right)^{\bullet} + \frac{\dot{h}}{h}\left(\frac{c_5}{3c_5 + 3c_6}\right) = \left(\frac{\dot{h}}{h}\right)^2 + \frac{\lambda}{\chi} I\ddot{\varphi}\phi^2 \tag{5.12}$$

If we confine the function $\varphi(I)$ as linear function $\ddot{\varphi} = 0$ or $\varphi = c_7 I + c_8$ then (4.26) has the solution

$$h = c_9 \exp\left[(c_8 t + 3c_6)^{2/3}\right] \text{then} \tag{5.13}$$

With the aid of (5.13) the equations (4.14), convert in to

$$v_1 = c_{11} \exp\left[c_{10}(3c_5 t + 3c_6)^{2/3}\right] \tag{5.14a}$$

$$v_2 = c_{12} \exp\left[c_{10}(3c_5 t + 3c_6)^{2/3}\right] \tag{5.14b}$$

$$v_3 = c_{13} \exp\left[c_{10}(3c_5 t + 3c_6)^{2/3}\right] \tag{5.14b}$$

From equation (4.13), we obtain

$$\phi = c_{15}(c_6 t + 3c_6)^{2/3} + c_{14} , \tag{5.15}$$

where c_i are constant of integration

6. Cosmological solution for variable declaration parameter

We consider the deceleration parameter to be a variable

$$q = -\frac{a\ddot{a}}{\dot{a}^2} . \tag{6.1}$$

where a is average scale factor given by

$$a^2 = AB . \tag{6.2}$$

From equations (6.2) and (5.9), we have

$$a = (3c_5 t + 3c_6)^{2/3} . \tag{6.3}$$

Using equations (6.3) and (6.1), we get

$$g = \frac{7}{2c_5}(3c_5 t + 3c_6)^{1/9} . \tag{6.4}$$

7. The Physical and Kinematical Properties of the Model:

The physical quantities of observational interest in cosmology are

The spatial volume is obtained as

$$V = (3c_5 t + 3c_6)\cosh x . \tag{7.1}$$

The mean Hubble parameter is given by

$$H = \frac{c_5}{(3c_5t + 3c_6)}. \qquad (7.2)$$

The expansion scalar is obtained as

$$\theta = 3H = \left(2\frac{\dot{A}}{A} + \frac{\dot{B}}{B}\right)$$

$$\theta = 3H = \frac{3c_5}{(3c_5t + 3c_6)}, \qquad (7.3)$$

The shear scalar gives

$$\sigma^2 = \frac{1}{2}\sum_{i=1}^{3} H_i^2 - \frac{\theta^2}{6},$$

$$\sigma^2 = 0. \qquad (7.4)$$

The mean anisotropic parameter A_m as

$$A_m = \frac{1}{3}\sum_{i=1}^{3}\left(\frac{H_i - H}{H}\right)^2.$$

$$A_m = 0. \qquad (7.5)$$

The deceleration parameter is given by

$$q = \frac{7}{2} \qquad (7.6)$$

The cosmic Jerk parameter is given by,

$$J = q + 2q^2 - \frac{\dot{q}}{H}$$

$$= 28. \qquad (7.8)$$

The state finder (r,s) parametersis given by

$$r = \frac{224}{27}c_5\frac{1}{(3c_5t + 3c_6)}, s = \frac{224}{243}c_5\frac{1}{(3c_5t + 3c_6)} \qquad (7.9)$$

Conclusion

In this paper, we have considered the particular case of theory of gravity in Bianchi type- metric.It is observed that the convergent, non-singular isotropic solution is evolved along with the component of vector potential.Investigated model shows that the universe expands algebraically in theory of gravity. The metric function (scalar factor) in non-static space time admit constant value at early time of the universe and after that metric function starts increasing with increasing in cosmic time, and finally diverges to as . This show that universe expands and approaches to infinite volume. The variable deceleration parameter increases with cosmic time. The spatial volume increases with time and tends to infinity for infinitely large time. The average Hubble parameter and the scalar expansion tend to zero as t becomes infinitely large and they all become infinitely large as t goes to zero. It is also observed that the model does not remain anisotropic throughout the evolution of the universe so that it exhibits a transition from decelerated phase to accelerated phase at late times which is in agreement with the late time acceleration of the universe in modern cosmology. It is well known that if q >0 the universe decelerates in the standard way and accelerates when q <0. Here the models decelerate in the standard way.Cosmologists believe that deceleration to acceleration transition of the universe occurs for models with positive value of jerk parameter. The jerk parameter and state finder parametersremains positive.

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Homogeneous Bianchi Type III Bulk Viscous Model In Presence of G and Λ In Scalar Tensor Theory of Gravitation

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ABSTRACT

In the present paper, we investigate Homogenious Bianchi Type-III bulk viscous fluid cosmological model with variable gravitational and cosmological constant 'Λ' in the framework of Seaz Ballester scalar tensor theory of gravitation. In order to find exact solutions of the Einstein's field equations, we assume i) the expansion scalar 'θ' is proportional to shear scalar 'σ', which leads to $C = B^n$, where B and C are functions of time only ii) the coefficient of bulk viscosity is a power function of the energy density and iii) the cosmic fluid obeys the barotropic equation of state. The nature of the model is discussed in the presence of variable gravitational and cosmological constant. Some physical and kinematical aspects of the model are also discussed.

Keywords: Bianchi Type III Cosmology, Bulk viscosity, Variable G and Λ.

INTRODUCTION

Einstein's general theory of relativity has been successful in describing gravitational phenomena. It has also served as a basis for models of the universe. However since Einstein first published his theory of gravitation, there have been many criticisms of general relativity because of the lack of certain desirable features in the theory. For example Einstein himself pointed out that general relativity does not account satisfactorily for inertial properties of matter, i.e. Mach's principle is not substantiated by general relativity. So in recent years there has been lot of interest in several alternative theories of gravitation.

The most important among them are scalar tensor theories of gravitation formulated by Brans and Dicke(1961), Nordtvedt (1970) and Saez and Ballester (1985). All version of the scalar tensor theories are based on the introduction of a scalar field ϕ into the formulation of general relativity, this scalar field together with the metric tensor field then forms a scalar tensor field representing the gravitational field.

In Saez-Ballester theory the metric is coupled with a dimensionless scalar field in a simple manner. This coupling gives a satisfactory description of weak fields and suggest a possible way to solve missing matter problem in non-flat FRW cosmologies.

The Saez Ballester (1985) field equations are

$$G_{ij} - \omega\phi^n\left(\phi_{,i}\phi_{,j} - \frac{1}{2}g_{ij}\phi_{,k}\phi^{,k}\right) = -8\pi T_{ij}, \quad (1)$$

$$2\phi^n\phi^i_{,i} + n\phi^{n-1}\phi_{,k}\phi^{,k} = 0 \quad (2)$$

Where $G_{ij} = R_{ij} - \frac{1}{2}Rg_{ij}$ is the Einstein tensor , T_{ij} is the stress energy tensor of the matter, ω and n are constant , comma (,) and semicolon (;) denotes partial and co-variant differentiation respectively.

Also energy conservation equation

$$T^{ij}_{,j} = 0 \quad (3)$$

Is the consequence of field equations (1) and (2).

A detailed discussion of Saez-Ballester cosmological models is contained in the work of Saez (1985), Sing and Agrawal (1991) , Shri Ram and Tiwari (1998), Reddy and Venkateswara Rao (2001). Recentaly Adhav et al. (2007) have studied Axially symmetric non-static domain walls in scalar-tensor theories formulated by Brans and Dick (1961) and Saez-Ballester (1985).

Bulk viscosity is supposed to play a very important role in the early evolution of the universe. There are many circumstances during the evolution of the universe in which bulk viscosity could arise.The bulk viscosity coeffiecient determines the magnitude of the viscous stress relative to the expansion. Ribeiro and Sanyal (1987) studied Bianchi type VI model containing the viscous fluid in the presence of an axial magnetic field. Also several aspects of viscous fluid cosmological model in early universe have been extensively investigated by many authors Raj Bali and Dave S. (2001), Adhav et al. (2009), M.K.Verma and Shri Ram (2011), Kandalkar et al (2012).

The cosmological constant Λ and the gravitational constant G are two parameters present in the Einstein's Field equations. The Newtonian constant G plays the role of coupling constant between geometry and matter in Einstein's field equations.There have been numerous modification of general relativityin which G varies with time in order to achive possible unification of gravitation and elementary partical physics or to incorporate Mach's principle in general relativity. The Λ term have been interpreted in terms of Higg's scalar field Wagoner (1970). Linde (1974) proposed that the Λ term is a function of temperature and related it to the process of broken system. The cosmological constant problem related to the existence of Λ have been discussed in the literature.A number of authors e.g. Kalligas et al. (1992), Arbab (1997), Abdussattar and Vishwakarma (1997),proposed linking of variations of G and Λ within the framework of general relativity. Verma et al.(2011) investigate bianchi type-VI bulk viscous fluid models with variable gravitationa and cosmological constant. Recently. Deo et al.(2015) discussed bianchi type-III cosmological model electromagnetic field with cosmic string in general theory of relativity.

In this paper, we investigated Bianchi Type III bulk viscous fluid cosmological model with variable G and Λ in Seaz Ballester theory of gravitation. The paper is organized as follows. We present the metric and Einstein's field equation for viscous fluid with time dependent G and Λ We deals with solution of the field equations and we obtain solution of the field equation under the assumption that 1) the expansion scalar 'θ' is proportional to shear scalar 'σ 2) the coefficient of bulk viscosity is a power function of the energy density and 3) the cosmic

fluid obeys the barotropic equation of state. The nature of the model is discussed in the presence of variable gravitational and cosmological constant.The physical and kinematical properties of the model have also been discuss

2.The metric and field equation

We consider the spatially homogeneous and anisotropic Bianchi type-III metric in the form

$$ds^2 = -dt^2 + A^2(t)dx^2 + B^2(t)e^{-2ax}dy^2 + C^2(t)dz^2 \tag{4}$$

Where a is nonzero constant and A, B, C are functions of the proper time t

The energy momentum-tensor for a bulk viscous fluid distribution is given by

$$T_i^j = (\rho + \bar{p})v_i v^j + \bar{p}g_i^j \tag{5}$$

where

$$\bar{p} = p - \xi\, v^j_{;i} \tag{6}$$

Here $\rho, p, \bar{p}$ and ξ are the energy densityof matter, thermodynamic pressure, effective pressure and bulk viscosity coefficient respectively and v_i is the flow vector satisfying the relations

$$g_{ij}v^i v^j = -1$$

we choose the co ordinates to be commoving, so that

$$v^1 = 0 = v^2 = v^3, v^4 = 1 \tag{7}$$

The semicolon stands for the covariant differentiation.

The field equations (1), (2) and (3) for the metric (4) with the help of (5) and (7) can be written as

$$\frac{B_{44}}{B} + \frac{C_{44}}{C} + \frac{B_4C_4}{BC} + \frac{\omega}{2}\phi^n\phi_4^{\,2} = -8\pi G\,\bar{p} + \Lambda \tag{8}$$

$$\frac{A_{44}}{A} + \frac{C_{44}}{C} + \frac{A_4C_4}{AC} + \frac{\omega}{2}\phi^n\phi_4^{\,2} = -8\pi G\,\bar{p} + \Lambda \tag{9}$$

$$\frac{A_{44}}{A} + \frac{B_{44}}{B} + \frac{A_4B_4}{AB} - \frac{a^2}{A^2} + \frac{\omega}{2}\phi^n\phi_4^{\,2} = -8\pi G\,\bar{p} + \Lambda \tag{10}$$

$$\frac{A_4B_4}{AB} + \frac{B_4C_4}{BC} + \frac{A_4C_4}{AC} - \frac{a^2}{A^2} - \frac{\omega}{2}\phi^n\phi_4^{\,2} = 8\pi G\,\rho + \Lambda \tag{11}$$

$$a\left(\frac{B_4}{B} - \frac{A_4}{A}\right) = 0 \tag{12}$$

and

$$\phi_{44} + \phi_4\left(\frac{A_4}{A} + \frac{B_4}{B} + \frac{C_4}{C}\right) + \frac{n}{2}\left(\frac{\phi_4^{\,2}}{\phi}\right) = 0 \tag{13}$$

where suffix 4 at the symbols A, B, C and ϕ denotes ordinary differentiation with respective to t . An additional equation for timr changes of G and Λ is obtained by the divergence of Einstein tensor,

i.e. $\left(R_i^j - \frac{1}{2}Rg_i^j\right)_{;j}$ which leads to $\left(8\pi G T_i^{\,j} - \Lambda g_i^{\,j}\right)_{;j} = 0$ which gives

$$8\pi G_4\rho + \Lambda_4 + 8\pi G\left[\rho_4 + (\rho + \bar{p})\left(\frac{A_4}{A} + \frac{B_4}{B} + \frac{C_4}{C}\right)\right] \tag{14}$$

The conservation of energy equation (14), after using equation (6), split into two equation

$$\rho_4 + (\rho + p)\left(\frac{A_4}{A} + \frac{B_4}{B} + \frac{C_4}{C}\right) = 0 \tag{15}$$

and

$$8\pi G_4 \rho + \Lambda_4 = 8\pi G\xi\left(\frac{A_4}{A} + \frac{B_4}{B} + \frac{C_4}{C}\right)^2 \tag{16}$$

The average scale factor R for the metric (4) is defined by

$$R^3 = ABCe^{-ax} \tag{17}$$

The volume scale factor V is given by

$$V = R^3 = ABCe^{-ax} \tag{18}$$

The generalized mean Hubble parameter H is given by

$$H = \frac{1}{3}(H_1 + H_2 + H_3) \tag{19}$$

Where $H_1 = \frac{A_4}{A}$, $H_2 = \frac{B_4}{B}$, $H_3 = \frac{C_4}{C}$

The expansion scalar θ and shear scalar σ are given by

$$\theta = v^i_{;i} = \left(\frac{A_4}{A} + \frac{B_4}{B} + \frac{C_4}{C}\right) \tag{20}$$

and

$$\sigma^2 = \frac{1}{3}\left[\left(\frac{A_4}{A}\right)^2 + \left(\frac{B_4}{B}\right)^2 + \left(\frac{C_4}{C}\right)^2 - \frac{A_4B_4}{AB} - \frac{B_4C_4}{BC} - \frac{A_4C_4}{AC}\right] \tag{21}$$

The important observational quantity in cosmology is the deceleration parameter q which is defined as

$$q = -\frac{RR_{44}}{R_4^2} \tag{22}$$

The sign of q indicates whether is model inflates or not. The positive sign corresponds to the standard decelerating model whereas the negative sign indicates inflation.

3. Solution of the field equations:

Equation (8) – (13) are six independent equations in seven unknowns A, B, C, ρ, p, ξ and ϕ .for the complete determinacy of the system, we need extra conditions. We consider the equation (12), yielding

$$A = kB \tag{23}$$

As we wish to consider space-time with Bianchi type-III, we have $A = B$ by taking $k = 1$ without loss of generality equation (23) yields,

$$A = B \tag{24}$$

Using equation (24) the field equations (8)-(13) becomes

$$\frac{B_{44}}{B} + \frac{C_{44}}{C} + \frac{B_4C_4}{BC} + \frac{\omega}{2}\phi^n\phi_4{}^2 = -8\pi G\,\bar{p} + \Lambda \tag{25}$$

$$2\frac{B_{44}}{B} + \left(\frac{B_4}{B}\right)^2 - \left(\frac{a}{B}\right)^2 + \frac{\omega}{2}\phi^n\phi_4{}^2 = -8\pi G\,\bar{p} + \Lambda \tag{26}$$

$$\left(\frac{B_4}{B}\right)^2 + 2\frac{B_4C_4}{BC} - \frac{a^2}{B^2} - \frac{\omega}{2}\phi^n\phi_4{}^2 = -8\pi G\,\rho + \Lambda \tag{27}$$

and

$$\phi_{44}+\phi_4\left(2\frac{B_4}{B}+\frac{C_4}{C}\right)+\frac{n}{2}\left(\frac{\phi_4^{\,2}}{\phi}\right)=0 \tag{28}$$

Solving equations (25) and (26), yield

$$\frac{B_{44}}{B}-\frac{C_{44}}{C}+\frac{B_4}{B}\left(\frac{B_4}{B}-\frac{C_4}{C}\right)-\left(\frac{a}{B}\right)^2=0 \tag{29}$$

Firstly we assume that the expansion is proportional to the shear which is physical condition. This condition leads to

$$C=B^n \tag{30}$$

where n is real number.

equation (29) together with (30) leads to

$$\frac{B_{44}}{B}+(1+n)\left(\frac{B_4}{B}\right)^2-\frac{1}{1-n}\left(\frac{a}{B}\right)^2=0 \tag{31}$$ which can

be rewritten as

$$\frac{d}{dB}(f^2)+\frac{2(1+n)}{B}(f^2)=\frac{2}{1-n}\left(\frac{a}{B}\right)^2 \tag{32}$$

where

$$B_4=f(B) \tag{33}$$

From (32) we obtain

$$\left(\frac{dB}{dt}\right)^2=\frac{a^2}{(1-n)^2}+\frac{k_1}{B^{2(1+n)}} \tag{34}$$

where k_1 is the constant of integration. After a suitable transformation of co ordinates, the metric (4) reduces to the form

$$ds^2=-\left(\frac{a^2}{(1-n)^2}+\frac{k_1}{B^{2(1+n)}}\right)^{-1}dT^2+T^2dx^2+T^2e^{-2ax}dy^2+T^{2n}dz^2 \tag{35}$$

where $B=T$

furthermore, to obtain the expression for Saez-Ballester scalar field ϕ, we rewrite

the equation (28) as

$$\frac{\phi_{44}}{\phi_4}+(2+n)\frac{B_4}{B}+\frac{n}{2}\frac{\phi_4}{\phi}=0 \tag{36}$$

after simplifying, we obtain

$$B^{(n+2)}\phi^{\frac{n}{2}}d\phi=\varphi_0 dt \tag{37}$$

We now substitute the value of B, we obtained

$$\phi^{\frac{n}{2}}d\phi=\frac{\varphi_0}{T^{n+2}}dt \tag{38}$$

Integrating, we obtain

$$\phi^{\frac{n+2}{2}}=-\varphi_0\frac{(n+2)}{2(n+1)}\left(\frac{a^2}{(1-n)^2T^{2(n+1)}}+\frac{k_1}{T^{4(1+n)}}\right)^{\frac{1}{2}}+\psi_0 \tag{39}$$

where ψ_0 is integrating constant.

It is clear that, given $\xi(t)$, we can find the physical and kinematical parameters associated with metric (35). The effect of bulk viscosity is to produce a change in the cosmic fluid and therefore exhibits essential change on character of the solution. In most of the investigations, the bulk viscosity is assumed to be a simple power function of the energy density(1995, 1972)

$$\xi(t) = \xi_0 \rho^{\alpha} \tag{40}$$

where ξ_0 and α (>1) are constant. For small density α may even be equal to unity [35]. The case $\alpha = 1$ corresponds to a radiative fluid (1972) Near a big-bang, v $0 \le \alpha \le 1/2$ is more appropriate assumption to obtain realistic models (1976).

For the specification of ξ, we assume that the fluid obeys an equation of state of the form

$$p = \gamma\rho \tag{41}$$

where $\gamma(0 \le \gamma \le 1)$ is constant.

From equation (15) and (41), we obtain

$$\rho' = \frac{-c(n+2)(1+\gamma)}{T}\rho \tag{42}$$

Where a dash denotes differentiation with respect to T.

Integrating of equation (42), yields

on using (37) in (34), we obtain

$$\rho = \frac{c}{T^{(n+2)(1+\gamma)}} \tag{43}$$

Where c is integrating constant. Diff. equation (42) we obtain

$$\rho' = \frac{-c(n+2)(1+\gamma)}{T^{(n+3)+(n+2)\gamma}} \tag{44}$$

Also using equation (39), from equation (27), we find

$$8\pi G\rho + \Lambda = (1+2n)\left(\frac{a^2}{(1-n)^2T^2} + \frac{k_1}{T^{4(1+n)}}\right) - \frac{\alpha^2}{T^2} - \frac{\omega}{2}\varphi_0^2\left(\frac{a^2}{(1-n)^2T^{(3n+4)}} + \frac{k_1}{T^{(6+5n)}}\right) \tag{45}$$

Which on differentiation leads to

$$8\pi G'\rho + 8\pi G\rho' + \Lambda' = \omega\varphi_0^2\left(\frac{(3n+4)a^4}{(1-n)^2T^{3(2n+3)}} + \frac{4(4n+5)a^2k_1}{(1-n)^2T^{(8n+11)}} + \frac{4(5n+6)k_1^2}{T^{(13+10n)}}\right)$$
$$- \frac{4(2n^2+3n+1)}{T^{(5+4n)}} - \frac{2n(n+2)\alpha^2}{T^3} \tag{46}$$

Now using (15), (40) and (44) in equation (46), we get

$$G = \left\{\omega\varphi_0^2\left(\frac{(3n+4)a^4}{(1-n)^2T^{2(2n+3)}} + \frac{4(4n+5)a^2k_1}{(1-n)^2T^{(8n+11)}} + \frac{4(5n+6)k_1^2}{T^{(13+10n)}}\right)\right.$$
$$\left. - \frac{4(2n^2+3n+1)}{T^{(5+4n)}} - \frac{2n(n+2)\alpha^2}{T^3}\right\} \times \left[\frac{8\pi\xi_0 c^{\alpha}(n+2)^2}{T^{\alpha(n+2)(1+\gamma)}}\sqrt{\frac{\alpha^2}{(1-n^2)T^4} + \frac{k_1}{T^{8(1+n)}}}\right.$$
$$\left. - \frac{8\pi(n+2)(1+\gamma)}{T^{(n+3)+(n+2)\gamma}}\right]^{-1} \tag{47}$$

Equation (43) and (47) in (45), we get

$$\Lambda = (1+2n)\left(\frac{a^2}{(1-n)^2T^2}+\frac{k_1}{T^{4(1+n)}}\right)-\frac{\alpha^2}{T^2}-\frac{\omega}{2}\varphi_0^2\left(\frac{a^2}{(1-n)^2T^{(3n+4)}}+\frac{k_1}{T^{(6+5n)}}\right)$$
$$-\left\{\omega\varphi_0^2\left(\frac{(3n+4)a^4}{(1-n)^2T^{2(2n+3)}}+\frac{4(4n+5)a^2k_1}{(1-n)^2T^{(8n+11)}}+\frac{4(5n+6)k_1^2}{T^{(13+10n)}}\right)\right.$$
$$\left.-\frac{4(2n^2+3n+1)}{T^{(5+4n)}}-\frac{2n(n+2)\alpha^2}{T^3}\right\}\times\left[\frac{\xi_0c^\alpha(n+2)^2}{T^{\alpha(n+2)(1+\gamma)}}\sqrt{\frac{\alpha^2}{(1-n^2)T^4}+\frac{k_1}{T^{8(1+n)}}}\right.$$
$$\left.-\frac{(n+2)(1+\gamma)}{T^{(n+3)+(n+2)\gamma}}\right]^{-1}\frac{c}{T^{(n+2)(1+\gamma)}} \quad (48)$$

From equation (40) and (43), we obtain

$$\xi(t)=\xi_0\frac{c^\alpha}{T^{\alpha(n+2)(1+\gamma)}} \quad (49)$$

5. Some physical and Kinematical Properties.

In this section we discuss some physical and kinematical properties of the velocity vector v^i of the metric (29), the spatial volume (V), the scalar expansion (θ), the shear scalar (σ) and deceleration parameter (q) of the fluid are given by

$$V=\sqrt{-g}=nT^3e^{-ax} \quad (50)$$

$$\theta=(n+2)\sqrt{\frac{\alpha^2}{(1-n^2)T^2}+\frac{k_1}{T^{4(1+n)}}} \quad (51)$$

$$\sigma^2=(2-4n+4n^2)\left(\frac{\alpha^2}{(1-n^2)T^2}+\frac{k_1}{T^{4(1+n)}}\right) \quad (52)$$ and,

$$q=\frac{2+3\alpha-2m}{1+2m} \quad (53)$$

The Hubble parameter is given by

$$H=\frac{(n+2)}{3}\sqrt{\frac{\alpha^2}{(1-n^2)T^2}+\frac{k_1}{T^{4(1+n)}}} \quad (54)$$

The spatial volume of the model given by (49) shows the anisotropic expansion of the universe with time. For the model expansion scalar θ, and shear scalar σ tends to zero as $T\to\infty$. The position value of deceleration parameter indicates the model decelerates in the standard way.

CONCLUSION

In this paper, we investigated Bianchi Type III bulk viscous fluid cosmological model with variable G and Λ in Seaz Ballester theory of gravitation. To get a determinate solution of the field equations, we have assumed the relation between metric potential and shear viscosity is proportional to the scale expansion. We observe that the spatial volume is zero at $T=0$. At this epoch the energy density ρ, expansion θ, shear scalar σ and the bulk viscosity coefficient ξ are all infinite. Therefore the model (35) starts ivolving with a big-bang at $T=0$. For large T energy density becomes zero, the rate of expansion in the model shows down tending to zero as $T\to\infty$. The cosmological constant term Λ is infinite at the beginning of the model and decreases at late time. The gravitational constant G is zero initially tends to

infinity as $T \to \infty$ These are supported by recent result from the observations of the typen La Supernova explosion (SN la).

Conflicts of interest: The authors stated that no conflicts of interest.

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1. Name of Organising Department	:	**Mathematics**
2. Name of Activity	:	Workshop on NET/SET Guidance in Mathematical Sciences
3. Place of Activity	:	AV Theatre, SGBAU,Amravati
4. No. of Participant	:	Students: 148, Teachers: 24 Resource persons:13
5. Date	:	22nd December,2019

Details of Activity (In Brief):

As per MOU, on the occasion of 'National Mathematics Day' one day workshop on NET/SET guidance in mathematical sciences, was organized on 22nd Dec., 2019 in collaboration with department of Mathematics, Sant Gadge Baba Amravati University, Amravati, Adarsha Mahavidyalaya, Dhamangaon Rly. About **185** members including faculty members and Research Scholars, PG students from various colleges participated in the workshop. Resource persons were invited from various reputed institutions. This programe was carried out in three sessions.

Outcome of the Programme:

- This workshop will help the students to make them ready to face the challenging questions, thereby crack the examination.
- Participants got motivated to clear the CSIR-UGC NET / SET Exams.
- Students got motivated to organize such type of useful workshops in future.

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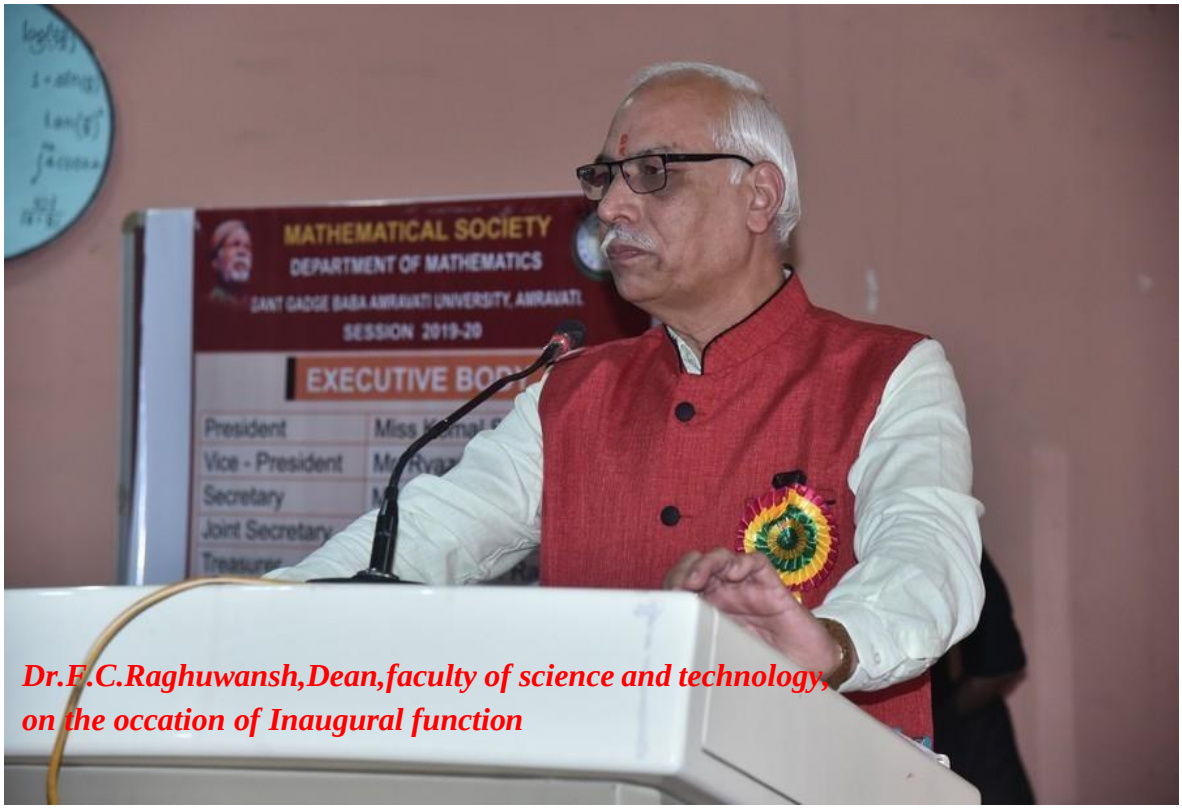
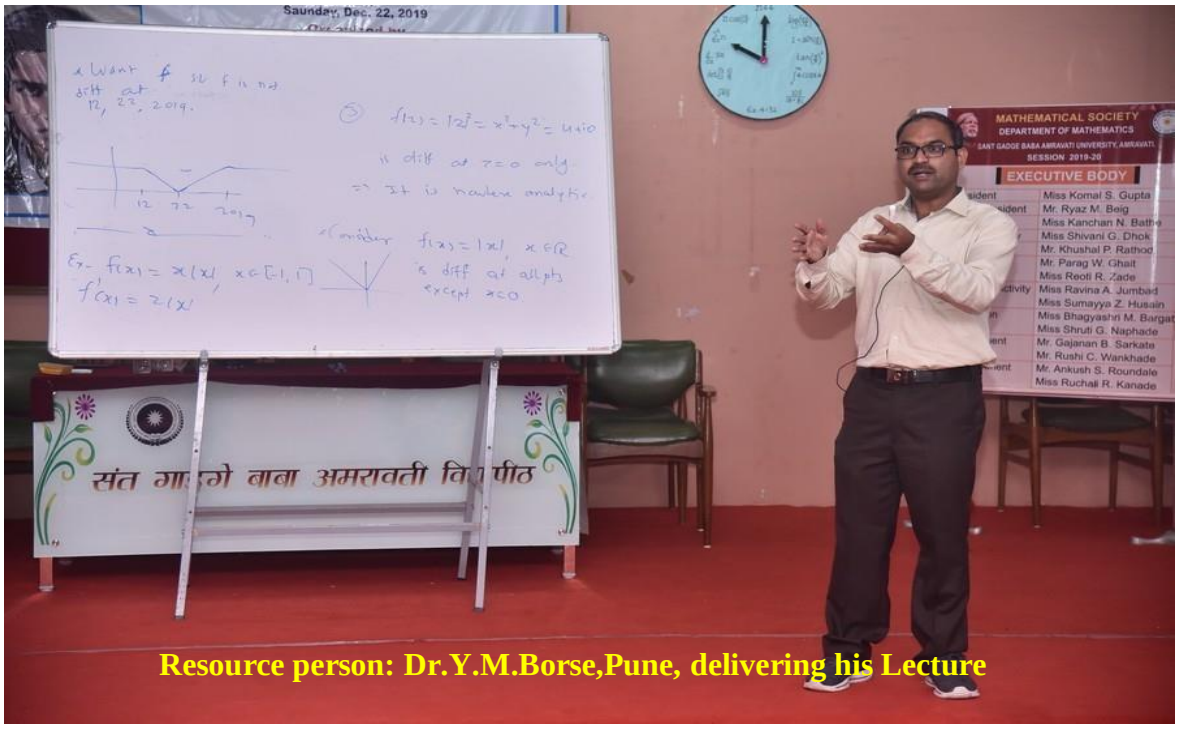
Dr.Rajesh Jaipurkar, Pro-VC, SGBAU,Amravati delivering his presidential speech



Dr.F.C.Raghuwansh,Dean,faculty of science and technology, on the occation of Inaugural function



Resource person: Dr.Y.M.Borse,Pune, delivering his Lecture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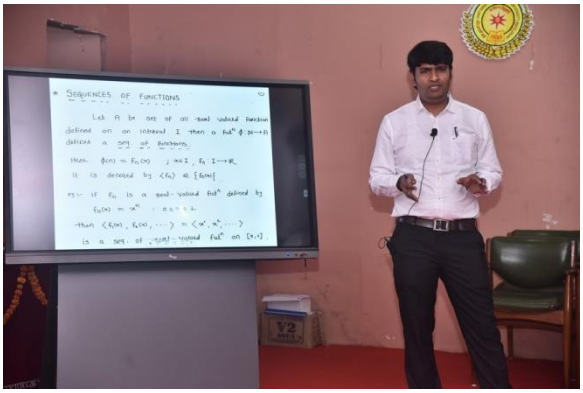
SEQUENCES OF FUNCTIONS


Important Subject's and it's Contribution.
1. Real Analysis
2. Complex Analysis
3. Modern Algebra
4. Linear Algebra
5. Ordinary and Partial Differential Equation
6. Calculus of Variation
7. Integral Equation
8. Linear Programming Problem


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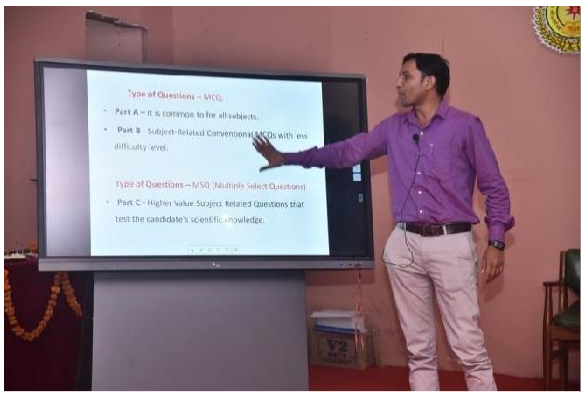
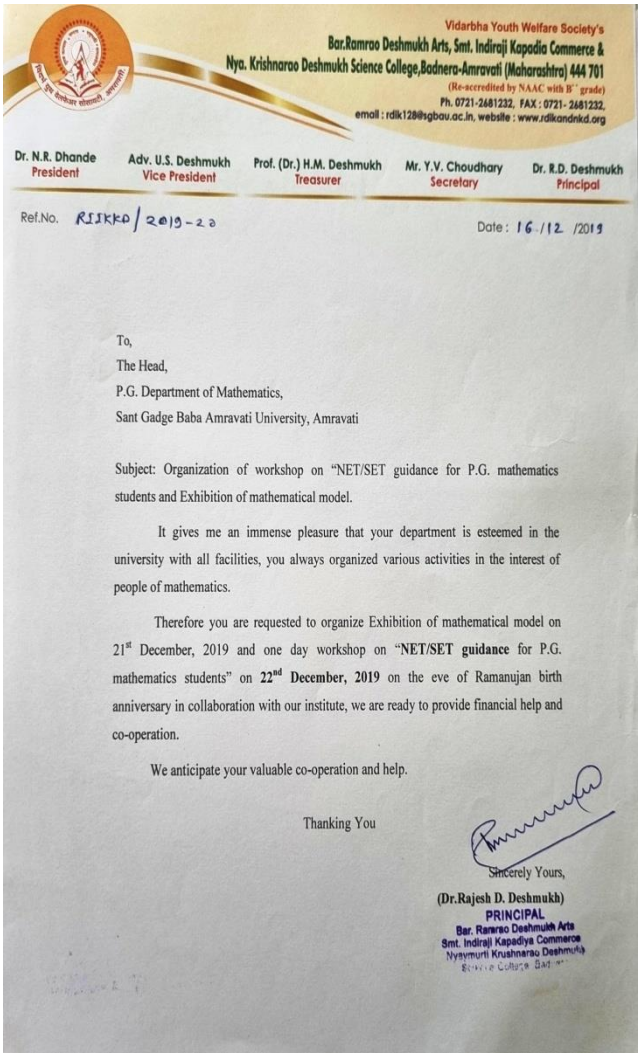

Type of Questions – MCQ.
Part A – It is common to for all subjects.
Part B - Subject-Related Conventional MCQs with ess
difficulty level.
Type of Questions – MSQ (Multiple Select Questions)
Part C - Higher Value Subject Related Questions that
test the candidate's scientific knowledge.


WORKSHOP



Vidarbha Youth Welfare Society's
Bar.Ramrao Deshmukh Arts, Smt. Indiraji Kapadia Commerce &
Nya. Krishnarao Deshmukh Science College,Badnera-Amravati (Maharashtra) 444 701
(Re-accredited by NAAC with 'B' grade)
Ph. 0721-2681232, FAX : 0721- 2681232,
email : rdik128@sgbau.ac.in, website : www.rdikandnkd.org

Dr. N.R. Dhande, President | Adv. U.S. Deshmukh, Vice President | Prof. (Dr.) H.M. Deshmukh, Treasurer | Mr. Y.V. Choudhary, Secretary | Dr. R.D. Deshmukh, Principal

Ref.No. RIKKD/2019-20 Date : 16/12/2019

To,
The Head,
P.G. Department of Mathematics,
Sant Gadge Baba Amravati University, Amravati

Subject: Organization of workshop on "NET/SET guidance for P.G. mathematics students and Exhibition of mathematical model.

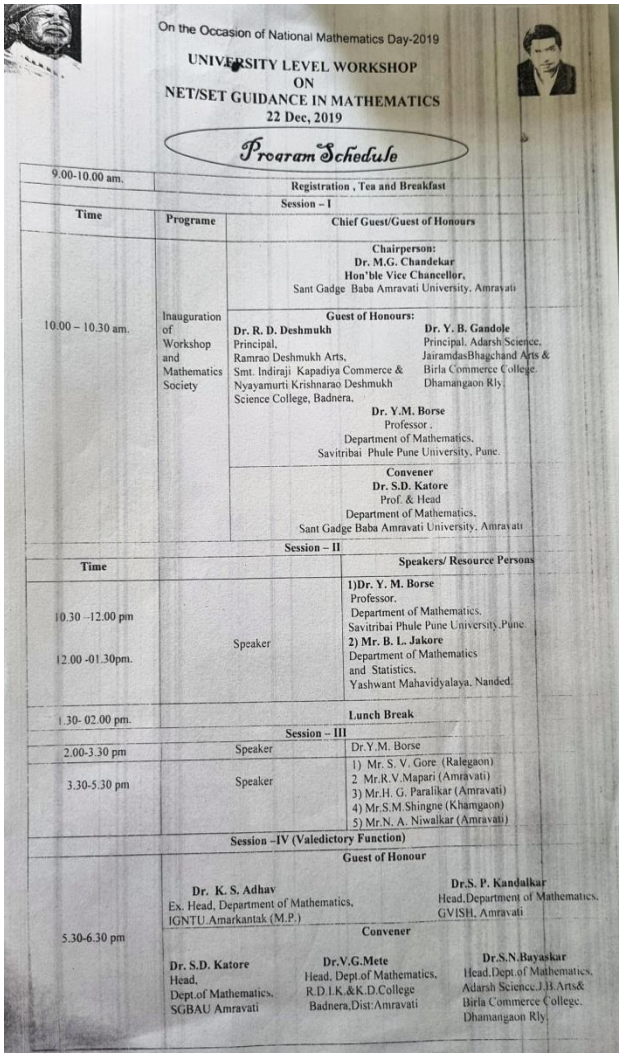
It gives me an immense pleasure that your department is esteemed in the university with all facilities, you always organized various activities in the interest of people of mathematics.

Therefore you are requested to organize Exhibition of mathematical model on 21st December, 2019 and one day workshop on "**NET/SET guidance** for P.G. mathematics students" on **22nd December, 2019** on the eve of Ramanujan birth anniversary in collaboration with our institute, we are ready to provide financial help and co-operation.

We anticipate your valuable co-operation and help.

Thanking You

Sincerely Yours,
(Dr.Rajesh D. Deshmukh)
PRINCIPAL
Bar. Ramrao Deshmukh Arts
Smt. Indiraji Kapadiya Commerce
Nyayamurti Krushnarao Deshmukh
Science College Bad...



On the Occasion of National Mathematics Day-2019

UNIVERSITY LEVEL WORKSHOP
ON
NET/SET GUIDANCE IN MATHEMATICS
22 Dec, 2019

Program Schedule

9.00-10.00 am. — **Registration , Tea and Breakfast**

Session – I

Time	Programe	Chief Guest/Guest of Honours
10.00 – 10.30 am.	Inauguration of Workshop and Mathematics Society	**Chairperson:** **Dr. M.G. Chandekar** **Hon'ble Vice Chancellor,** Sant Gadge Baba Amravati University, Amravati **Guest of Honours:** **Dr. R. D. Deshmukh** Principal, Ramrao Deshmukh Arts, Smt. Indiraji Kapadiya Commerce & Nyayamurti Krishnarao Deshmukh Science College, Badnera. **Dr. Y. B. Gandole** Principal, Adarsh Science, JairamdasBhaychand Arts & Birla Commerce College, Dhamangaon Rly. **Dr. Y.M. Borse** Professor , Department of Mathematics, Savitribai Phule Pune University, Pune. **Convener** **Dr. S.D. Katore** Prof. & Head Department of Mathematics, Sant Gadge Baba Amravati University, Amravati

Session – II

Time		Speakers/ Resource Persons
10.30 –12.00 pm 12.00 -01.30pm.	Speaker	**1)Dr. Y. M. Borse** Professor. Department of Mathematics. Savitribai Phule Pune University.Pune. **2) Mr. B. L. Jakore** Department of Mathematics and Statistics, Yashwant Mahavidyalaya, Nanded.
1.30- 02.00 pm.	**Lunch Break**	

Session – III

2.00-3.30 pm	Speaker	Dr.Y.M. Borse
3.30-5.30 pm	Speaker	1) Mr. S. V. Gore. (Ralegaon) 2 Mr.R.V.Mapari (Amravati) 3) Mr.H. G. Paralikar (Amravati) 4) Mr.S.M.Shingne (Khamgaon) 5) Mr.N. A. Niwalkar (Amravati)

Session –IV (Valedictory Function)

5.30-6.30 pm — **Guest of Honour**

Dr. K. S. Adhav
Ex. Head, Department of Mathematics,
IGNTU.Amarkantak (M.P.)

Dr.S. P. Kandalkar
Head,Department of Mathematics,
GVISH, Amravati

Convener

Dr. S.D. Katore
Head,
Dept.of Mathematics,
SGBAU Amravati

Dr.V.G.Mete
Head, Dept.of Mathematics,
R.D.I.K.&K.D.College
Badnera,Dist:Amravati

Dr.S.N.Bayaskar
Head,Dept.of Mathematics,
Adarsh Science,J.B.Arts&
Birla Commerce College,
Dhamangaon Rly.

1. Name of Organising Department	:	**Mathematics**
2. Name of Activity	:	National Level Mathematics Quiz Competition
3. Place of Activity	:	Online
4. No. of Participant	:	Students: 683, Teachers: 08
5. Date of Activity	:	6th May 2020

Details of Activity (In Brief):

On 6th May, 2020, department of Mathematics organized an online national level quiz competition for P.G. students to mark the "International Mathematics Day" focusing on the different perspective, concept and themes of Mathematics. In this Online Event **683** students from affiliated colleges were responded the quiz. The event was successfully coordinated and was technically managed by Dr. V.G.Mete, Dr.V.N.Mahalle, Nehal Palaskar, Samiksha Khade, Ajinkya Kathe.

Outcome of the Programme:

- Quizzes are intended to encourage fun learning methods while also enhancing general knowledge.
- Students can "think outside the box" or from diverse perspectives by participating in quiz competition.
- quizzes build student's general knowledge and also boost their confidence.
- To motivate the students to participate in the inter-collegiate level competitions.
- Student received certificate of participation.

(Name & Signature of Concern Teacher)

List of participants

National Level Online Quiz Competition, Date. 06/05/2020

Timestamp	Email Address	Score	Full Name	College Name	Whats App N	Class
6/5/2020 17:24:50	samikshakhade120496@gmail.com	44 / 50	Samiksha G. Khade	G.V.I.S.H. Amravati	8378841279	M.Sc II
6/5/2020 17:40:32	sraut1247@gmail.com	48 / 50	Shailesh B. Raut	Smt sitabai shinde collage of science, Shindewahi,Chandrpur	8380098805	B. Sc III
6/5/2020 19:15:28	utkarshagulhane2@gmail.com	14 / 50	Utkarsha Kishor Gulhane	R.D.I.k and N.K.D college badnera	9511268690	M.Sc II
6/5/2020 19:40:17	hrishikeshtale28@gmail.com	14 / 50	Hrishikesh Dinkarrao Tale	RDIK College, Badnera, Amravati.	8308367084	M.Sc I
6/5/2020 20:06:18	monikathere8@gmail.com	36 / 50	Monika Nandkishor There	Smt. Sindhutai Jadhao Arts and Science college	9604179746	Other
6/5/2020 20:11:28	ati_vijaymete@yahoo.co.in	28 / 50	Vedant Mete	PRMIT Badnera	8390962556	Other
6/5/2020 20:20:50	nirajkhangale@gmail.com	4 / 50	Niraj Bhola Khangale	Bar. Ramrao Deshmukh Arts, Smt. Indiraji Kapadia Commerce & Nyayamurt	9604627810	M.Sc I
6/5/2020 20:24:08	namratarotkar12@gmail.com	20 / 50	Namrata Sureshrao Rotkar	RDIK college Bandera		M.Sc II
6/5/2020 20:28:58	poojaraut32@gmail.com	24 / 50	Pooja Ganeshrao Raut	Rdik & nkd college, Badnera	9922184544	M.Sc II
6/5/2020 20:29:12	shubhbhongle65@gmail.com	12 / 50	Shubham Raju Bhongle	Indira Gandhi Kala Mahavidyalaya, Ralegaon	9049762105	B.Sc II
6/5/2020 20:31:25	pranaliparate976@gmail.com	8 / 50	Pranali Bhashkar Parate	Indira Gandhi Kala mahavidyalaya ralegav	8080474093	B.Sc II
6/5/2020 20:36:47	gauriwelankar97@gmail.com	26 / 50	Gauri Dhanraj Welankar	Rdik Badnera	8329164270	M.Sc I
6/5/2020 20:37:44	drsrb2014@gmail.com	24 / 50	Dr Sanjay R Bhoyar	Phulsing Naik Mahavidyalaya Pusad	9422583592	Other
6/5/2020 20:38:24	sarveshgawas13@gmail.com	48 / 50	SARVESH SUSHANT GAWAS	GOA UNIVERSITY	8975081597	M.Sc II
6/5/2020 20:39:17	rahulnaik160@gmail.com	38 / 50	Rahul Ravindra Naik	St. Xavier's College, Mapusa-Goa	8975104734	B.Sc I
6/5/2020 20:42:38	tejeswanaik22@gmail.com	28 / 50	Tejeswa Pandurang Naik	St Xavier's college	9923476395	B. Sc III
6/5/2020 20:45:49	sakshizoting97@gmail.com	16 / 50	Sakshi Gopalrao Zoting	Indira Gandhi Kala Mahavidyalay Ralegaon	9022142297	B.Sc I
6/5/2020 20:50:03	vpkadamgsg@gmail.com	38 / 50	Dr Vijay Pralhad Kadam	G S G College	9423613054	Other
6/5/2020 20:59:37	mahesh.netkr@gmail.com	38 / 50	Mahesh Dashrath Netnaskar	Bapumiya Sirajoddin Patel Arts, Commerce and Science College, Pimpalgaon	9604335210	Other
6/5/2020 21:01:29	akankshakhandalkar3@gmail.com	16 / 50	Akansha Shankar khandalkar	Indira Gandhi kala Mahavidyalay Ralegaon	7499104769	B.Sc I
6/5/2020 21:04:52	deepeshgouda26@gmail.com	14 / 50	Deepesh Gouda	St. Joseph Vaz, Contain	7378326174	B.Sc II
6/5/2020 21:07:26	dnyaneshwarikawale11@gmail.com	10 / 50	Dnyaneshwari Diliprao Kawale	Shri.dr.r.g.rathod arts and science college murtizapur	9561135331	M.Sc II
6/5/2020 21:13:43	shrutikagawande15@gmail.com	38 / 50	Shrutika Arun Gawande	RDIk and KD college , Badnera,Amravati	7709531811	M.Sc II
6/5/2020 21:15:11	prachidhayep@gmail.com	12 / 50	Chaitali pramod dhaye	R.g.rathod college mzr	7620578551	B. Sc III
6/5/2020 21:16:15	akankshakhandalkar3@gmail.com	44 / 50	Akansha shankar khandalkar	Indira Gandhi Kala Mahavidyalay Ralegaon y	7499104769	B.Sc I
6/5/2020 21:17:10	ramulu.purra@gmail.com	38 / 50	Dr. P. Ramulu	M.V.S. Govt. Arts and Science College (Autonomous, Mahabubnagar	9866266010	Other
6/5/2020 21:19:10	kalyaniwahile28@gmail.com	22 / 50	Kalyani vinod Wahile	Dr. R. G. Rathod science collage murtizapu	9529921338	B. Sc III
6/5/2020 21:22:37	vivekkhawale100@gmail.com	18 / 50	Vivek R. Khawale	R. G. Rathod Science and Arts collage Murtizapur	8698021740	M.Sc I
6/5/2020 21:24:15	borgadek@gmail.com	26 / 50	Kailas Raghunath Borgade	Phulsing Naik College,Pusad	9763638504	Other
6/5/2020 21:25:27	poonamgulhane35@gmail.com	22 / 50	Poonam sunilrao Gulhane	Mahatma fule mahavidhyalay warud	9890621103	B. Sc III
6/5/2020 21:26:08	fauziyakauser98@gmail.com	18 / 50	Fauziya Kauser Shaikh Bismillah	Shri Dr.R.G Rathod Arts And Science College Murtizapur District Akola	7741944485	M.Sc II
6/5/2020 21:26:12	yojanadhayej@gmail.com	50 / 50	Ku.Prachi Pramod Dhaye	Shri.Dr.R.G.Rathod art's and sci college murtizapur	9356375424	B.Sc II
6/5/2020 21:29:24	wankhade.kishor@rediffmail.com	18 / 50	Dr. Kishor Sudhakar Wankhade	Yashwantrao Chavan Art's and Science Mahavidyalaya Mangrulpir Dist Wasi	8888364251	Other
6/5/2020 21:30:43	pushpa1997gawai@gmail.com	8 / 50	Pushpa Arun Gawai.	R.G.rathod college murtizapur.	7083014508	M.Sc II
6/5/2020 21:33:22	shreyabawane20@gmail.com	18 / 50	Shreya Devnath Bawane	Amolakchand Mahavidyalya	8317244864	B.Sc I
6/5/2020 21:34:04	miuccan14@gmail.com	42 / 50	Miuccan Jesus Ergil D'Souza	St. Xavier's College, Mapusa	7972076981	B.Sc II
6/5/2020 21:36:16	revatikale92@gmail.com	14 / 50	Revati Datta Kale	Amolokchand Mahavidhyala Yavatmal	9158975455	B.Sc I

6/5/2020 21:36:30	nemadejaya18@gmail.com	10 / 50	Jaya Ganesh Nemade	D.M.Burugale College Shegaon	9309564180	B.Sc II
6/5/2020 21:39:52	vaishnavisontakke99@gmail.com	10 / 50	Vaishnavi Suresh Sontakke	Dr.R.G.Rathod art and science college murtizapur	8411060610	M.Sc I
6/5/2020 21:39:58	abhisheklande973@gmail.com	16 / 50	Abhishek Suresh Lande	B.S Patel College Pimpalgaon Kale	9096069502	B.Sc II
6/5/2020 21:40:33	soniya.naik1966@gmail.com	36 / 50	Soniya Naik	St Xavier's College	9822610940	B.Sc II
6/5/2020 21:40:34	sudipnaik839@gmail.com	12 / 50	Sudip Rajendra Naik	St Xavier's College Mapusa-Goa	8390519671	B.Sc I
6/5/2020 21:41:46	swatiingle0321@gmail.com	8 / 50	Swati Ramnath Ingle	S.D.M. Burungale Sci& Arts college, Shegoan	9075765150	B. Sc III
6/5/2020 21:41:46	poojakamble2108@gmail.com	20 / 50	POOJA YADAVRAO KAMBLE	Amolakchand Mahavidyalaya , Yavatmal	7507467518	B.Sc I
6/5/2020 21:43:44	gaurisontakke01@gmail.com	28 / 50	Gauri pandurang sontakke	Shri dnyaneshwar maskuji burungale college, shegoan	9307826476	B.Sc II
6/5/2020 21:44:31	harmalkarjatin2@gmail.com	24 / 50	Jatin Umesh Harmalkar	St. Xavier's college, mapusa	8554999327	B.Sc II
6/5/2020 21:44:32	rajurkarpoonam18@gmail.com	22 / 50	Poonam Arvind Rajurkar	Shri Dr R.G Rathod Art and science College murtizapur	8308954505	B.Sc I
6/5/2020 21:45:49	rupalimasne03@gmail.com	18 / 50	Rupali Mahadev Masne	Shri D. M. Burugle science and art college Shegaon	9579381460	B. Sc III
6/5/2020 21:47:49	tanujazoting856@gmail.com	20 / 50	Tanuja Ramchandra Zoting	Indira Gandhi kala mahavidyalaya ralegaon	9359954481	B.Sc I
6/5/2020 21:47:54	drw4112000@gmail.com	20 / 50	Divya Ravindra Wankhade	Shri.dr.r.g.rathod college murtizapur	9284194367	B.Sc II
6/5/2020 21:50:16	pdvithalkar@gmail.com	18 / 50	Priyanka dilip vithalkar	Amolackchand mahavidyalay	9404705847	B.Sc I
6/5/2020 21:51:48	roshanpatrakar2020@gmail.com	16 / 50	Roshan patrakar	Indira Gandhi kala mahavidyalay, ralegaon	7666028937	B.Sc II
6/5/2020 21:53:56	vaishnavisontakke99@gmail.com	42 / 50	Vaishnavi Suresh Sontakke	Dr.R.G.Ratho arts and science college murtizapur	7411060610	M.Sc I
6/5/2020 21:54:31	mayurikaikade2001@gmail.com	20 / 50	Mayuri Naresh kaikade	Amolakchand mahavidyalaya yavatmal	9307828728	B.Sc I
6/5/2020 21:56:47	rupalibodade16@gmail.com	12 / 50	Miss.Rupali Mangesh Bodade	Bapumiya Sirajoddin Patel Arts,Commerce and Science College Pimpalgaon I	7219007375	B. Sc III
6/5/2020 21:56:52	Kalidaswakulkar2000@gmail.com	22 / 50	Kalidas Subhashrao Wakulkar	Indira Gandhi Arts and Science College,Ralegaon	9763402883	B.Sc II
6/5/2020 21:57:39	revatikale92@gmail.com	50 / 50	Revati Datta Kale	Amolokchand Mahavidyalaya Yavatmal	9158975455	B.Sc I
6/5/2020 21:59:46	pandediksha09@gmail.com	24 / 50	Diksha Jayant Pande	Indira Gandhi kala mahavidyalaya ralegaon	7378407838	B.Sc II
6/5/2020 22:01:28	mahimasharma1902@gmail.com	22 / 50	Mahima Mahendra Sharma	Shri. D. M. Burungale Arts and Science College, Shegaon.	9130948109	B.Sc II
6/5/2020 22:01:32	aneesha2806@gmail.com	22 / 50	Anisha Anil Sharma	Shri. D. M. Burungale Arts and Science College, Shegaon	8805142884	B.Sc II
6/5/2020 22:02:27	vaishnavivirokar@gmail.com	20 / 50	Vaishnavi Ananta Virokar	Shri D.M.Burungale science and arts college, shegaon	9421494407	B. Sc III
6/5/2020 22:02:36	jyotirmoyghosh777@gmail.com	32 / 50	Jyotirmoy Ghosh	Vivekananda Mahavidyalaya	9732786800	B.Sc II
6/5/2020 22:02:44	sushmarchavhan2000@gmail.com	20 / 50	Sushma Ramesh Chavhan	Shri Dr. R. G. Rathod Art's and Science College Murtizapur	8379808728	B.Sc II
6/5/2020 22:05:22	jayshriwasake29120@gmail.com	46 / 50	Jayshri Ramchandra Wasake	Indira Gandhi Kala Mahavidyalaya Ralegaon	7666160427	B.Sc I
6/5/2020 22:10:03	nirmalmanisha81@gmail.com	16 / 50	Manisha Nirmal	Shri Gyaneshvar maskuji burugale science and arts college, shegaon	8390696375	B.Sc II
6/5/2020 22:11:44	sumanta1999c@gmail.com	36 / 50	Sumanta Chakraborty	D.B.N.D.S.M	6295729439	B. Sc III
6/5/2020 22:12:51	mangeshnikode97@gmail.com	16 / 50	Mangesh devidas nikode	Rdik collage badnera	8308117753	M.Sc II
6/5/2020 22:13:50	maheksheikh0210@gmail.com	42 / 50	Mahek Sharif Sheikh	Indira gandhi kala mahavidyalaya, ralegaon.	9623711826	B.Sc I
6/5/2020 22:13:56	ishakansar9@gmail.com	32 / 50	Isha Jayant Kansar	St. Xavier's College	7030355311	B.Sc II
6/5/2020 22:14:43	riyamhapne08@gmail.com	36 / 50	Riya Mhapne	St. Xavier's College Mapusa-Goa	9822200685	B.Sc II
6/5/2020 22:15:54	mayekaramisha22@gmail.com	10 / 50	Amisha Dinanath Mayekar	St. Xavier's college	9284271394	B.Sc I
6/5/2020 22:16:06	harshakarale26@gmail.com	14 / 50	Harsha Gajanan Karale	Shri. Dnyaneshwar Maskuji Burungale Science and Arts Collage, Shegaon	9325967070	B.Sc II
6/5/2020 22:20:31	payalkapse1405@gmail.com	8 / 50	Payal Vijay kapse	Priyadarshani institute of engineering and technology	7770069063	Other
6/5/2020 22:22:25	mailme.abhijitpal2018@gmail.com	42 / 50	Abhijit Pal	DBNDSM	9064080869	B. Sc III
6/5/2020 22:23:33	sangammainkar01@gmail.com	22 / 50	sangam mainkar	st. Xavier College mapusa Goa	8660031419	B.Sc II
6/5/2020 22:29:40	archanawankhade22@gmai.com	42 / 50	Shreya Devnath Bawane	Amolakchand mahavidyalaya	8317244864	B.Sc I
6/5/2020 22:34:10	biplabdawn43@gmail.com	42 / 50	BIPLAB DAWN	DBNDSM	8617893596	B. Sc III

6/5/2020 22:35:51	anjalinayse123@gmail.com	10 / 50	Anjali dnyaneshwar Nayse	S. D. M. B. Arts and science college shegaon	8600551585	B. Sc III
6/5/2020 22:36:03	whitneyannlobo1206@gmail.com	14 / 50	Whitney Ann Lobo	St. Xaviers College Mapusa, Goa	8888531259	B.Sc II
6/5/2020 22:36:29	urvashidhankani108@gmail.com	20 / 50	Urvashi Sanjay Dhankani	Dr. R.G.Rathod arts and science college	9022168208	B.Sc I
6/5/2020 22:41:59	komalpudake8@gmail.com	22 / 50	Komal Prakash Pudake	Shri Dnyneshwar Maskuji Burungale Science & Art College,Shegaon.	9834611175	B.Sc II
6/5/2020 22:47:42	prosunboral@gmail.com	44 / 50	PROSUN BORAL	DBNDSM	7718621859	B. Sc III
6/5/2020 22:48:36	manishadhote74@gmail.com	6 / 50	Manisha rameshrao dhote	Mahatma fule warud	7744016017	B. Sc III
6/5/2020 22:52:16	vaishnavitade24@gmail.com	32 / 50	Vaishnavi gajanan Tade	RDIK college	8412092783	M.Sc II
6/5/2020 23:00:38	sonusarde5@gmail.com	22 / 50	Sonal Dattatray Sarde	Amolakchand mahavidyalaya yavatmal	9075474532	B.Sc I
6/5/2020 23:05:42	vaishnavidhole1997@gmail.com	22 / 50	Vaishnavi Gajanan Dhole.	R.D.I.K. college ,Badnera	7038713731	M.Sc II
6/5/2020 23:07:23	nikitashinde@gmil.com	12 / 50	Nikita chandrakant shinde	Dr rg rathod art and science collage	9657916301	B.Sc II
6/5/2020 23:11:00	chumkibanerjee1999@gmail.com	42 / 50	Chumki banerjee	Dr.bhupendranath dutta smriti mahavidyalaya	7001102591	B. Sc III
6/5/2020 23:14:02	rishikdubey510@gmail.com	36 / 50	Rishik Dubey	Vivekananda Mahavidyalaya	9064883464	B. Sc III
6/5/2020 23:14:05	anushikhakhirkar@gmail.com	16 / 50	Anushikha Narendra khirkar	Amolakchand mahavidyalya yavatmal	8080556732	B.Sc I
6/5/2020 23:16:26	hariom108420@gmail.com	16 / 50	Hariom Shivhari Gawande	D.M.burungale college , shegaon	7499793209	B.Sc I
6/5/2020 23:18:33	anitamali16575@gmail.com	26 / 50	Anita Niwrutti Mali	Shri D. M. Burungle Science and Arts College, Shegaon	7768074078	B. Sc III
6/5/2020 23:24:01	tanmoykhan664@gmail.com	20 / 50	Tanmoy khan	Dr Bhupendra nath Dutta Smriti Mahavidyalaya	8371948670	B. Sc III
6/5/2020 23:24:26	pal.subha18@gmail.com	0 / 50	Subhajit Pal	DBNDSM	8617649545	B. Sc III
6/5/2020 23:26:19	nandisouvik99@gmail.com	44 / 50	SOUVIK NANDI	VIVEKANAND MAHAVIDYALAYA		B. Sc III
6/5/2020 23:28:59	abdulwajid476@gmail.com	38 / 50	Abdul Wajid Abdul Rashid	R.D.I.k and NKD Badnera	9970219943	M.Sc II
6/5/2020 23:35:15	sanikasawant160@gmail.com	20 / 50	Sanika sukhaji sawant	St. Xavier college	7507312149	B.Sc II
6/5/2020 23:54:04	gulhaneshreya9@gmail.com	20 / 50	Shreya Ramrao Gulhane	Shri dr R.G. rather arts and science college murtizapur	7498307013	B.Sc II
6/5/2020 23:54:55	dixitshraddha69@gmail.com	22 / 50	Shraddha dixit	Kanpur university	7651812678	Other
6/6/2020 0:01:52	achallonkar445@gmail.com	14 / 50	Achal Ramesh Lonkar	Shri. Dnyaneshwar Maskuji Burungale Science and Art college Shegaon.	9175546909	B.Sc II
6/6/2020 0:36:24	nabaniranjanm@gmail.com	42 / 50	Nabani Ranjan Mahanta	Vivekananda Mahavidyalaya	6294919002	B.Sc II
6/6/2020 0:43:15	shivammishra3171@gmail.com	34 / 50	Shivam Kumar Mishra	National Post Graduate College Barhalganj	6307104810	B. Sc III
6/6/2020 1:37:01	r.v.mapari@gmail.com	40 / 50	Rahul V Mapari	Government Vidarbha Institute of Science and Humanities Amravati	9405316462	Other
6/6/2020 5:41:50	vaishnavikhirade2018@gmail.com	22 / 50	Ku .vaishnavi banan khirade	Y.C.ARTS AND SCIENCE CLG M.PIR	9075541843	B. Sc III
6/6/2020 5:51:32	pram81206@gmail.com	12 / 50	Rampawar	Indira Gandhi kala mahavidyalay ralegaon	9356410347	B.Sc I
6/6/2020 6:32:53	mohanta.arijit18@gmail.com	42 / 50	Arijit Mohanta	Dr. BHUPENDRA NATH DUTTA SMRITI MAHAVIDYALAYA	9382725342	B. Sc III
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6/6/2020 6:59:07	suchitraphande@gmail.com	14 / 50	Suchitra pramod Hande	Shri D. M. Burungale science and arts college shegaon	9309735819	B. Sc III
6/6/2020 7:01:14	manishshelke2002@gmail.com	22 / 50	Shivani Arun shelke	Y.C.Art and science college Mangrulpir	9359664176	B. Sc III
6/6/2020 7:03:47	snehalsultane342@gmail.com	8 / 50	Snehal Dnyaneshwar Sultane	Shri Dnyaneshwar muskuji burungale science and arts college shegaon	9067087708	B.Sc II
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6/6/2020 7:20:49	sohailkhan8270@gmail.com	22 / 50	Sohail khan Ahemad khan	Dr. R.G rathod arts and science college murtizapur	9730497481	B.Sc I
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6/6/2020 7:42:08	thakarepratiksha89@gmail.com	16 / 50	Pratiksha Sanjay Thakare	SPM COLLAGE GHATANJI	9307009792	B.Sc II
6/6/2020 7:44:48	maheshgawkhare@gmail.com	40 / 50	MAHESH GAWKHARE	Government College of Arts Science and Commerce, Quepem Goa	7875235728	Other
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6/6/2020 7:49:00	aachallonkar777@gmail.com	48 / 50	Aachal Ramesh Lonkar	Shri. Dnyaneshwar Maskuji Burungale Science and Art College, Shegaon.	9420562601	B.Sc II
6/6/2020 7:50:19	pallavipise2609@gmail.com	18 / 50	Pallavi Babu rao Pise	Shri D. M. Burungale arts and science College Shegaon	9604498356	B.Sc II
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6/6/2020 7:59:21	tambudkarsneha@gmail.com	14 / 50	sneha Rajendra Tambuskar	Bar. RDIK & OF science collage Badnera	8625910316	M.Sc II
6/6/2020 8:04:35	hazraananya386@gmail.com	26 / 50	Ananya Hazra	Dr. Bhupendranath Dutta Smriti Mahavidyalaya	8250380321	B. Sc III
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6/6/2020 8:25:49	bhushandeulkar31@gmail.com	18 / 50	Bhushan Dipakrao Deulkar	Indira Gandhi Arts & Science College, Ralegaon	7387893024	B.Sc II
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6/6/2020 8:36:11	pranitbonde6@gmail.com	8 / 50	Pranit bonde	R j rathod	9021778040	B.Sc I
6/6/2020 8:38:49	sr59271@gmail.com	6 / 50	MR.SHARMA ROHANKUMAR.SURESI	KADI UNIVERSITY	7383350178	Other
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6/6/2020 8:52:42	ananyaa.mondal.2017@gmail.com	32 / 50	Ananyaa Mondal	Dr. Bhupendra Nath Dutta Smriti Mahavidyalaya	8637083089	B. Sc III
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6/6/2020 9:23:50	aniketkhedkar99@gmail.com	14 / 50	Aniket Sunil Khedkar	Shri Dr. R. G. Rathod Arts and Science College Murtizapur	8208261132	B. Sc III
6/6/2020 9:26:13	ishita96.ghosh@gmail.com	40 / 50	Ishita Ghosh	Visva-Bharati	8900252549	B. Sc III
6/6/2020 9:32:12	aratirathod652@gmail.com	24 / 50	Arati Ramkrushna Rathod	Indira gandhi kala mahavidyalay Ralegoan	9021795927	B.Sc II
6/6/2020 9:36:03	naysedivya@Gmail.com	42 / 50	Divya Dnyaneshwar Nayse	S.D.M.B. science and arts college, shegaon	7057497882	B.Sc I
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6/6/2020 9:52:22	poonamkulmethe2001@gmail.com	20 / 50	Poonam Suresh kulmethe	Amlokchand Mahavidyalaya yavatmal	8378885267	B.Sc I
6/6/2020 9:53:25	saqulainkhan48@gmail.com	18 / 50	Saqulain Ayub Khan	Bapumiya sirajoddin patel arts, commerce and science College. Pimpalgaon k	7972512595	B.Sc I
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6/6/2020 10:00:37	wb.riyahazra@gmail.com	32 / 50	Riya Hazra	Dr.Bhupendra nath Dutta smriti Mohavidyalay	8818088052	B. Sc III
6/6/2020 10:02:32	osamamohd2017@gmail.com	18 / 50	Mohd Osama Mohd Rashid	B S patel art comm science college pimpadgaon kale	7276741575	B. Sc III
6/6/2020 10:03:58	ruchitagulhane268@gmail.com	24 / 50	Ruchita Rajesh Gulhane	RDIK & KD college	8975860507	Other
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6/6/2020 10:12:03	pragatidudhe27@gmail.com	16 / 50	Pragati Dineshrao Dudhe	Aadarsh College Dhamangaon Rly	9552094256	B. Sc III
6/6/2020 10:13:07	ganeshbhagat1916@gmail.com	14 / 50	Ganesh Shankar Bhagat	Shri D.M.Burungle science &art college,Shegaon	9325147854	B.Sc II

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6/6/2020 10:14:19	anuradhasjoshi30@gmail.com	48 / 50	Anuradha Sakharam Joshi	RDIK clg badnera	8975500602	M.Sc II
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6/6/2020 11:55:44	sonuexam29@gmail.com	38 / 50	Niraj Bhola Khangale	Bar Ramrao Deshmukh Arts, Smt. Indiraji Kapadia Commerce & Nyayamurti	9604627810	M.Sc I
6/6/2020 11:57:09	dikshabarve01@gmail.com	14 / 50	Diksha Barve	St Xavier's College Mapusa Goa	7038317930	B.Sc II
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6/6/2020 12:02:10	shubham27junghare@gmail.com	10 / 50	Shubham Subhash Junghare	Amv Dhamangaon rly	7263886654	M.Sc II
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6/6/2020 14:31:56	sunitamugali72@gmail.com	28 / 50	Dr.SUNITA CHINMALLI Assistant Profes	S S MARGOL DEGREE COLLEGE SHAHABAD	9449956799	B.Sc II
6/6/2020 14:33:53	mrunalibokde9@gmail.com	30 / 50	Mrunali anil bokde	Vidhharbha institute of science and humanity Amravati	8600280300	Other
6/6/2020 14:34:13	gauravtiwalkar@gmail.com	46 / 50	Gaurav Dadarao Tiwalkar	R. D. I. K. & K. D. College, Badnera, Amravati	8380869146	M.Sc II
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6/6/2020 14:37:28	poonamnarkhede2521@gmail.com	38 / 50	Poonam shrinivas Narkhede	VMV clg malkapur	9156120536	Other
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6/6/2020 14:51:54	suneelsingh6920@gmail.com	10 / 50	SUNEEL SINGH YADAV	PG college Ghazipur	9125342353	M.Sc II
6/6/2020 14:53:02	ashvini9370@gmail.com	18 / 50	Ashvini Dhanraj Nakhale	DRGIT&R,Amrvati	9370415683	M.Sc II
6/6/2020 14:53:32	srinathvaishali@gmail.com	16 / 50	Vaishali Vishnu Shrinath	D.M.Burungale college,shegoan	7499745512	B.Sc II
6/6/2020 14:54:38	patilpragati69@gmail.com	38 / 50	Pragati Bhimrao Patil	Govt. Vidarbha Institute of Science and Humanities, Amravati	9096620358	M.Sc II
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6/6/2020 15:01:23	achalkapse1996@gmail.com	50 / 50	Sayali Ramkrushna kapse	K.D.K. College Of Engineering, Nagpur	8080094895	Other
6/6/2020 15:02:25	sanketitayade9325@gmail.com	22 / 50	SANKETI BHASHKAR TAYADE	Adarsha science, j. B. Arts and birla Commerce mahavidyalaya	9356607794	B.Sc II
6/6/2020 15:02:34	chetanrc.accm@gmail.com	20 / 50	Dipti ramesh chopade	Vidnyan mahavidyalay malkapur	7387759477	B. Sc III
6/6/2020 15:05:03	anaghapadwad1@gmail.com	12 / 50	Anagha Purushottam Padwad	Arts, commerce and science college Kiran nagar Amravati	8625096514	M.Sc II

6/6/2020 15:07:23	wankhadeneha2@gmail.com	50 / 50	Neha Diliprao Wankhade	Mahatma Fule mahavidyalay Warud	7083275645	B. Sc III
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6/6/2020 15:26:59	mayurinandeshwar0000@gmail.com	16 / 50	Mayuri Nandeshwar.	R.G.Rathode College	8180892869	B.Sc I
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6/6/2020 16:45:19	Urathod605@gmail.com	22 / 50	Umesh Prakash Rathod	Govt. V.I.S.H. Amravati	7276164295	M.Sc II
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6/6/2020 17:07:58	pratikshahage26@gmail.com	48 / 50	Pratiksha Laxman Hage	Shri dnyaneshwar maskuji burugale science and art collage shegaon	9021461858	B.Sc I
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6/6/2020 17:37:36	deshmukhaarati57@gmail.com	16 / 50	Aarti Vikas Deshmukh	Brijlal Biyani Science College	9657222831	M.Sc II
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6/6/2020 19:25:18	nehamurarka77@gmail.com	16 / 50	Neha Sunil Murarka	Shri Dnyaneshwar Maskuji Burungale Science and Arts College, Shegaon	8459198475	B. Sc III
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6/6/2020 21:05:00	rathodashutosh91@gmail.com	28 / 50	Ashitosh Ramprasad Rathod	Bapuraoji Butle Arts, Narayanrao Bhat Commerce & Bapusaheb Patil Scienc	9022857601	B.Sc II
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6/6/2020 22:41:20	aniketajmire96k@gmail.com	34 / 50	Pranali Dipakrao Ajmire	Adarsha clg Dhamngaon	9607563574	M.Sc I
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6/6/2020 23:00:58	jaiepimpalkar384@gmail.com	24 / 50	Jaie R. Pimpalkar	Adarsh mahavidyalaya dhamangaon rly	9595538691	B.Sc II
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6/6/2020 23:14:39	sarikarekhate@gmail.com	32 / 50	Sarika Nandkishor Rekhate	Sant Gadge Baba Amaravati University	7499050042	M.Sc I
6/6/2020 23:30:34	hemantuike563@gmail.com	30 / 50	HEMANT SURESHRAO UIKE	GOVT. VIDARBHA INSTITUTE OF SCIENCE AND HUMANITIES AMI	7057146694	M.Sc II
6/6/2020 23:31:35	adityamadame358@gmail.com	26 / 50	Aditya Sanjayrao Madame	Adarsha Science College Dhamangaon Rly	9607473190	M.Sc II
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6/7/2020 0:12:48	rahulgedam1992@gmail.com	16 / 50	Rahul Vitthal Gedam	S. P. M. Science and Gilani Art's commerce college Ghatanji	9689791042	M.Sc II
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6/7/2020 6:26:09	achalchaudhari027@gmail.com	12 / 50	Achal Raju Chaudhari	Indira Gandhi Kala Mahavidualy Ralegaon	9529051600	B.Sc I

6/7/2020 6:50:49	bhartirathod661@gmail.com	16 / 50	Bharti Vinod Rathod	B. B. Arts. N. B. Commers. B. P. Science. College digars	9307888124	B.Sc I
6/7/2020 8:24:20	nileshdhone177@gmai.com	44 / 50	Harshal Raju Thakre	Government Polytechnic Arvi	7066510663	Other
6/7/2020 8:34:49	rajdeepkandarkar1998@gmail.com	36 / 50	Rajdeep Gajanan Kandarkar	Department Of Mathematics, SGBAU.	7038000609	M.Sc I
6/7/2020 8:45:24	karanpawar291296@gmail.com	16 / 50	Karan Vasantrao Pawar	M. M. College	9503967350	B. Sc III
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6/7/2020 9:05:58	abhigawhane2712@gmail.com	6 / 50	Abhishek Sukhdev Gawhane	B. B. Arts, N. B. Commerce and B. P. Science College digras	8766419832	B.Sc II
6/7/2020 9:21:22	atharva.m.kawathe@gmail.com	20 / 50	Atharva Manoj Kawathe	Government College of Engineering, Amravati	7218397620	Other
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6/7/2020 9:24:17	sdixit1245@gmail.com	30 / 50	Shubham C. Dixit	Government College of engineering amravati	8788156570	Other
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6/7/2020 9:53:48	pranalishende208@gmail.com	38 / 50	PRANALI DRONACHARYA SHENDE	Government College Of Engineering Amravati		Other
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6/7/2020 9:57:28	gauravgadbail6@gmail.com	46 / 50	Gaurav Narayanrao Gadbail	Govt. Vidarbha Institute of science and Humanities	9665930458	Other
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6/7/2020 9:58:53	joshishemant1999@gmail.com	34 / 50	Hemant Joshi	Vishwakarma Institute of technology	7030059206	Other
6/7/2020 9:59:22	sakshijamunkar@gmail.com	8 / 50	Sakshi Subhash Jamunkar	Amolakchand Mahavidyalaya Yavatmal	7972679936	B.Sc I
6/7/2020 10:04:08	tafeemkausar7@gmail.com	50 / 50	Tahereem Kausar Iftekhar Ahemad	B.B Arts, N.B Commerece and B.P Science College Digras	9922084453	B. Sc III
6/7/2020 10:06:41	prajaktapradhan1998@gmail.com	12 / 50	Ku. Prajakta Vilas pradhan	Y. C. Arts and Science college mangrulpir	9356615856	B. Sc III
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6/7/2020 10:17:39	sarangkuk2000@gmail.com	2 / 50	Sarang Chandrakant Kukade	Government College of Engineering, Amravati	9769237720	Other
6/7/2020 10:21:43	sakshikasare10@gmail.com	12 / 50	Sakshi Sanjay kasare	Amolakchan mahavidyalaya yavatamal	8080480968	B.Sc I
6/7/2020 10:34:31	surajpalimkar123@gmail.com	36 / 50	Suraj Dinant Palimkar	Government College Of Engineering Amravati	8208106942	Other
6/7/2020 10:40:22	anujg5350@gmail.com	18 / 50	Anuj Manish Gupta	Government college of engineering amravati	9270458677	Other
6/7/2020 10:51:41	swa12mini34@gmail.com	16 / 50	Swamini Kukade	Government college of engineering,Amravati	9766845145	Other
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6/7/2020 11:02:46	maheshwar0088@gmail.com	26 / 50	Maheshwar D. Gaikwad	Govt. College of Engineering, Amravati	7558796691	Other
6/7/2020 11:03:09	anuradhabhonde2006@gmail.com	10 / 50	Ku. Anuradha Gajanan Bhonde.	Dr. R. G. Rathod Arts and Science college murtizapur	9130979246	B.Sc II
6/7/2020 11:05:05	adhone180@gmail.com	18 / 50	Ashish Dhone	Government college Of Engineering, Amravati	7038414870	Other
6/7/2020 11:06:34	shashwatdk00@gmail.com	40 / 50	Shashwat Dilip Kalbandhe	Government college of engineering Amravati	7522912858	Other
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6/7/2020 11:08:07	akshayganorkar789@gmail.com	20 / 50	Akshay Prabhakarro Ganorkar	Sant Gadge Baba Amravati University Amravati	7083959025	M.Sc II
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6/7/2020 11:24:37	ankuchavhan11@gmail.com	50 / 50	Ankush Rajesh Chavhan	Government College of engineering Amravati	7387137596	Other
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6/7/2020 11:35:40	chaitalirathod2018@gmail.com	22 / 50	Chaitali Ramesh Rathod	Government College of engineering Amravati	9359758017	Other
6/7/2020 11:37:46	daveeshani1010@gmail.com	8 / 50	Eshani dharmendra Kumar dave	Shri & smt p.k.kotawala arts college	9427612638	Other
6/7/2020 11:39:26	todasepallavi441@gmail.com	12 / 50	Pallavi Ravbaji Todase	Indira Gandhi kala mahavidyaly ralegaon	9529244574	B.Sc 1
6/7/2020 11:41:27	muskankhurana2014@gmail.com	22 / 50	Muskan Harish Khurana	Aadarsh college, dhamangaon	7709487153	M.Sc 1
6/7/2020 11:42:24	ankitakothalkar21@gmail.com	28 / 50	Ankita Gajanan Kothalkar	Bapumiya Sirajoddin Patel Art, Commerce and Science College Pimpalgaon k	7775856307	B. Sc III
6/7/2020 11:42:49	vivekmadavi321@gmail.com	16 / 50	Vivek Suresh Madavi	GCOEA	7038324097	Other
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6/7/2020 12:21:28	shraddhaahir2000@gmail.com	12 / 50	Shraddha Prabhakar Ahir	Shri Dnyaneshwar Maskuji Burungale Science and Art college shegaon	8459262017	B.Sc II
6/7/2020 12:24:01	amitkale1026@gmail.com	32 / 50	Amit Shamrao kale	Government college of Engineering, Amravati	9689244754	Other
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6/7/2020 13:22:23	vaishnavibole54@gmail.com	26 / 50	Vaishnavi manohar bole	Shri dr R G Rathod art and science college murtizapur	8698604284	M.Sc 1
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6/7/2020 14:11:11	yashawantvdeshmukh@gmail.com	10 / 50	Yashwant Vijay Deshmukh	Shri Shivaji Agricultural College, Amravati	8381047431	B.Sc II
6/7/2020 14:12:29	shrungarediksha@gmail.com	50 / 50	Ku. Diksha Ramesh Shrungare	Y. C. Art's And Science College Mangrulpir	9011852096	B. Sc III
6/7/2020 14:15:37	prajwalpisudde52431@gmail.com	32 / 50	Prajwal Arun Pisudde	University Institute of Chemical Technology, Jalgaon	9119457345	Other
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6/7/2020 14:32:19	dpmulay729@gmail.com	26 / 50	DNYANESHWAR PURUSHOTTAM MU	GOVERNMENT COLLEGE OF ENGINEERING AMRAVATI		Other
6/7/2020 14:42:39	thakrepragati2002@gmail.com	18 / 50	Pragati Yogiraj Thakare	Government polytechnic yavtmal	7972597753	Other
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6/7/2020 14:44:24	anshkarale@gmail.com	8 / 50	Ku. Ashwini Santosh Karale	Amolakchand mahavidyalaya, yavtmal	7447385403	B.Sc 1
6/7/2020 15:00:59	avantikabahakar125@gmail.com	26 / 50	Avantika Madhusudan Bahakar	Government college of engineering amravati	9881485465	Other
6/7/2020 15:21:12	cmoon8417@gmail.com	24 / 50	Priya Chakraborty	Siliguri girls high school	9064440924	Other
6/7/2020 15:31:41	kartiklawangewar@gmail.com	34 / 50	Kartik Sanjay Lawangewar	Government College Of Engineering, Amravati	7774951536	Other
6/7/2020 15:40:08	sakshilanjewar46168@gmail.com	8 / 50	Sakshi Sunil Lanjewar	SHREE DR.R.G RATHOD ART'S AND SCIENCE COLLEGE MURTIZAI	9921547624	B.Sc 1
6/7/2020 15:46:53	kajalramteke04@gmail.com	26 / 50	Kajal Bharat Ramteke	Government College of Engineering Amravati	7083112793	Other
6/7/2020 15:50:26	anupawari143@gmail.com	14 / 50	Anup Gosai Awari	Government college of engineering jalgaon	8669890421	Other
6/7/2020 15:51:05	sakshigawarshettiwar@gmail.com	8 / 50	Sakshi chandrashekhar gawarshettiwar	Amolakchad mahavidyalay yavatmal	8007556317	B.Sc 1
6/7/2020 16:05:48	samikshapatil61197@gmail.com	10 / 50	Samiksha Madanrao Patil	R.d.i.k.college badnera	7875374346	M.Sc II
6/7/2020 16:08:50	guestownerog@gmail.com	28 / 50	Aditya Joshi	VMV		Other
6/7/2020 16:20:15	rsshrinath@gmail.com	20 / 50	Ritika shalikram shirnath	Shri Dr R G Rathod Arts and Science College Murtizapur	8888997595	M.Sc 1

6/7/2020 16:21:55	krishnalata899@gmail.com	28 / 50	Ku krishna kamalkishor Lata.	Shree Dr R.G.Rathod arts and science college ,murtizapur	9284285699	M.Sc 1
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6/7/2020 16:33:15	ankittelgote411@gmail.com	18 / 50	Ankit Telgote	Government College of Engineering, Jalgaon	7666030577	Other
6/7/2020 16:38:43	wankhederenuka21@gmail.com	18 / 50	Renuka subhashrao wankhede	Aadarsh mahavidhalaya dhamangaon rly	8380876380	M.Sc II
6/7/2020 16:43:27	suhaskolse13@gmail.com	36 / 50	SUHAS MADHUKAR KOLSE	SKNCOE,Pune	9503281025	Other
6/7/2020 17:01:20	sauravdeshmukh7768@gmail.com	48 / 50	Deshmukh Saurav Dadarao	Government College of Engineering Jalgaon	7378557580	Other
6/7/2020 17:04:09	akulwarprathamesh555@gmail.com	44 / 50	Prathamesh Similes Akulwar	Government college of engineering, Amravati	7558427467	Other
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6/7/2020 17:26:08	saurabhghugeking@gmail.com	40 / 50	Saurabh Diliprao Ghuge	Government College Of Engineering Jalgaon	9579354717	Other
6/7/2020 17:26:25	vaishnaviraut922001@gmail.com	16 / 50	Vaishnavi Vinod Raut	VIIT,PUNE	8788707698	Other
6/7/2020 17:27:12	shivrajdhale973@gmail.com	8 / 50	Dhale Shivraj prabhakar	Government College of engineering jalgaon	8788305963	Other
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6/7/2020 17:31:58	dhawaleroshan2808@gmail.com	14 / 50	ROSHAN BALKRUSHNA DHAWALE	Government college of engineering jalgaon	7350252060	Other
6/7/2020 17:32:05	shivamdahale123@gmail.com	16 / 50	Shivam dahale	Dr.R.g rathod art and science college murtizapur	8485852916	B. Sc III
6/7/2020 17:43:45	reshmamohitepatil123@gmail.com	12 / 50	Reshma Sahadev Mohite	Shri. D. M. Burungale college shegaon	8600559253	B.Sc II
6/7/2020 17:46:22	prachimirase@gmail.com	34 / 50	Prachi Ravi Mirase	Government college of engineering,Amravati	9011773503	Other
6/7/2020 17:47:51	sudarshandarade21@gmail.com	18 / 50	Sudarshan Bhaskar darade	Government engineering college Jalgaon	9168151912	Other
6/7/2020 18:02:42	ashish.kottur.comp.2019@vpkbiet.org	20 / 50	Ashish Anil Kottur	VP college	7020192641	Other
6/7/2020 18:05:47	jaiswalvaishnavi65@gmail.com	14 / 50	Vaishnavi Rajulal Jaiswal	Amolakchand Mahavidyalaya Yavatmal	8459025834	B.Sc 1
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6/7/2020 18:50:42	thakarepratiksha89@gmail.com	28 / 50	Pratiksha Sanjay Thakare	SPM GILANI COLLAGE GHATANJI	9307009792	B.Sc II
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6/7/2020 19:28:26	chetangarghate000@gmail.com	6 / 50	Chetan Diliprao Garghate	Adarsha College Dhamangaon Rly	9309934653	M.Sc 1
6/7/2020 19:32:17	pathodepuja0@gmail.com	8 / 50	Puja Sanjay Pathode	Dr.R.G.Rathode Arts&Science College Murtizapur	9356355721	B.Sc II
6/7/2020 19:33:30	tejaswinigarpal8055@gmail.com	32 / 50	Tejaswini pramod garpal	Rdik and kd clg Badnera, Amravti	7420913810	M.Sc 1
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6/7/2020 19:41:16	pkpraful885@gmail.com	30 / 50	Praful revanath kumare	S.p.m college ghatanji	8459600804	Other
6/7/2020 19:42:16	snehapkhandare@gmail.com	42 / 50	Sneha Punjaji Khandare	Government Vidarbha Institute Of Science And Humanities, Amravati	7620133685	M.Sc II
6/7/2020 19:44:48	rushigawande3696@gmail.com	50 / 50	Rushikesh Ramesh Gawande	BB.Arts,NB.Commerce And BP.Science College, Digras	9730483637	B.Sc 1
6/7/2020 19:49:18	gedamsnehal07@gmail.com	46 / 50	Snehal Vijay Gedam	S p m Gillani college Ghatanji	7083622032	B. Sc III
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6/7/2020 20:17:10	pranalibhalge23@gmail.com	10 / 50	Pranali bhagwan bhalge	B.B arts, N.B commerce and B.P science college, digras	7499179465	B. Sc III
6/7/2020 20:24:26	vp882001@gmail.com	24 / 50	VISHAL AMBADAS PAWAR	Government college of engineering jalgaon	7507461754	Other
6/7/2020 20:35:33	vedantshirbhate25@gmail.com	8 / 50	Vedant sanjayrao shirbhate	Government college of engineering amravati	8390637021	Other
6/7/2020 20:38:52	chandrikamadavi2001@gmail.com	12 / 50	Chandrika Pramod Madavi	Government college of engineering Amravati	7666297027	Other
6/7/2020 20:53:10	samikshap144@gmail.com	8 / 50	Samiksha Raju Patil	Amolakchand Mahavidyalaya, Yavatmal	8947787368	B.Sc II
6/7/2020 20:55:47	sshirbhate23@gmail.com	30 / 50	Sakshi Gajanan Shirbhate	Government College Of Engineering, Amravati	9623164405	Other
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6/7/2020 21:02:29	mtikar7@Gmail.com	16 / 50	Manoj Rajendra Tikar	Govt. College of education	9527547510	Other
6/7/2020 21:08:01	ujjwalarathod65407@gmail.com	48 / 50	Shweta Vinod Rathod	Mauli group of institute collage of engineering and technology,Shegaon	9518940354	Other
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6/7/2020 21:23:14	chavhanmanisha199@gmail.com	14 / 50	Manisha sanjay Chavhan	BB arts nb commerce bp science College digras	9284326139	B.Sc I
6/7/2020 21:39:55	komaltayade27@gmail.com	18 / 50	Komal Devanand Tayade	Mauli college of engineering and technology shegaon	9579816162	Other
6/7/2020 21:41:00	vikramkhursange80754@gmail.com	50 / 50	Pratham Vikram Khursange	S.p.m College Ghatanji	9309906948	Other
6/7/2020 21:42:34	vidyaattarkar9@gamil.com	12 / 50	Vidya sunil attarkar	Bapumiya sirajoddin Patel ACS college p . Kale	9370446952	B.Sc I
6/7/2020 21:43:34	harish11pawar@gmail.com	0 / 50	Harish Vasantrao Pawar	Amolakchad Mahavidylay Yavatmaal	7387709715	B.Sc I
6/7/2020 21:44:21	abhinashpadha1@gmail.com	36 / 50	ABHINASH PADHA	Jammu University	9149581878	Other
6/7/2020 21:54:47	pkove1954@gmail.com	16 / 50	Sahil Rajesh kove	Sandipani English medium school	8605387348	Other
6/7/2020 21:58:35	amarmeshramuvc@gmail.com	6 / 50	Amar Dipak Meshram	SPM Science & gilani art, commerce college ghatanji	9370202721	B.Sc II
6/7/2020 21:59:29	shubhampatil8675@gmail.com	24 / 50	Shubham Mohan Patil	T.C.College	7499027375	B.Sc I
6/7/2020 22:20:08	mohanpatil7319@gmail.com	2 / 50	Shubham Mohan Patil	T.C.College		B.Sc I
6/7/2020 22:20:09	mandwepriti@gmail.com	8 / 50	Ku.Priti Sudhakarrao Mandwe.	Shri.Dr.R.G.Rathod Arts And Science College ,Murtizapur, Dist:- Akola	8329818359	M.Sc I
6/7/2020 22:26:42	chanchalsalampuria12@gmail.com	12 / 50	Chanchal Salampuriya	Mauli group of institution Shegaon	9767991652	Other
6/7/2020 23:04:23	mqasimshaikhisa@gmail.com	16 / 50	MOHAMMAD QASIM SHAIKH ISA	BAPUMIYA SIRAJODDIN PATEL ARTS COMMERS & SCIENCE COLI	7887373833	B. Sc III
6/8/2020 7:15:38	vgmansute@gmail.com	22 / 50	Vaishnavi Ganesh Mansute	Shri. D. M. Burungale college shegaon	9158767648	B.Sc II
6/8/2020 7:27:45	skale480@gmail.com	32 / 50	Sagar Vijay Kale	Shri Shivaji College of Arts Commerse and Science Akola	7875454864	M.Sc II
6/8/2020 8:07:25	pujawagh44@gmail.com	48 / 50	Puja Narayan Wagh	Government Vidarbha institute of Science and Humanities Amravati	7720864910	M.Sc I
6/8/2020 9:27:39	shubhamnannaware000@gmail.com	12 / 50	Shubham Diwakar Nannaware	Government college of engineering, Amravati	7378703139	Other
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6/8/2020 11:48:03	pp2534000@gmail.com	10 / 50	Priyanka patil	Adarsh science college chandur rly	9356328709	M.Sc II
6/8/2020 12:04:06	asmitakamble1997@gmail.com	34 / 50	Asmita Sudam Kamble	Adarsh Science College Chandur rly	7410730364	M.Sc II
6/8/2020 12:29:37	labhanshujadhav15@gmail.com	14 / 50	Labhanshu Jadhav	Adarash science JB arts Birla commerce Mahavidyalaya Dhamamgaon railwa	7498645981	B.Sc II
6/8/2020 13:00:09	santosh1tadulwar@gmail.com	50 / 50	Santosh Ganesh Tadulwar	Lokmanya Tilak Mahavidyalaya ,wani	8421256164	Other
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6/8/2020 15:17:53	vaishnavitidke112@gmail.com	20 / 50	Vaishnavi Kailas Tidke	Mgicoet Shegaon	9168406616	Other
6/8/2020 15:36:54	chatebharati98@gmail.com	14 / 50	Bharati Vijay Chate	Mauli group of institutions college of engineering and technology shegoan	9763296635	Other
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Academic Year 2019-20

1.Name of Organizing Department / Committee: Department of Computer Science

2. Name of Activity : Short Term Course (Web Development)

3. No. of Participants : Students 55 Teachers 01 Other

4. Details of Activity (In Brief):

Short Term Course **"Web Development"** is organized by Department of Computer Science & Pune Academy of Advance Computer technologies on dated 17th Feb. 2020 to 25th Feb. 2020. The training language in this course is PHP & MYSQL.

Outcome of the Program:

- This training will inculcate a level of confidence to help then aspirant for achieving numerous career objectives.
- To gain the knowledge about PHP & MYSQL program /Language.
- To acquire the knowledge of technical & Practical of web Application.
- To develop problem solving thinking process.
- The student will become aware of web application in PHP & MYSQL language.

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Nyayamurti Krishnarao Deshmukh Science College, Badnera-Amravati.
Department of Computer Science

And

Pune Academy of Advance Computer Technologies

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CERTIFICATE

This is to certify that

Mr./Mrs. Pratiksha S. Khandar

has successfully completed 5 days Short Term Course on

"Web Development"

from 17 Feb. to 25th Feb 2020

Pune Academy of Advance Computer Technologies Amravati

Mr. S. S. Lakde
(Center Co-Ordinator)
(PACT, Amravati)

Prof. S. G. Choudhary
(Convener & Head)
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Dr. R. D. Deshmukh
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Academic Year 2019-20

1.Name of Organizing Department / Committee: Department of Computer Science

2. Name of Activity : M.Sc. Project (under MoU)

3. No. of Participants : Students 09 Teachers 04 Other

4. Details of Activity (In Brief):

The project duration will be from 3/1/2020 to 15/3/2020.the training language in PHP and ASP.Net.

Outcome of the Program:

- An Ability to effectively communicate technical concept in oral and written form.
- An ability to understand the social and ethical implication of working as a professional in the field of computer science.
- Students give knowledge to build web application and websites.
- Aware about handling real time problems and finding their solution.

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CERTIFICATE COURSE ADD ON COURSE ON PROJECT MAKING

CERTIFICATE OF PARTICIPATION

This is to certify that Mr./Mrs./Ku._____

has successfully completed "Add on Course on Project Making on PHP and ASP.net " Conducted by Department of Computer Science , Br. R. D. I. K. & N. K. D. College, Badnera, from Jan 2020 to March 2020 in_____ Division .

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12. Plane Symmetric Universe Filled With Electromagnetic Filed In $f(R)$ Theory of Gravity

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Abstract

In $f(R)$ theory of gravity, we have studied the electromagnetic fields in plane symmetric space-time, by considering the general case $f(R) = \lambda R$. It is observed that the convergent and isotropic solution of the metric function can be evolved with the components of the vector potentials.

Keyword: Plane symmetric, electromagnetic field, $f(R)$ theory of gravity**,** constant vector potentials.

Introduction

Now a days there has a lot of interest of cosmologists in modified theory of gravity in the view of the direct evidence of late time accelerated expansion of the universe which comes from high redshift supernova experiment (Riess *et al* [1,2]).There are mainly two approaches in $f(R)$ theory of gravity. The first is called "metric approaches" in which the connection is the Levi-Civita connection and the variation of the action is done with respect to metric. The second approach is "Platini formalism" in which connection and the metric are considered independent of each other and the variation done for parameters independently. Sharif and Shamir [3] have studied plane symmetric solution in $f(R)$ gravity. The idea of introducing additional terms of the Ricci scalar to the Einstein-Hilbert action did not begin years ago with the $f(R)$ theory of gravity (Carroll *et.al* [4]).There are two kinds of alternative accelerated expansion of the universe have been proposed for this unexpected observational phenomenon. One is negative

pressure known as dark energy (DE) which induces a late-time accelerating cosmic expansion and the other one is the modified gravity, which originates from the idea that the general relativity is inadequate in the cosmic scale and therefore need to be modified. The $f(R)$ theory of gravitation formulated by Nojiri and Odintsov [5,6]. In order to explain the nature of the DE and accelerated expansion, a variety of theoretical models have been proposed in literature.

Symmetry plays an important role to find exact analytical solution for R^2 gravity, by invoking Nother symmetry [7]. Further it has been shown [8], that there exists a conserved current, other that Nother current, for a general scalar tensor theory of gravity, nonminimally coupled to a scalar field under certain condition [9]. In our opinion, one of interesting and prospective version of modified gravity theories is the $f(R,T)$ gravity proposed by Harko *et al* [10,11].The exact solutions of $f(R,T)$ field equations for locally rotationally symmetric Bianchi type-I cosmological model has been discussed by Adhav [12]. Mete and Mule [13] studied Biachi-VI_0 magnetized cosmological model in $f(R)$ gravity. Bijan Saha [14] explored the interacting scalar and electromagnetic fields in Bianchi type-I universe. Solanke and Karade [15] have studied plane symmetric universe filled with combination of perfect fluid and scalar field with electromagnetic fields in $f(R,T)$ theory of gravity. Our interest is to explore the role of electromagnetic field played in the amended $f(R)$ theory of gravity in other Biachi types or metric universe. In this paper we considered plane symmetric metric universe.

Plane symmetric space-time

Here, we consider the plane symmetric metric in the form

$$ds^2 = dt^2 - A^2(dx^2 + dy^2) - B^2 dz^2 . \tag{1}$$

where A and B are functions of time t only.

Gravitational field equations of $f(R)$ gravity

The field equation of $f(R,T)$, theory due to Harko [10-11] are deduced by varying the action

$$S = \int f(R,T)\sqrt{-g}d^4x + \int L_m\sqrt{-g}dx^4 , \tag{2}$$

where L_m are Lagrangian and other symbols have their usual meaning

Varying the action equation (2) with respect to g^{ij} which yields

$$\delta S = \frac{1}{2x}\int\left\{f_R(R,T)\frac{\partial R}{\partial g^{ij}} + f_T(R,T)\frac{\partial T}{\partial g^{ij}} + \frac{f(R,T)}{\sqrt{-g}}\frac{\partial\sqrt{-g}}{\partial g^{ij}} + \frac{2x}{\sqrt{-g}}\frac{\partial\left(L_m\sqrt{-g}\right)}{\delta g^{ij}}\right\}\sqrt{-g}d^4x . \tag{3}$$

Considering $\delta s = 0$ from equation (3) upon integration, we obtain

$$f_R(R,T)R_{ij} - \frac{1}{2}f(R,T)g_{ij} + \left[g_{ij}\left(\nabla^i\nabla_j - \nabla_i\nabla_j\right)\right]f_R(R,T) = xT_{ij} - f_T(R,T)\left[T_{ij} + \theta_{ij}\right], \tag{4}$$

where ∇_i is the covariant derivative.

Replaced $f(R,T)$ by $f(R)$ in equation (4), we obtain

$$f_R(R)R_{ij} - \frac{1}{2}f(R)g_{ij} + \left[g_{ij}\left(\nabla^i\nabla_j - \nabla_i\nabla_j\right)\right]f_R(R) = xT_{ij}, \tag{5}$$

Taking trace of equation (5), we get

$$\nabla^i\nabla_j f_R(R) = \frac{1}{3}xT + \frac{2}{3}f(R) - \frac{1}{3}f_R(R). \tag{6}$$

Energy momentum tensor for electromagnetic field

Energy momentum tensor for electromagnetic field is given by

$$T_{ij} = L_m g_{ij} - 2\frac{\partial L_m}{\partial g^{ij}}, \tag{7}$$

where $L_m = \frac{1}{4}F_{kl}F^{kl}$ and F_{kl} electromagnetic field $\frac{\partial L_m}{\partial g^{ij}} = \frac{1}{2}g^{\alpha k}F_{\alpha i}F_{kj}$, (8)

Using equation (8), the equation (7) reduces to

$$T_{ij} = F_{ki}F_j^k + \frac{1}{4}F_{kl}F^{kl}g_{ij} \tag{9}$$

The equation (9) can be conveniently expressed in the mixed form

$$T_j^i = F_k^i F_j^k + \frac{1}{4}g_j^i F_{kl}F^{kl}. \tag{10}$$

Electromagnetic field tensor

The electromagnetic field tensor is given by

$$F_{ij} = \frac{\partial V_i}{\partial x^j} - \frac{\partial V_j}{\partial x^i}. \tag{11}$$

To achieve the capability with non-static space time (1), we assume electromagnetic vector potential in the form

$$V_i = \left[u(\alpha)v_1(t), v_2(t),\ v_3(t), v_4(t)\ \right]. \tag{12}$$

From equations (11) and (12), we can easily deduce

$$F_{14} = u\dot{v}_1, F_{24} = \dot{v}_2, F_{34} = \dot{v}_3, F_{41} = -u\dot{v}_1, \tag{13}$$

$$F^{14} = -\frac{u\dot{v}_1}{A^2}, F^{24} = -\frac{\dot{v}_2}{A^2}, F^{34} = -\frac{\dot{v}_3}{B^2}, F^{41} = \frac{u\dot{v}_1}{A^2}. \tag{14}$$

From equations (13) and (14), we can compute

$$F_{ij}F^{ij} = -2\left[\frac{u\dot{v}_1^2}{A^2} + \frac{\dot{v}_2^2}{A^2} + \frac{\dot{v}_3^2}{B^2}\right]. \tag{15}$$

Using (14), we establish the following nonzero components of the energy momentum tensor of material field

$$T_1^1 = \frac{1}{2}\left[\frac{u\dot{v}_1^2}{A^2} - \frac{\dot{v}_2^2}{A^2} - \frac{\dot{v}_3^2}{B^2}\right]. \tag{16}$$

$$T_2^2 = \frac{1}{2}\left[-\frac{u\dot{v}_1^2}{A^2} + \frac{\dot{v}_2^2}{A^2} - \frac{\dot{v}_3^2}{B^2}\right]. \tag{17}$$

$$T_3^3 = -\frac{1}{2}\left[\frac{u^2\dot{v}_1^2}{A^2} + \frac{\dot{v}_2^2}{A^2} - \frac{\dot{v}_3^2}{B^2}\right]. \tag{18}$$

$$T_4^4 = \frac{1}{2}\left[\frac{u\dot{v}_1^2}{A^2} + \frac{\dot{v}_2^2}{A^2} + \frac{\dot{v}_3^2}{B^2}\right]. \tag{19}$$

From equations (16) to (19), we can deduced the components of energy tensor as follows

$$T_j^i = 0, \text{ for } i \neq j. \tag{20}$$

Variation of Lagrangian L_m with respect to electromagnetic field [14] gives

$$\frac{\partial}{\partial x^j}\left(\sqrt{-g}F^{ij}\right) = 0, \tag{21}$$

For $i = 1, j = 4$ $\quad \frac{(\dot{v}_1)^{\bullet}}{v_1} + \frac{\dot{v}_1^2}{v_1^2} + \frac{\dot{v}_1}{v_1}\left[\frac{\dot{B}}{B}\right] = 0.$ (22)

For $i = 2, j = 4$ $\quad \frac{(\dot{v}_2)^{\bullet}}{v_2} + \frac{\dot{v}_2^2}{v_2^2} + \frac{\dot{v}_2}{v_2}\left[\frac{\dot{B}}{B}\right] = 0.$ (23)

For $i = 3, j = 4$ $\quad \frac{(\dot{v}_3)^{\bullet}}{v_3} + \frac{\dot{v}_3^2}{v_3^2} + \frac{\dot{v}_3}{v_3}\left[\frac{2\dot{A}}{A} - \frac{\dot{B}}{B}\right] = 0.$ (24)

For $i = 4, j = 1$ $u = c.$ (25)

where c constant of integration

Since for space time (1), we get $R_2^1 = R_3^1 = R_3^2 = 0$ and from equation (10), give

$$\frac{\dot{v}_1}{v_1} = \frac{\dot{v}_2}{v_2} = \frac{\dot{v}_3}{v_3} = 0, \tag{26}$$

which further imply

$$\frac{\dot{v}_1}{v_1} = \frac{\dot{v}_2}{v_2} = \frac{\dot{v}_3}{v_3} = \frac{\dot{D}}{D}, \tag{27}$$

where D is some unknown function of t.

Using equation (27), we obtain

$$v_1 = k_1 D, v_2 = k_2 D, v_3 = k_3 D, \tag{28}$$

where k's are constants of integration.

Solution of field equations

As in Solanke and Karade [16], we consider

$$\frac{u\dot{v}_1^2}{A^2} + \frac{\dot{v}_2^2}{A^2} + \frac{\dot{v}_3^2}{B^2} = \left[\frac{u^2\dot{v}_1^2}{A^2} + \frac{\dot{v}_2^2}{A^2} + \frac{\dot{v}_3^2}{B^2}\right]\left(\frac{\dot{D}}{D}\right)^2 = -I\left(\frac{\dot{D}}{D}\right)^2$$

Now our plan is to express the components of T_j^i in terms of T_4^4

$$T_1^1 = \frac{u\dot{v}_1^2}{2A^2} - \frac{\dot{v}_2^2}{2A^2} - \frac{\dot{v}_3^2}{2B^2} = -T_4^4 - \frac{u^2\dot{v}_1^2}{A^2}\left(\frac{\dot{D}}{D}\right)^2, \tag{29}$$

$$T_2^2 = -\frac{u\dot{v}_1^2}{2A^2} + \frac{\dot{v}_2^2}{2A^2} - \frac{\dot{v}_3^2}{2B^2} = -T_4^4 + \frac{\dot{v}_2^2}{A^2}\left(\frac{\dot{D}}{D}\right)^2, \tag{30}$$

$$T_3^3 = -\frac{u\dot{v}_1^2}{2A^2} - \frac{\dot{v}_2^2}{2A^2} + \frac{\dot{v}_3^2}{2B^2} = -T_4^4 + \frac{\dot{v}_3^2}{B^2}\left(\frac{\dot{D}}{D}\right)^2, \tag{31}$$

$$T_4^4 = \frac{u\dot{v}_1^2}{2A^2} + \frac{\dot{v}_2^2}{2A^2} + \frac{\dot{v}_3^2}{2B^2} = -\frac{1}{2}I\left(\frac{\dot{D}}{D}\right)^2. \tag{32}$$

By using equation (28), we get trace of energy momentum tensor as

$$T = I\left(\frac{\dot{D}}{D}\right)^2 - I\left(\frac{\dot{D}}{D}\right)^2 = 0, \tag{33}$$

With the help of equations (28) and from equations (22) to (24), we get

$$\left(\frac{\dot{D}}{D}\right)^{\bullet}+\left(\frac{\dot{D}}{D}\right)^{2}+\frac{\dot{D}}{D}\left[\frac{\dot{B}}{B}\right]=0. \tag{34}$$

$$\left(\frac{\dot{D}}{D}\right)^{\bullet}+\left(\frac{\dot{D}}{D}\right)^{2}+\frac{\dot{D}}{D}\left[\frac{2\dot{A}}{A}-\frac{\dot{B}}{B}\right]=0 . \tag{35}$$

From equations (34) and (35), we get

$$\frac{\dot{A}}{A}=\frac{\dot{B}}{B}. \tag{36}$$

Integrating equations (36) with respect to t, we get

$$A=k_4 B, \tag{37}$$

where k_4 is a constant of integration.

Particular Case $f(R)=\lambda R$

we consider the particular case $f(R)=\lambda R$

$$f_R(R)=\frac{\partial f(R)}{\partial R}=\frac{\partial}{\partial R}\lambda R=\lambda \ , \tag{38}$$

The field equation (4) with the aid of (38), reduces to

$$\lambda R_{ij}-\frac{1}{2}\lambda R g_{ij}=xT_{ij}, \tag{39}$$

The equation (10) with the aid of (38), reduces to

$$xT+(\lambda R)=0, \tag{40}$$

Using equation (38) in (40), we obtain

$$\lambda R_{ij}+\frac{1}{2}(xT)g_{ij}=xT_{ij}. \tag{41}$$

The equation (41) can be conveniently expressed in the mixed form

$$\lambda R_i^j+\frac{1}{2}(xT)g_i^j=xT_i^j$$

$$\lambda\left[\frac{\ddot{A}}{A}+\frac{\dot{A}\dot{A}}{AA}+\frac{\dot{A}\dot{B}}{AB}\right]=x\left[-T_4^4+\frac{u^2\dot{v}_1^2}{A^2}\left(\frac{\dot{D}}{D}\right)^2\right] \tag{42}$$

$$\lambda\left[\frac{\ddot{A}}{A}+\frac{\dot{A}\dot{A}}{AA}+\frac{\dot{A}\dot{B}}{AB}\right]=x\left[-T_4^4+\frac{u^2\dot{v}_2^2}{A^2}\left(\frac{\dot{D}}{D}\right)^2\right] \tag{43}$$

$$\lambda\left[\frac{\ddot{B}}{B}+2\frac{\dot{A}\dot{B}}{AB}\right]=x\left[-T_4^4+\frac{\dot{v}_3^2}{B^2}\left(\frac{\dot{D}}{D}\right)^2\right] \tag{44}$$

$$\lambda\left[\frac{\ddot{B}}{B}+2\frac{\dot{A}}{A}\right]=x\left[-\frac{1}{2}I\left(\frac{\dot{D}}{D}\right)^2\right] \tag{45}$$

By using equation (33) and from equations (42) to (45), yields

$$\frac{\ddot{A}}{A}+\frac{\dot{A}\dot{A}}{AA}+\frac{\dot{A}\dot{B}}{AB}=0, \tag{46}$$

$$\frac{\ddot{B}}{B}+\frac{\dot{A}\dot{B}}{AB}+\frac{\dot{A}\dot{B}}{AB}=0\ , \tag{47}$$

$$\frac{2\dot{A}}{A}+\frac{\dot{B}}{B}=0. \tag{48}$$

From equations (37) and (46), we get

$$\frac{\ddot{A}}{A}+2\frac{\dot{A}^2}{A^2}=0. \tag{49}$$

Which on integration, give

$$A=\left(3k_5t+k_6\right)^{\frac{1}{3}}, \tag{50}$$

where $k_5\neq 0$ and $k_6=0$ are constants of integration.

From equations (37) and (47), we get

$$B=\left(3k_7t+k_8\right)^{\frac{1}{3}}, \tag{51}$$

where $k_7\neq 0$ and $k_8=0$ are constants of integration

From equations (37), (50) and (51), we get

$$A=B=\left(3d_1t+d_2\right)^{\frac{1}{3}}, \tag{52}$$

where $d_1=k_5=k_7\neq 0$ and $d_2=k_6=k_8$ are constants of integration.

From equation (34), we get

$$D = k_{10}\exp\left\{k_9\int\frac{1}{B}dt\right\}. \quad (53)$$ With

the help of equation (52) and the equation (28) convert in to

$$v_1 = k_{11}\exp\left\{k_9\int\frac{1}{B}dt\right\} \quad (54)$$

$$v_2 = k_{12}\exp\left\{k_9\int\frac{1}{B}dt\right\} \quad (55)$$

$$v_3 = k_{13}\exp\left\{k_9\int\frac{1}{B}dt\right\} \quad (56)$$

v_4 remain undetermined (57)

where k's is a constant.

Adjusting the all constants of equations (54) to (57) and the vector potential assume that the following form as

$$v_i = [k, k, k, v_4].$$

Using equation (52), the line element (1) reduces to

$$ds^2 = dt^2 - (3d_1t + d_2)^{\frac{2}{3}}\left[(dx^2 + dy^2) - dz^2\right]. \quad (58)$$

Conclusion

In this paper, we have investigated plane symmetric cosmological model in the presence electromagnetic field in $f(R)$ theory of gravity with particular case $f(R) = \lambda R$. It is observed that convergent non-singular, isotropic solution can be evolved for the metric function and the components of vector potential. Model shows that universe expand algebraically in $f(R) = \lambda R$ theory of gravity. The metric function in non-static space time admits constant value at early time of the universe $(t = 0)$ tends to zero and after that the metric function start increasing with increase in cosmic time and finally diverge to infinity as time tend to infinity .This shows that the universe expand and approaches to infinite volume. It is also interesting to note that the investigated model is free from singularity. Hence, the model approaches isotropic for the anytime.

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MAGNETIZED AXIALLY SYMMETRIC COSMOLOGICAL MODEL IN $f(R,T)$ THEORY OF GRAVITATION

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ABSTRACT

In this paper we have investigated the axially symmetric cosmological model in $f(R,T)$ theory of gravitation with the functional form $f(R,T)=R+2T$ in presence of electromagnetism. We get the isotropy at any cosmic time t, by converting the vector potential in the constant form.

Key words: *Axially symmetric universe, Electromagnetic Field, $f(R,T)$ theory of gravity.*

INTRODUCTION

The modified theory $f(R,T)$ theory of gravitation is proposed by Harko T. et al [7,8] where R is the curvature scalar and T is the trace of energy momentum tensor. Basically, two kinds of alternative reasons of accelerated expansion of the universe have been proposed for this unexpected observational phenomenon. One is Dark energy (DE) which has negative pressure and which induces a late-time accelerating cosmic expansion. The other is the modified gravity, which originate from the idea that the general relativity is incorrect in the cosmic scale and therefore need to be modified. In order to explain the nature of the DE and accelerated expansion, a variety of theoretical models have been proposed in literature. There are several modified gravity theories like $f(R)$ gravity formulated by Nojiri and Odintsov [5,6]. The idea of introducing additional terms of the Ricci scalar to the Einstein-Hilbert action did not begin years ago with the $f(R)$ theory of gravity paper by Carroll [4]. He explained the presence of a late time cosmic acceleration of the universe in $f(R)$ theory of gravity. In $f(R,T)$ theory of gravity, cosmic acceleration may result not only due to geometrical contribution to the total cosmic energy density but it is also depends on matter contents. Many authors have investigated different problem within the scope of $f(R,T)$ theory. Bijan Saha [9] has studied the interacting scalar and electromagnetic fields in Bianchi type I universe. Our interest is to explore the role of scalar and electromagnetic field played in the amended $f(R,T)$ of gravity in other Bianchi types or other metric universe. In this paper we consider auxiliary symmetric metric universe.

GRAVITATIONAL FIELD EQUATIONS OF F (R, T) GRAVITY

The action of theory of gravitation is as follows

$$S=\int f(R,T)\sqrt{-g}\,d^4x+\int L_m\sqrt{-g}\,dx^4, \qquad (2.1)$$

where L_m are Lagrangian and other symbols have their usual meaning in Riemannian geometry.
Energy Momentum Tensor is given by

$$T_{ij}=2\frac{\partial L_m}{\partial g^{ij}}-L_m g_{ij}, \qquad (2.2)$$

Varying the action (2.1) with respect to metric tensor g^{ij} yields

$$\delta S=\frac{1}{2x}\int\left\{f_R(R,T)\frac{\partial R}{\partial g^{ij}}+f_T(R,T)\frac{\partial T}{\partial g^{ij}}+\frac{f(R,T)}{\sqrt{-g}}\frac{\partial\sqrt{-g}}{\partial g^{ij}}+\frac{2x}{\sqrt{-g}}\frac{\partial\left(L_m\sqrt{-g}\right)}{\delta g^{ij}}\right\}\sqrt{-g}d^4x, \qquad (2.3)$$

Here we define

$$\theta_{ij}=g^{\alpha\beta}\frac{\partial T_{\alpha\beta}}{\partial g^{ij}} \text{ and } \frac{\partial g^{mn}}{\partial g^{ij}}=\delta_i^{\,m}\delta_j^{\,n}, \qquad (2.4)$$

Considering $\delta s=0$ from equation (2.3) upon integration we obtain

$$f_R(R,T)R_{ij}-\frac{1}{2}f(R,T)g_{ij}+\left(g_{ij}\nabla^i\nabla_j-\nabla_i\nabla_j\right)f_R(R,T)=xT_{ij}-f_T(R,T)\left[T_{ij}+\theta_{ij}\right], \qquad (2.5)$$

Taking trace of equation (2.5) we get

$$\nabla^i\nabla_j f_R(R,T)=\frac{2}{3}f(R,T)-\frac{1}{3}f_R(R,T)R+\frac{1}{3}xT-\frac{1}{3}f_R(R,T)[T+\theta], \qquad (2.6)$$

We assume that the function $f(R,T)$ given by Harko [2011]

$$f(R,T)=R+2f(T)$$

We choose the particular case $f(T)=T$ that particular case the function $f(R,T)=R+2f(t)=R+2T$

In this case we follows the notation $f_R(R,T)=\frac{\partial f(R,T)}{\partial R}=1$ and

$$f_T(R,T)=\frac{\partial f(R,T)}{\partial T}=2$$

$$R_{ij}-\frac{1}{2}f(R+2T)g_{ij}=xT_{ij}-2\left[T_{ij}+\theta_{ij}\right], \qquad (2.7)$$

From equation (2.6) we write

$$R+2T=2\theta-xT, \qquad (2.8)$$

Inserting equation (2.8) in equation (2.7) we obtain the field equation as

$$R_j^i=x\left[T_j^i-\frac{1}{2}Tg_j^i\right]-2\left[T_j^i+\theta_j^i\right]+\theta g_j^i, \qquad (2.9)$$

Varying the equation (2.2) with respect to metric tensor g^{ij} we get,

$$T_{\alpha\beta}=2\frac{\partial L_m}{\partial g^{\alpha\beta}}-L_m g_{\alpha\beta}, \qquad (2.10)$$

But term (2.2)

$$\frac{\partial L_m}{\partial g^{ij}}=\frac{1}{2}\left[T_{ij}+L_m g_{ij}\right]=2\frac{\partial^2 L_m}{\partial g^{ij}\partial g^{\alpha\beta}}-L_m\frac{\partial g_{\alpha\beta}}{\partial g^{ij}}-\frac{1}{2}g_{\alpha\beta}T_{ij}-\frac{1}{2}L_m g_{\alpha\beta}g_{ij}, \qquad (2.11)$$

But $\frac{\partial g_{\alpha\beta}}{\partial g^{ij}}=-g_{\alpha i}g_{\beta j}$

Inserting the above value in (2.11), we obtain

$$\frac{\partial T_{\alpha\beta}}{\partial g^{ij}}=2\frac{\partial^2 L_m}{g^{ij}\partial g^{\alpha\beta}}+g_{\alpha i}g_{\beta j}L_m-\frac{1}{2}g_{\alpha\beta}L_m-\frac{1}{2}g_{\alpha\beta}g_{ij}T_{ij}, \qquad (2.12)$$

Using the equations (2.2),(2.4) and (2.12) we obtain

$$\theta_{ij}=-T_{ij}+2\left[g^{\alpha\beta}\frac{\partial^2 L_m}{\partial g^{ij}\partial g^{\alpha\beta}}-\frac{\partial L_m}{\partial g^{ij}}\right], \qquad (2.13)$$

MATTER FIELD LAGRANGIAN: THE ELECTROMAGNETIC FIELD TENSOR IS GIVEN BY

$$L_m=-\frac{1}{16\pi}F_{ab}F^{ab}=-\frac{1}{16\pi}F_{ab}g^{ca}g^{db}F_{cd}, \qquad (3.1)$$

From (2.2), we have

$$T_j^i=\frac{1}{4\pi}F_m^{\mu}F_j^m-\frac{1}{16\pi}F_{mn}F^{mn}g_i^{\mu}, \qquad (3.2)$$

From equation (2.13) we get

$$\theta_{ij}=-T_{ij}, \qquad (3.3)$$

From the equations (3.2) and (3.3) after contraction field we obtain.

$$\theta=-g^{ij}T_{ij}=-T=0, \qquad (3.4)$$

THE METRIC AND FIELD EQUATIONS

We consider the axially symmetric in the form

$$ds^2=dt^2-A^2(dx^2+f^2(x)d\phi^2)-B^2dz^2, \qquad (4.1)$$

where A and B are functions of time t and f is a function of coordinate x only.

Electromagnetic Maxwell field tensor F_{ij} is given by

$$F_{ij}=\frac{\partial A_i}{\partial x^j}-\frac{\partial A_j}{\partial x^i}, \qquad (4.2)$$

To achieve the capability with non-static space time (4.1), we assume electromagnetic vector potential in the form

$$V_i=\left[\lambda(x)v_1(t)\quad v_2(t),\ v_3(t)\ v_4(t)\right], \qquad (4.3)$$

From equations (4.2) and (4.3) yields

$$F_{14}=\lambda\dot{v}_1 \qquad F_{24}=\dot{v}_2 \qquad F_{34}=\dot{v}_3, \qquad (4.4)$$

We deduce easily

$$F_{ij}F^{ij}=-2\left[\frac{\lambda\dot{v}_1^2}{A^2}+\frac{\dot{v}_2^2}{Af^2}+\frac{\dot{v}_3^2}{B^2}\right], \qquad (4.5)$$

Noting (4.3) we deduce the nonzero components of the energy momentum tensor of material fields as follows

$$T_1^1=\frac{1}{4\pi}\left[\frac{\lambda^2\dot{v}_1^2}{A^2}-\frac{\lambda^2\dot{v}_2^2}{2A^2}-\frac{\dot{v}_3^2}{2A^2f^2}-\frac{\dot{v}_3^2}{2B^2}\right], \qquad (4.6a)$$

$$T_2^2=\frac{1}{4\pi}\left[-\frac{\lambda^2\dot{v}_1^2}{2A^2}+\frac{\dot{v}_2^2}{2A^2f^2}-\frac{\dot{v}_3^2}{2B^2}\right], \qquad (4.6b)$$

$$T_3^3=\frac{1}{4\pi}\left[-\frac{\lambda^2\dot{v}_1^2}{2A^2}+\frac{\dot{v}_2^2}{2A^2f^2}+\frac{\dot{v}_3^2}{2B^2}\right], \qquad (4.6c)$$

$$T_2^2=\frac{1}{4\pi}\left[\frac{\lambda^2\dot{v}_1^2}{2A^2}+\frac{\dot{v}_2^2}{2A^2f^2}+\frac{\dot{v}_3^2}{2B^2}\right], \qquad (4.6d)$$

From equations (3.2) and (4.6a,b,c,d) we can deduced the components of energy tensor as follows

$$T_i^i=0, \qquad (4.7)$$

Following [Saha Bian] variation of Lagrangian L_m with respect to electromagnetic field gives $\frac{\partial}{\partial x^j}\left(\sqrt{-g}F^{ij}\right)=0$,

$$\left(\frac{\dot{v}_1}{v_1}\right)^{\cdot}+\frac{\dot{v}_1^2}{v_1^2}+\frac{\dot{v}_1}{v_1}\left[\frac{\dot{B}}{B}\right]=0, \quad (4.8a)$$

$$\left(\frac{\dot{v}_2}{v_2}\right)^{\cdot}+\frac{\dot{v}_2^2}{v_2^2}+\frac{\dot{v}_2}{v_2}\left[\frac{\dot{B}}{B}\right]=0, \quad (4.8b)$$

$$\left(\frac{\dot{v}_3}{v_3}\right)^{\cdot}+\frac{\dot{v}_3^2}{v_3^2}+\frac{\dot{v}_3}{v_3}\left[2\frac{\dot{A}}{A}-\frac{\dot{B}}{B}\right]=0, \quad (4.8c)$$

$f\dot{\lambda}+\lambda\dot{f}\Rightarrow\lambda f=k_1$, where k_1 is constant of integration (4.8d)

Since for the space time (4.1) we get $R_2^1=0$, $R_3^1=0, R_3^2=0$ and from (2.9) we have

$T_2^1=0=\dot{v}_1\dot{v}_2$ $\quad T_3^1=0=\dot{v}_1\dot{v}_3$

$T_3^2=0=\dot{v}_2\dot{v}_3$, (4.9)

From equation (4.9) we can rewrite it as

$$\frac{\dot{v}_1}{v_1}=\frac{\dot{v}_2}{v_2}=\frac{\dot{v}_3}{v_2}=0, \quad (4.10)$$

$\frac{\dot{v}_1}{v_1}=\frac{\dot{v}_2}{v_2}=\frac{\dot{v}_3}{v_2}=\frac{\dot{g}}{g}$, where g is some unknown function (4.11)

Integrating (4.11) we get

$v_1=gk_2 \quad v_2=gk_3 \quad v_3=gk_4$, (4.12)

Inserting (4.11) in (4.10) we get

$$\left(\frac{\dot{g}}{g}\right)^2=\left(\frac{\dot{g}}{g}\right)^2=\left(\frac{\dot{g}}{g}\right)^2=0, \quad (4.13)$$

From equations (4.8 a.b.c.d),(4.11) and (4.12) we get

$$\left(\frac{\dot{g}}{g}\right)^{\cdot}+\frac{\dot{g}^2}{g^2}+\frac{\dot{g}}{g}\left[\frac{\dot{B}}{B}\right]=0, \quad (4.14a)$$

$$\left(\frac{\dot{g}}{g}\right)^{\cdot}+\frac{\dot{g}^2}{g^2}+\frac{\dot{g}}{g}\left[2\frac{\dot{A}}{A}-\frac{\dot{B}}{B}\right]=0, \quad (4.14b)$$

From equations(4.14 a b) we get

$$\frac{\dot{A}}{A}=\frac{\dot{B}}{B}, \quad (4.15)$$

Integrating $A=k_5B$, where k_5 is integration constant. (4.16)

The field equation (3.2) for the metric (4.1) with help of equations (4.11) to (4.16) can be written as

$$\frac{\dot{A}^2}{A^2}+\frac{\ddot{A}}{A}+\frac{\dot{A}\dot{B}}{AB}-\frac{1f''}{B^2f}=0, \quad (4.17a)$$

$$\frac{\dot{A}^2}{A^2}+\frac{\ddot{A}}{A}+\frac{\dot{A}\dot{B}}{AB}-\frac{1f''}{A^2f}=0, \quad (4.17b)$$

$$\frac{\ddot{B}}{B}+2\frac{\dot{B}\dot{A}}{BA}=0, \quad (4.17c)$$

$$2\frac{\ddot{A}}{A}+\frac{\ddot{B}}{B}=0, \quad (4.17d)$$

From equations (4.15) and (4.17c) we get.

$$\frac{\ddot{B}}{B}+2\frac{\dot{B}^2}{B^2}=0, \quad (4.18)$$

Upon integration which reduced to

$$B=\left(3k_6t+k_7\right)^{\frac{1}{3}}, \quad (4.19)$$

where $k_6\neq0$ and k_7 are constants of integration.

From equations (4.16) and (4.18) we obtain

$$A=\left(3k_8t+k_9\right)^{\frac{1}{3}}, \quad (4.20)$$

where $k_8\neq0$ and k_9 are constants of integration.

From equations (4.20) and (4.18) we obtain

$\dot{A}=3\left(3k_8t+k_9\right)^{-\frac{2}{3}}k_8$ and $\dot{B}=3\left(3k_7t+k_8\right)^{-\frac{2k}{3}}k_6$ (4.21)

From equations (4.18),(4.20) and (4.21) we obtain

$$\frac{\dot{A}}{A}=\frac{k_8}{(3k_8t+k_9)}, \quad (4.22)$$

$$\frac{\dot{B}}{B}=\frac{k_6}{(3k_6t+k_7)}, \quad (4.23)$$

From equations (4.15) we get

$$\frac{k_8}{(3k_8t+k_9)}=\frac{k_6}{(3k_6t+k_7)} \quad (4.24)$$

This implies that $k_6=K_8$ and $K_7=k_9$,

Let $k_6=K_8=d_1$ and $K_7=k_9=d_2$,

$$A=B=\left(3d_1t+d_2\right)^{\frac{1}{3}}, \quad (4.25)$$

Using equations (4.15) and (4.16) reduces to $f''=0$

Integrating we get

$$f(x)=k_{10}+k_{11} \quad (4.26)$$

Again From equation (4.8d) we get

$$\lambda(x) = \frac{k_1}{k_{10}x + k_{11}} \quad (4.27)$$

From equation (4.16) we get $\frac{\dot{g}}{g} = 0$,

Upon Integrating $g = c$,where c constant of Integration (4.28)

From (4.15) and (4.28) we have

$v_1 = c = k_{10}$ $v_2 = c = k_{11}$ $v_3 = c = k_{11}$ v_4 is a undetermined (4.29)

where k 's is a constant.

Adjusting the constants in (4.29) and the vector potential assume that the following form $v_i = [k, k, k, v_4]$

From equation (4.25) and line element (4.1) reduces to

$$ds^2 = dt^2 - (3d_1 t + d_2)^{\frac{2}{3}}[(dx^2 + (k_{10}x + k_{11})^2(d\phi^2) - dz^2] \quad (4.30)$$

CONCLUSION

In this paper, we have investigated axially symmetric cosmological model with electromagnetic field in particular case of $f(R, T)$ theory of gravitation $f(R, T) = R + T$. The model which is obtained in (4.30) gives solution of the axially symmetric universe with algebraic volumetric expansion of universe. We get isotropy at any cosmic time t. The metric functions admits constants value at early time of the universe (t tends to zero) and after that the metric function start increasing with increasing in cosmic time and finally diverge to infinity as time tend to infinity .This shows that the universe expand and approaches to infinite volume. It is also interesting to note that the investigated model is from singularity and observed that $f(x)$ and $\lambda(x)$ are reciprocal of each other.

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KALUZA- KLEIN SPACE TIME WITH COSMOLOGICAL CONSTANT IN SCALAR TENSOR THEORY

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ABSTRACT

Kaluza-Klein type cosmological model with time dependent cosmological term-Λ in the framework of Saez and Ballester (1986) theory of gravitation has been studied. In order to find the exact solution of the field equations, we have used the equation of state and the fact that scalar expansion is proportional to the shear scalar. The cosmological constant term is found to decreasing function of cosmic time. Some physical and kinematical properties of the model are also discussed.

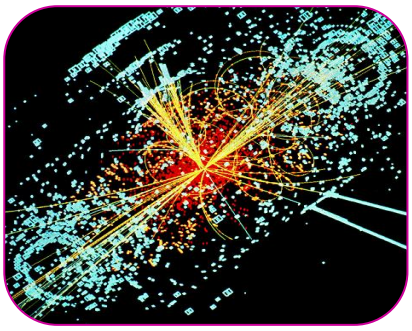
KEYWORDS: *Cosmological constant term;scalar- tensor theory;Kaluza-Klein cosmological space-time.*

1. INTRODUCTION

Einstein's general theory of relativity has successfully described gravitational phenomena. It has also served as a basis for models of the universe. However since Einstein first publishedhis theory of gravitation, there have been many criticismsof general relativity because of the lack of certain desirable features in the theory. For example Einstein himself pointed out that the general relativity does not account satisfactorily for inertial properties of matter,i.e.Mach's principle is not substantiated by general relativity.Since last few decades, there is a growing interest in alternative theories of gravitation, especially scalar-tensor theories of gravity, which are very useful tools in understanding the early stages of evolution of the universe.The most important among them are scalar-tensor theories of gravitation formulated by Brans and Dicke [1], Nordtvedt[2] and Saez and Ballester [3]. All version of the scalar tensor theories are based on the introduction of a scalar field ϕ into the formulation of general relativity, this scalar field along with the metric tensor field forms a scalar- tensor field representing the gravitational field.

The Saez-Ballester theory [3]have developed a new scalar - tensor theory of gravitation in which metric is coupled with a dimensionless scalar field in a simple manner .This coupling gives a satisfactory description of weak fields. In spite of the dimensionless character of the scalar field, an antigravity regime appears in the theory. Also, this theory suggests a possible way to solve missing matter problem in non-flat FRW cosmologies.

Some of the authors, Sing and Agrawal [4], Shri Ram and Tiwari [5], Reddy and VenkateswaraRao [6], Reddy et.al.[7] have studied several aspects of the Saez-Ballester scalar-tensor theory. Adhav et al.[8] investigatedaxially symmetric non-static domain walls in scalar-tensor theories formulated by Brans and Dick (1961) and Saez-Ballester.RecentlyEinstein-Rosen, Axially symmetry and Plane symmetry cosmological models in Saez-Ballester theory of gravitation have been investigated by Mete et.al [9, 10,11].



The Kaluza-Klein theory was introduced to unify Maxwell's theory of electromagnetism and Einstein's gravity theory by adding the fifth dimension. Kaluza-Klein theory has been regarded as a candidate

of the fundamental theory due to its potential theory function to unite the fundamental interactions. Kaluza-Klein cosmological model has been studied with different matters [12-16]. In Kaluza-Klein theory, the inflation was considered [17] and the Schwarzschild solution for three space and n dimensions were formed [18]. String cloud and domain walls with quark matter in n-dimensional Kaluza-Klein cosmological model have also been studied by Adhav et.al [19].

Higher dimensional cosmology is important because it has physical relevance to the early stages of evolution of the universe before it has undergone compactification transitions. Hence several authors(Witten[20],Chodos and Detweller[21] Appelquist et al.[22],Marchiano[23])were attracted to the study of higher dimensional cosmology. Also in the context of Kaluza-Klein and super string theories higher dimensions have recently acquired much significance. Several investigations have been made in higher dimensional cosmology in the frame work of different scalar- tensor theories. In particular, Reddy et al. [24] have investigated a five dimensional Kaluza-Klein cosmological model in the presence of perfect fluid in $f(R,T)$ gravity.

The effect of cosmological constant has been extensively studied in the literature within the framework of general relativity and its alternative theories. Singh and Singh[25] investigated a cosmological model in Brans-Dicke theory by considering cosmological constant as a function of scalar field ϕ. Pimentel [26]obtained exact cosmological solutions in Brans-Dicke theory with uniform cosmological constant.A class of flat FRW cosmological models with cosmological constant in Brans- Dicke theory have also been obtained by Azar and Riazi [27]. The age of the universe from a view point of the nucleosynthesis with Λ term in Brans-Dicke theory was investigated byEtoch et al.[28]. Azad and Islam [29]extended the idea of Singh and Singh [25]to study cosmological constant in Bianchi type-I modified Brans-Dicke cosmology.Recently Qiang et al. [30] discussed cosmic acceleration in five dimensional Bran-Dicke theory using interacting Higgs and Brans-Dicke fields.

This motivatesus toinvestigate Kaluza-Klein type cosmological model with time dependent cosmological term-Λ in the framework of Saez and Ballester (1986) theory of gravitation.

2. THE METRIC AND FIELD EQUATION

The Einstein's field equations (in gravitational units, $8\pi c=1$) in the scalar tensor theory proposed by (Saez and Ballester,1986) with time dependent Λ-term may be written as

$$R_{ij}-\frac{1}{2}Rg_{ij}-\omega\phi^{n}\left(\phi_{,i}\phi_{,j}-\frac{1}{2}g_{ij}\phi_{,k}\phi^{,k}\right)=-T_{ij}+\Lambda(t)g_{ij}, \quad (1)$$

where T_{ij} is the energy momentum tensor of matter and ϕ is the scalar field satisfying the equation

$$2\phi^{n}\phi^{i}_{;i}+n\phi^{n-1}\phi_{,k}\phi^{,k}=0. \quad (2)$$

Here n is arbitrary constant, ω is the dimensionless coupling constant. Comma and semi-colon respectively denote partial and covariant derivativewith respective to t.

The energy momentum tensor T_{ij} of cosmic fluid can be define as

$$T_{ij}=(\rho+p)u_{i}u_{j}-pg_{ij}, \quad (3)$$

where ρ, p are the energy density and pressure respectively and $u_{i}=(0,0,0,0,1)$ is the flow vector satisfying the relation

$$g_{ij}u^{i}u^{j}=1. \quad (4)$$

Here weconsider Kaluza-Klein type space time described by the line element

$$ds^{2}=dt^{2}-A^{2}(t)\left(dx^{2}+dy^{2}+dz^{2}\right)-B^{2}(t)dw^{2}, \quad (5)$$

where the metric potentials A and B are functions of the proper time $t$only.

The field equations (1) and (2) for the metric (5) with the help of (3) and (4) can be written as

$$2\frac{\ddot{A}}{A}+\left(\frac{\dot{A}}{A}\right)^2+2\frac{\dot{A}\dot{B}}{AB}+\frac{\ddot{B}}{B}-\frac{\omega}{2}\phi^n\dot{\phi}^2=-p-\Lambda \qquad (6)$$

$$3\frac{\ddot{A}}{A}+3\left(\frac{\dot{A}}{A}\right)^2-\frac{\omega}{2}\phi^n\dot{\phi}^2=-p-\Lambda \qquad (7)$$

$$3\left(\frac{\dot{A}}{A}\right)^2+3\frac{\dot{A}\dot{B}}{AB}+\frac{\omega}{2}\phi^n\dot{\phi}^2=\rho-\Lambda \qquad (8)$$

$$\ddot{\phi}+\dot{\phi}\left(\frac{2A_4}{A}+\frac{B_4}{B}\right)+\frac{n}{2}\left(\frac{\dot{\phi}^2}{\phi}\right)=0, \qquad (9)$$

where suffix 4 at the symbols A, B, ϕ and ρ denotes ordinary differentiation with respective to t. The geometrical quantities;spatial volume V and average scale factor $a(t)$ for Kaluza-Klein space time are define by

$$V=a^4(t)=A^3B \qquad (10)$$

The mean Hubble parameter H isgiven by

$$H=\frac{1}{4}\sum_{i=1}^{4}H_i$$

$$=\frac{1}{4}\left[3\frac{\dot{A}}{A}+\frac{\dot{B}}{B}\right] \qquad (11)$$

Thescalar expansion θ and shear scalar σ^2 given by

$$\theta=4H=3\frac{\dot{A}}{A}+\frac{\dot{B}}{B} \qquad (12)$$

$$\sigma^2=\frac{1}{2}\sigma^{ij}\sigma_{ij} \qquad (13)$$

$$\sigma_{ij}=\frac{1}{2}\left[u_{i,j}-u_{j,i}\right]+\frac{1}{2}\left[u_{i,k}u^k u_j-u_i u_{j,k}u^k\right]-\frac{1}{3}\theta \qquad (14)$$

The average anisotropic parameter A_m is define as

$$A_m = \frac{1}{4}\sum_{i=1}^{4}\left(\frac{H_i - H}{H}\right)^2, \qquad (15)$$

where $H_i, i = 1,2,3,4$ represents the directional Hubble parameters in x, y, z and w directions respectively and $A_m = 0$ corresponds to isotropic expansion.

3. SOLUTION OF THE FIELD EQUATIONS

The set of field equation (6) – (9) are the system of fourindependent equations with six unknowns A, B, p, ρ, ϕ and Λ. To find determinate solution, extra condition should be needed. Here we use the scalar expansion θ is proportional to scalar expansion σ^2. So that we have (Collins et al. [31])

$$A = B^m, \qquad (16)$$

where m is a arbitrary constant.
From equations (6) and (7), we get

$$\frac{\ddot{B}}{B} + 3n\left(\frac{\dot{B}}{B}\right)^2 = 0 \qquad (17)$$

solving this differential equation, we obtain the expression for metric coefficients as

$$A = \left[(3m+1)(k_1 t + k_2)\right]^{\frac{m}{3m+1}} \qquad (18)$$

And

$$B = \left[(3m+1)(k_1 t + k_2)\right]^{\frac{1}{3m+1}}, \qquad (19)$$

where $k_1 \neq 0$ and k_2 are constants of integration.
From equation (9) ,we have

$$\dot{\phi}\phi^{\frac{n}{2}} A^3 B = \phi_0 \qquad (20)$$

using equations (18) and (19), equation (20) yields

$$\phi^{\frac{n+2}{2}} = \left(\frac{\phi_0}{2k_1}\right)\left(\frac{n+2}{3m+1}\right)\log(k_1 t + k_2) + \psi_0, \qquad (21)$$

where ϕ_0 and ψ_0 are constants of integration.
Therefore the investigated Kaluza-Klein space time (5) can be written as

$$ds^2 = dt^2 - \left[(3m+1)(k_1 t + k_2)\right]^{\frac{2m}{3m+1}}\left(dx^2 + dy^2 + dz^2\right) - \left[(3m+1)(k_1 t + k_2)\right]^{\frac{2}{3m+1}} dw^2 \qquad (22)$$

4. SOME PHYSICAL DISCUSSION

We assume the relation between pressure and density of matter i.e. the linear equation of state given by

$$p = \gamma\rho \quad (23)$$

using this relation one can obtain the following expressions for energy density , pressure and cosmological constant term - Λ as

$$\rho = \frac{6m(m+1) + \omega\phi_0^2}{(1+\gamma)(3m+1)(k_1 t + k_2)^2} \quad (24)$$

$$p = \frac{6\gamma m(m+1) + \omega\phi_0^2}{(1+\gamma)(3m+1)(k_1 t + k_2)^2} \quad (25)$$

And

$$\Lambda = \left[3m(m+1) + \omega\phi_0^2\right]\left(\frac{1-\gamma}{1+\gamma}\right)\left(\frac{1}{(3m+1)^2(k_1 t + k_2)^2}\right) \quad (26)$$

From the relations (24) - (26), we can obtain three types of physical relevant models

- When $\gamma = 0$, we obtain empty model ,the energy density, pressure and cosmological term Λ are given by

$$\rho = \frac{6m(m+1) + \omega\phi_0^2}{(3m+1)(k_1 t + k_2)^2} \quad (27)$$

$$p = 0 \quad (28)$$

and

$$\Lambda = \left[3m(m+1) + \omega\phi_0^2\right]\left(\frac{1}{(3m+1)^2(k_1 t + k_2)^2}\right) \quad (29)$$

- When $\gamma = \frac{1}{3}$,we obtain radiating dominated model, the energy density, pressure and cosmological term Λ are given by

$$\rho = \frac{3\left[6m(m+1) + \omega\phi_0^2\right]}{4(3m+1)(k_1 t + k_2)^2} \quad (30)$$

$$p = \frac{\left[6m(m+1) + \omega\phi_0^2\right]}{4(3m+1)(k_1 t + k_2)^2} \quad (31)$$

And

$$\Lambda = \left[3m(m+1) + \omega\phi_0^2\right]\left(\frac{1}{2(3m+1)^2(k_1t+k_2)^2}\right) \qquad (32)$$

- When $\gamma = 1$,we obtain Zeldovich fluid or stiff fluid model ,the energy density, pressure and cosmological term Λ are given by

$$p = \rho = \frac{\left[6m(m+1) + \omega\phi_0^2\right]}{2(3m+1)(k_1t+k_2)^2} \qquad (33)$$

And

$$\Lambda = 0 \qquad (34)$$

The physical and kinematical quantities for the model (22) have the following expressions

The mean Hubble parameter $H = \frac{1}{4(k_1t+k_2)}$ (35)

Spatial volume $V = (3m+1)(k_1t+k_2)$ (36)

Scalar expansion $\theta = 4H = \frac{1}{k_1t+k_2}$ (37)

Shear scalar $\sigma^2 = \frac{2}{9}\left(\frac{1}{k_1t+k_2}\right)^2$ (38)

Deceleration parameter $q = \frac{d}{dt}\left(\frac{1}{H}\right) - 1 = 3$ (39)

and the anisotropic parameter is

$$A_m = \frac{1}{12} \qquad (40)$$

From equation (26) ,we observe that the cosmological term-Λ decreases as t increases i.e. it varies inversely as square of time therefore our solution is consistent with observation of the present day values of the cosmological constant term-Λ which are very small. The positive value of deceleration parameter indicates that the universe is decelerated. The spatial volume V of the model increases as cosmic time increases which shows the spatial expansion of the universe. The Hubble parameter H , scalar expansion θ and shear scalar σ are decreases at $t \to \infty$.

5. CONCLUSION

In this paper, we have studied Kaluza-Klein type cosmological model with time dependent cosmological term-Λ in the framework of Saez and Ballester (1986) theory of gravitation Here, we have

discussed three cases corresponding the values of $\gamma = 0,\ \frac{1}{3},\ 1$. When $\gamma = 0,\ \frac{1}{3}$, the cosmological term - Λ is decreasing function of time t and when $\gamma = 1$,the cosmological term - Λ becomes zero. Also in this investigated model, we observed that $\frac{\sigma^2}{\theta^2} =$ constant i.e. the model does not approach isotropy at any time. The energy density and pressure are also decreases as time $t \to \infty$.

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Bianchi Type - III Charged Fluid Universe in Brans-Dicke Theory of Gravitation

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***Abstract* –** We investigate the spatially homogeneous Bianchi Type-III space time with electromagnetic field tensor and relativistic charged perfect fluid in Brans-Dicke (B-D) theory of gravity. Solutions have been obtained by using a general approach of solving the partial differential equations. It is observed that the convergent and isotropic solution of the metric function can be derived with the components of the vector potentials.

***Keywords*-** *Bianchi type-III universe, Brans-Dicke theory of gravitation, electromagnetic field, perfect fluid, vector potentials*

I. INTRODUCTION

In recent years there has been a lot of interest in several alternative theories of gravitation; out of which the most important among them is scalar-tensor theory of gravitation formulated by Brans-Dicke [1]. This theory of gravity is one of the most competent theory due to its vast cosmological implications [2].In this theory, the scalar field has the dimensions of universe of the gravitational constant and its role is confined to its effect on gravitational field equations. This theory of gravity is mediated by a scalar field ϕ in addition to the usual metric tensor field g_{ij} present in Einstein's theory. Among the various modifications of general relativity, the B-D theory of gravity is well known example of a scalar tensor theory in which the gravitational interaction involves a scalar field and the metric tensor.

In recent years, the study of Bianchi type models in the context of B-D theory has attracted many authors Pawar *et.al* [3], Sharif *et.al* [4], Kandalkar *et.al* [5], Raut *et.al* [6], Katore *et.al* [7]. A detailed discussion of B-D cosmology is given by Singh *et al.*[8]. Lorenz-Petzold [9] studied exact Bianchi type–III solutions in the presence of electromagnetic field. Bianchi type-I space–time in scalar-tensor theory have been investigated by Kumar *et al.*[10]. Adhav *et al.*[11] studied LRS Bianchi type-II cosmological model with anisotropic dark energy, Katore *et al.*[12,13] explored Bianchi type-V and plane symmetric space-time filled with dark energy models in B-D theory. Bianchi type - III dark energy model in scalar tensor theory of gravitation explained by Naidu *et al.*[14]. Adhav *et al*. [15] explored Bianchi type-III cosmological model with negative constant deceleration parameter in B-D theory of gravity in presence of perfect fluid. Shamir *et al*. [16] have studied anisotropic dark energy Bianchi type-III cosmological models in B-D theory of gravity.

The Brans-Dicke field equations are given by

$$G_j^{\mu} = \frac{-8\pi}{\phi}\left(T_j^{\mu}\right) - \frac{\omega}{\phi^2}\left(g^{\mu i}\phi_{,i} - \frac{1}{2}g_j^{\mu}\phi_{,k}\phi^{,k}\right) - \frac{1}{\phi}\left(g^{\mu i}\phi_{i;j} - g_j^{\mu}\phi_{;k}^{;k}\right),$$

where ω is a dimensionless coupling constant. The function ϕ is known as B-D scalar field. Karade and Solanke [17] investigated Bianchi type-III universe field with the perfect fluid and scalar field coupled with electromagnetic fields in $f(R,T)$ theory of gravity. Recently Bhoyar *et al.*[18] discussed the Bianchi type-III and Kantowski Sachs cosmological model containing magnetic field with variable cosmological constant.

This motivates us to investigate Bianchi type-III charged fluid universe in B-D Theory of gravitation.

The paper is organized as follows:

Section II, deals with the derivation and solutions of the field equations. A brief summary is given is section III.

II. THE METRIC AND FIELD EQUATIONS

Here, we consider a spatially homogeneous Bianchi Type-III space time in the form

$$ds^2 = -dt^2 + A^2dx^2 + B^2e^{-2mx}dy^2 + c^2dz^2, \quad (1)$$ where A, B and C are functions of t and m is constant.

For the charged fluid, the field equations of B-D theory assume that

$$G_j^{\mu} = \frac{-8\pi}{\phi}\left(T_j^{\mu} + E_j^{\mu}\right) - \frac{\omega}{\phi^2}\left(g^{\mu i}\phi_{,i} - \frac{1}{2}g_j^{\mu}\phi_{,k}\phi^{,k}\right) - \frac{1}{\phi}\left(g^{\mu i}\phi_{i;j} - g_j^{\mu}\phi_{;k}^{,k}\right), \quad (2)$$

where G_j^{μ} is Einstein tensor, E_j^{μ} is energy momentum tensor for electromagnetic field, T_j^{μ} is energy momentum tensor for perfect fluid with conservation equation.

$$\phi_{;k}^{,k} = \frac{1}{\sqrt{-g}}\left[\sqrt{-g}\phi^k\right]_{,k}$$

and other symbols and notations have their conventional meanings.

Electromagnetic field

The energy momentum tensor for electromagnetic field is given by

$$E_{ij} = \frac{1}{4}F_{ab}F^{ab}g_{ij} - F_{ai}F_{bj}g^{ab}, \quad (3)$$

Here the electromagnetic field tensor F_{ij} has the expression

$$F_{ij} = \frac{\partial V_i}{\partial x^j} - \frac{\partial V_j}{\partial x^i}, \quad (4)$$

where V_i is a four potential vector.

To achieve the compatibility with space time (1), we assume electromagnetic vector potential as

$$V_i = [\alpha(x)v_1(t), v_2(t), v_3(t), v_4(t)], \quad (5)$$

Noting (4) and (5) we can deduce easily the following

$$F_{14} = \alpha\dot{v}_1,\ F_{24} = \dot{v}_2, F_{34} = \dot{v}_3, F_{43} = -\dot{v}_3, \quad (6)$$

From equations (4), (5) and (6), we can deduce

$$F_{ab}F^{ab} = -2\left[\frac{\alpha^2\dot{v}_1^2}{A^2} + \frac{\dot{v}_2^2}{B^2e^{-2mx}} + \frac{\dot{v}_3^2}{C^2}\right], \quad (7)$$

Using (3) we can deduce the components of energy momentum tensors

$$E_1^1 = \frac{1}{2}\frac{\alpha^2\dot{v}_1^2}{A^2} - \frac{1}{2}\frac{\dot{v}_2^2}{B^2e^{-2mx}} - \frac{1}{2}\frac{\dot{v}_3^2}{C^2}, \quad (8a)$$

$$E_2^1 = \frac{\alpha\dot{v}_1\dot{v}_2}{A^2}, \quad (8b)$$

$$E_3^1 = \frac{\alpha\dot{v}_1\dot{v}_3}{A^2}, \quad (8c)$$

$$E_2^2 = -\frac{1}{2}\frac{\alpha^2\dot{v}_1^2}{A^2} + \frac{1}{2}\frac{\dot{v}_2^2}{B^2e^{-2mx}} - \frac{1}{2}\frac{\dot{v}_3^2}{C^2}, \quad (8d)$$

$$E_3^2 = \frac{\dot{v}_2\dot{v}_3}{B^2e^{-2mx}}, \quad (8e)$$

$$E_1^3 = \frac{\alpha\dot{v}_1\dot{v}_3}{C^2}, \quad (8f)$$

$$E_3^3 = -\frac{1}{2}\frac{\alpha^2\dot{v}_1^2}{A^2} - \frac{1}{2}\frac{\dot{v}_2^2}{B^2e^{-2mx}} + \frac{1}{2}\frac{\dot{v}_3{}^2}{C^2}, \quad (8g)$$

$$E_4^4 = \frac{1}{2}\frac{\alpha^2\dot{v}_1^2}{A^2} + \frac{1}{2}\frac{\dot{v}_2{}^2}{B^2e^{-2mx}} + \frac{1}{2}\frac{\dot{v}_3{}^2}{C^2}, \quad (8h)$$

The stress energy tensor of a perfect fluid with density ρ, pressure p and four velocity u_i is given by

$$T_j^i = (\rho + p)u^iu_j - p\delta_i^j, \quad (9)$$

where $g_{ij}u^iu^j = 1$

For co-moving coordinate system, we have

$u_x = 0, u_y = 0, u_z = 0, u_t \neq 0,$

Accordingly (9) provides

$$T_1^1 = (\rho + p)u^1u_1 - p\delta_1^1 = -p,$$

$$T_2^2 = (\rho + p)u^2u_2 - p\delta_2^2 = -p,$$

$$T_3^3 = (\rho + p)u^3u_3 - p\delta_3^3 = -p,$$

$$T_4^4 = (\rho + p)u^4 u_4 - p\delta_4^4 = \rho,$$

$$T_1^1 + E_1^1 = \frac{1}{2}\frac{\alpha^2 \dot{v}_1^2}{A^2} - \frac{1}{2}\frac{\dot{v}_2{}^2}{B^2 e^{-2mx}} - \frac{1}{2}\frac{\dot{v}_3{}^2}{C^2} - p, \quad (9a)$$

$$T_2^1 + E_2^1 = \frac{\alpha \dot{v}_1 \dot{v}_2}{A^2}, \quad (9b)$$

$$T_3^1 + E_3^1 = \frac{\alpha \dot{v}_1 \dot{v}_3}{A^2}, \quad (9c)$$

$$T_2^2 + E_2^2 = -\frac{1}{2}\frac{\alpha^2 \dot{v}_1^2}{A^2} + \frac{1}{2}\frac{\dot{v}_2^2}{B^2 e^{-2mx}} - \frac{1}{2}\frac{\dot{v}_3^2}{C^2} - p, \quad (9d)$$

$$T_3^2 + E_3^2 = \frac{\dot{v}_2 \dot{v}_3}{B^2 e^{-2mx}}, \quad (9e)$$

$$T_3^3 + E_3^3 = -\frac{1}{2}\frac{\alpha^2 \dot{v}_1^2}{A^2} - \frac{1}{2}\frac{\dot{v}_2^2}{B^2 e^{-2mx}} + \frac{1}{2}\frac{\dot{v}_3^2}{C^2} - p, \quad (9f)$$

$$T_4^4 + E_4^4 = \frac{1}{2}\frac{\alpha^2 \dot{v}_1^2}{A^2} + \frac{1}{2}\frac{\dot{v}_2^2}{B^2 e^{-2mx}} + \frac{1}{2}\frac{\dot{v}_3^2}{C^2} + \rho, \quad (9g)$$

Conservation Law is

$$\frac{\partial}{\partial x^{ij}}\left(\sqrt{-g}F^{ij}\right) = 0, \quad (10)$$

This equation with different combination of i and j, gives following equations

$$\left[\frac{\dot{v}_1}{v_1}\right]^{\cdot} + \frac{\dot{v}_1{}^2}{v_1{}^2} + \frac{\dot{v}_1}{v_1}\left[\frac{\dot{B}}{B} + \frac{\dot{C}}{C} - \frac{\dot{A}}{A}\right] = 0, \quad (10a)$$

$$\left[\frac{\dot{v}_2}{v_2}\right]^{\cdot} + \frac{\dot{v}_2^2}{v_2^2} + \frac{\dot{v}_2}{v_2}\left[\frac{\dot{A}}{A} + \frac{\dot{C}}{C} - \frac{\dot{B}}{B}\right] = 0, \quad (10b)$$

$$\left[\frac{\dot{v}_3}{v_3}\right]^{\cdot} + \frac{\dot{v}_3^2}{v_3^2} + \frac{\dot{v}_3}{v_3}\left[\frac{\dot{A}}{A} + \frac{\dot{B}}{B} - \frac{\dot{C}}{C}\right] = 0, \quad (10c)$$

$$\phi^{;k}_{;k} = -\ddot{\phi} - \dot{\phi}\left[\frac{\dot{A}}{A} + \frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right], \quad (10d)$$

From the vanishing components of Einstein tensor, using equations (2) and (4), we deduce

$$\frac{\dot{v}_1 \dot{v}_2}{v_1 v_2} = \frac{\dot{v}_1 \dot{v}_3}{v_1 v_3} = \frac{\dot{v}_2 \dot{v}_3}{v_2 v_3} = 0, \quad (11)$$

$$\frac{\dot{v}_1}{v_1} = \frac{\dot{v}_2}{v_2} = \frac{\dot{v}_3}{v_3} = \frac{\dot{D}}{D}, \quad (12)$$

where D is an unknown function of t

Integrating this with respect to t, we get

$$v_1 = k_1 D \quad , \quad v_2 = k_2 D \quad , \quad v_3 = k_3 D \quad (13)$$

where k_1, k_2 and k_3 are constants

Inserting (12) in (11), we get

$$\left(\frac{\dot{D}}{D}\right)^2 = 0, \quad (14)$$

With the aid of equation (12), we can write the equation (10) as,

$$\left(\frac{\dot{D}}{D}\right)^{\cdot} + \left(\frac{\dot{D}}{D}\right)^2 + \frac{\dot{D}}{D}\left(\frac{\dot{B}}{B} + \frac{\dot{C}}{C} - \frac{\dot{A}}{A}\right) = 0, \quad (15a)$$

$$\left(\frac{\dot{D}}{D}\right)^{\cdot} + \left(\frac{\dot{D}}{D}\right)^2 + \frac{\dot{D}}{D}\left(\frac{\dot{A}}{A} + \frac{\dot{C}}{C} - \frac{\dot{B}}{B}\right) = 0, \quad (15b)$$

$$\left(\frac{\dot{D}}{D}\right)^{\cdot} + \left(\frac{\dot{D}}{D}\right)^2 + \frac{\dot{D}}{D}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} - \frac{\dot{C}}{C}\right) = 0, \quad (15c)$$

From equations (15a), (15b)and (15c) ,we have

$$\frac{\dot{A}}{A} = \frac{\dot{B}}{B} = \frac{\dot{C}}{C}, \quad (16)$$

Integrating with respect to t, we get

$$A = k_4 B, \quad B = k_5 C, \quad C = k_6 A, \quad (17)$$

where k_4, k_5 and k_6 are constants.

We attempt to express the component of T_j^i in terms of T_4^4 for this consider the expression

$$\frac{\alpha^2 \dot{v}_1{}^2}{A^2} + \frac{\dot{v}_2{}^2}{B^2 e^{-2mx}} + \frac{\dot{v}_3^2}{C^2} = \left[\frac{\alpha^2 v_1{}^2}{A^2} + \frac{v_2{}^2}{B^2 e^{-2mx}} + \frac{v_3{}^2}{C^2}\right]\left(\frac{\dot{D}}{D}\right)^2 = 0$$

$$T_4{}^4 = \frac{1}{2}\frac{\alpha^2 \dot{v}_1{}^2}{A^2} + \frac{1}{2}\frac{\dot{v}_2{}^2}{B^2 e^{-2mx}} + \frac{1}{2}\frac{\dot{v}_3^2}{C^2} + \rho = \rho, \quad (18a)$$

$$T_1^1 = -T_4^4 + \rho - p, \quad (18b)$$

$$T_2^2 = -T_4^4 + \rho - p, \tag{18c}$$

$$T_3^3 = -T_4^4 + \rho - P, \tag{18d}$$

Now, considering the non-vanishing component of Einstein tensor, from equation (2), we derive

$$\frac{\ddot{B}}{B}+\frac{\ddot{C}}{C}+\frac{\dot{B}\dot{C}}{BC}=\frac{-8\pi}{\phi}\left[-T_4^4+\rho-p\right] -\frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2-\frac{\ddot{\phi}}{\phi}-\frac{\dot{\phi}}{\phi}\left(\frac{\dot{B}}{B}+\frac{\dot{C}}{C}\right), \tag{19a}$$

$$\frac{\ddot{A}}{A}+\frac{\ddot{C}}{C}+\frac{\dot{A}\dot{C}}{AC}=-\frac{8\pi}{\phi}\left[-T_4^4+\rho-p\right]-\frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 -\frac{\ddot{\phi}}{\phi}-\frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A}+\frac{\dot{C}}{C}\right), \tag{19b}$$

$$-\frac{m^2}{A^2}+\frac{\ddot{A}}{A}+\frac{\ddot{B}}{B}+\frac{\dot{A}\dot{B}}{AB}=-\frac{8\pi}{\phi}\left[-T_4^4+\rho-p\right] -\frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2-\frac{\ddot{\phi}}{\phi}-\frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A}+\frac{\dot{B}}{B}\right), \tag{19c}$$

$$-\frac{m^2}{A^2}+\frac{\dot{A}\dot{B}}{AB}+\frac{\dot{B}\dot{C}}{BC}+\frac{\dot{A}\dot{C}}{AC}=-\frac{8\pi}{\phi}[\rho]+\frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 -\frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A}+\frac{\dot{B}}{B}+\frac{\dot{C}}{C}\right), \tag{19d}$$

$$\frac{\dot{A}}{A}-\frac{\dot{B}}{B}=0, \tag{19e}$$

Integrating (19e) with respect to t, we get

$$A = k_7 B, \tag{20}$$

where k_7 is constant.

From equations (19a) and (19b), we get

$$\frac{\ddot{B}}{B}-\frac{\ddot{A}}{A}+\frac{\ddot{C}}{C}\left(\frac{\dot{B}}{B}-\frac{\dot{A}}{A}\right)+\frac{\dot{\phi}}{\phi}\left(\frac{\dot{B}}{B}-\frac{\dot{A}}{A}\right)=0, \tag{20a}$$

From equations (19b) and (19c), we get

$$\frac{m^2}{A^2}+\frac{\ddot{C}}{C}-\frac{\ddot{B}}{B}+\frac{\dot{A}}{A}\left[\frac{\dot{C}}{C}-\frac{\ddot{B}}{B}\right]+\frac{\dot{\phi}}{\phi}\left[\frac{\dot{C}}{C}-\frac{\dot{B}}{B}\right]=0, \tag{20b}$$

Using equations (19c) and (19a), we obtain

$$-\frac{m^2}{A^2}+\frac{\ddot{A}}{A}-\frac{\ddot{C}}{C}+\frac{\dot{B}}{B}\left[\frac{\dot{A}}{A}-\frac{\dot{C}}{C}\right]+\frac{\dot{\phi}}{\phi}\left[\frac{\dot{A}}{A}-\frac{\dot{C}}{C}\right]=0, \tag{20c}$$

Eliminating $\frac{m^2}{A^2}$ between (20b) & (20c), we get

$$\frac{\ddot{A}}{A}-\frac{\ddot{B}}{B}+\frac{\dot{A}\dot{C}}{AC}-\frac{\dot{B}\dot{C}}{BC}+\frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A}-\frac{\dot{B}}{B}\right)=0, \tag{20d}$$

$$\frac{\ddot{A}}{A}-\frac{\ddot{B}}{B}+\frac{\dot{C}}{C}\left[\frac{\dot{A}}{A}-\frac{\dot{B}}{B}\right]+\frac{\dot{\phi}}{\phi}\left[\frac{\dot{A}}{A}-\frac{\dot{B}}{B}\right]=0, \tag{20e}$$

Upon integration of (20a) and (20e), yields

$$\frac{A}{B}=k_9\exp\left\{k_8\int\frac{1}{ABC\phi}dt\right\}, \tag{21a}$$

Similarly

$$\frac{B}{A}=k_{11}\exp\left\{k_{10}\int\frac{1}{ABC\phi}dt\right\}, \tag{21b}$$

We can express the values of A and B in the following form

$$A=(ABC)^{1/3}k_{12}\exp\left\{k_{11}\int\frac{1}{ABC\phi}dt\right\}, \tag{22a}$$

$$B=(ABC)^{1/3}k_{14}\exp\left\{k_{13}\int\frac{1}{ABC\phi}dt\right\}, \tag{22b}$$

Equation (17) implies C is scalar multiple of A

$$C=(ABC)^{1/3}k_{16}\exp\left\{k_{15}\int\frac{1}{ABC\phi}dt\right\}, \tag{22c}$$

Using equations (15) and (22), we get,

$$\frac{\ddot{D}}{\dot{D}}+\frac{\dot{A}}{A}=0, \tag{23}$$

Integrating above equation, we get

$$D=k_{17}\int\frac{1}{A}dt+k_{18}, \tag{24}$$

Using (24) the equation (13) reduces to

$$v_1=k_{19}\int\frac{1}{A}dt+k_{20}, \tag{25}$$

$$v_2=k_{21}\int\frac{1}{A}dt+k_{22}, \tag{26}$$

$$v_3=k_{23}\int\frac{1}{A}dt+k_{24}, \tag{27}$$

v_4 is undetermined.

The metric in (1), with the help of (22) can be redefined in the form

$$ds^2 = (ABC)^{2/3}\left[K' \exp K'' \int \frac{1}{(ABC)\phi} dt\right]^2 \left(dx^2 + e^{-2mx}dy^2 + dz^2\right) - dt^2, \quad (28)$$

where $K' = k_{12}k_{14}k_{16}$ and $K'' = k_{11}k_{13}k_{15}$ are constants.

III. CONCLUSION

In this present paper, we have presented Bianchi Type-III space time with electromagnetic field tensor and relativistic charged perfect fluid in the context of Brans-Dicke theory of gravity. We have derived and solved the gravitational field equations corresponding to B-D theory. It is observed that the convergent, non-singular, isotropic solutions can be obtained along with the components of vector potential. It is also interesting to note that the investigated models are free from singularity.

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MAGNETIZED PLANE SYMMETRIC COSMOLOGICAL MODEL WITH WET DARK FLUID IN SCALAR TENSOR THEORY OF GRAVITATION

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Abstract

Magnetized plane symmetric Bianchi type-I cosmological model with wet dark fluid is investigated in a scalar tensor theory of gravitation proposed by Saez-Ballester [7]. To solve the field equations, a special law of variation of Hubble's parameter proposed by Berman [20] has been used. The exact solutions of the field equations are obtained. Some important geometrical and physical features regarding this model have also been studied.

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1. Introduction

Einstein's general theory of relativity [1] has provided a modern theory of gravitation and it has become very successful in describing gravitational phenomenon and also served as a basis for model of the universe. Einstein himself pointed out that general relativity does not account satisfactorily for inertial properties of matter, i.e., Mach's principle is not substantiated by general relativity. So, in recent years, several theories of gravitation have been proposed as alternatives for Einstein's theory. The most important among them are scalar-tensor theories of gravitation formulated by Jordan [2], Brans and Dicke [3], Nordtvedt [4], Ross [5] and Schmidt et al. [6]. Saez and Ballester [7] have developed a scalar-tensor theory in which the metric is coupled with dimensionless scalar field in a simple manner. This coupling gives a satisfactory description of the weak field. In spite of the dimensionless character of the scalar field, an antigravity regime appears. This theory suggests a positive way to solve the missing matter problem in non-flat FRW cosmologies.

In addition, the magnetic field has an important role at the cosmological scale and is present in galactic and intergalactic space. It plays a vital role in description of energy distribution in the universe as it contains highly ionized matter. Strong magnetic fields can be created due to adiabatic compression in cluster of galaxies. The large scale magnetic field can be specified by observing their effects on the CMB radiation. These fields would enhance anisotropies in the CMB, since the expansion rate will be different depending on the direction of field lines (Melvin [8]).

2. The Wet Dark Fluid (WDF) as a Model for Dark Energy

This model was in the spirit of generalization of Chaplygin gas, where a physically motivated equation of state was offered with properties relevant for the dark energy problem. Here, motivation stems from an empirical equation of state proposed by Tait [9] and Hayward and Brit [10] to treat water and aqueous solution.

The equation of state for WDF:

$$p_{WDF} = \omega(\rho_{WDF} - \rho^*) \tag{2.1}$$

is very simple and is motivated by the fact that it is a good approximation for many fluids including water, in which the internal attraction of the molecules makes negative pressures possible.

To find the WDF energy density, we use the energy conservation equation

$$\rho'_{WDF} + 3H(p_{WDF} + \rho_{WDF}) = 0. \tag{2.2}$$

From the equation of state (2.1) and using $3H = \frac{V'}{V}$ in the above equation, we get

$$\rho_{WDF} = \frac{\omega}{1+\omega}\rho^* + \frac{C}{V(1+V)}, \tag{2.3}$$

where C is a constant of integration and V is the volume expansion. WDF naturally includes two components: a piece that behaves as a cosmological constant as well as pieces those red shifts as a standard fluid with an equation of state $p_{WDF} = \omega\rho_{WDF}$.

If we take $C > 0$, then we can show that this fluid will never violate the strong energy condition

$$p_{WDF} + \rho_{WDF} \geq 0,$$

$$p_{WDF} + \rho_{WDF} = (1+\omega)\rho_{WDF} - \omega\rho^* = (1+\omega)\frac{C}{V^{(1+\omega)}} \geq 0. \tag{2.4}$$

Bianchi type-I universe with WDF has been studied by Singh and Chaubey [11]. Adhav et al. [12, 13] have investigated wet dark fluid cosmological model. Jain et al. [14] studied axially symmetric cosmological model with dark fluid in biometric theory of relativity. Recently, Nimkar [15] has studied axially symmetric non-static wet dark fluid in Brans-Dicke theory of gravitation, Kandalkar and Samdurkar [16] have constructed

Bianchi type-I cosmological model in scalar tensor theory of gravitation with viscous fluid distribution, anisotropic bulk string cosmological model in scalar tensor theory of gravitation has been investigated by Reddy et al. [17] and Mete et al. [18, 19] have studied Bianchi type-V and IX magnetized cosmological models in various aspects.

Inspired by the above works, in this paper, we obtain a plane symmetric cosmological model in the presence of electromagnetic field with WDF.

3. The Metric and Field Equations

Here, we consider the plane symmetric metric in the form

$$ds^2 = dt^2 - A^2(dx^2 + dy^2) - B^2dz^2, \tag{3.1}$$

where A and B are functions of time t only.

Saez-Ballester field equations for combined scalar-tensor field are

$$G_{ij} - \omega\phi^n\left(\phi_{,i}\phi_{,j} - \frac{1}{2}g_{ij}\phi_{,k}\phi^{,k}\right) = -T_i^j + E_i^j, \tag{3.2}$$

where $G_{ij} = R_{ij} - \frac{1}{2}Rg_{ij}$ is Einstein tensor, R is the scalar curvature, ω is the dimensionless constant and n is a constant.

The scalar field satisfies the equation

$$2\phi^n\phi_{,i}^{,i} + n\phi^{n-1}\phi_{,k}\phi^{,k} = 0. \tag{3.3}$$

In equation (3.2), E_i^j is the electromagnetic field given by

$$E_i^j = \frac{1}{4\pi}\left[-F_{il}F^{jl} + \frac{1}{4}g_i^jF_{lm}F^{lm}\right]. \tag{3.4}$$

We assume that the magnetic field is in xy-plane; therefore, the current is flowing along the z-axis. Thus, F_{12} is the only non-vanishing component of the electromagnetic field tensor F_{ij}. In a co-moving co-ordinate system,

we have

$$v^i = (0, 0, 0, 1) \text{ and } x^i = \left(0, 0, 0\frac{1}{c}, c\right).$$

The first set of Maxwell's equations is

$$F_{ij,k} + F_{jk,i} + F_{ki,j} = 0 \text{ and } [F^{ik}\sqrt{-g}], \quad k = 0. \tag{3.5}$$

This leads to

$$F_{12} = ke^{-ax}, \tag{3.6}$$

where k is a constant so that magnetic field depends upon space co-ordinate x only.

From equations (3.4), (3.5) and (3.6), it follows that $F_{12} = 0$.

The non-vanishing components of E_i^j corresponding to the line element are given by

$$E_1^1 = \frac{H^2}{8\pi A^2} = E_4^4, \quad E_2^2 = -\frac{H^2}{8\pi A^2} = E_3^3. \tag{3.7}$$

Also, we have energy conservation equation

$$T_{;j}^{ij} = 0. \tag{3.8}$$

The energy-momentum tensor is given by

$$T_{ij} = (\rho_{WDF} + p_{WDF})u_i u_j - p_{WDF} g_{ij}, \tag{3.9}$$

where ρ_{WDF}, p_{WDF} are density and pressure of WDF, respectively.

Here, the four velocity vectors u_i and x_i satisfy the standard relations

$$u_i u^j = -x_i x^j = 1 \text{ and } u^i x_j = 0.$$

In the moving co-ordinate system, from equations (3.8) and (3.9), we get

$$T_1^1 = T_2^2 = T_3^3 = -p_{WDF}, \quad T_0^0 = \rho_{WDF}. \tag{3.10}$$

The field equation (3.2) for the metric (3.1) with the help of equations (3.7) to (3.10) can be written as

$$\frac{\ddot{A}}{A}+\frac{\ddot{B}}{B}+\frac{\dot{A}\dot{B}}{AB}-\frac{\omega\phi^{n}\dot{\phi}^{2}}{2}=p_{WDF}+\frac{H^{2}}{8\pi A^{2}}, \tag{3.11}$$

$$\frac{\dot{A}^{2}}{A^{2}}+2\frac{\ddot{A}}{A}-\frac{\omega\phi^{n}\dot{\phi}^{2}}{2}=p_{WDF}-\frac{H^{2}}{8\pi A^{2}}, \tag{3.12}$$

$$\frac{\dot{A}^{2}}{A^{2}}+2\frac{\dot{A}\dot{B}}{AB}+\frac{\omega\phi^{n}\dot{\phi}^{2}}{2}=p_{WDF}-\frac{H^{2}}{8\pi A^{2}}, \tag{3.13}$$

$$\ddot{\phi}+\dot{\phi}\left(2\frac{\dot{A}}{A}+\frac{\dot{B}}{B}\right)+\frac{n\dot{\phi}^{2}}{2\phi}=0, \tag{3.14}$$

where dot over the field variables denotes differentiation with respect to t.

Spatial volume and the scale factor for the metric (3.1) are defined by

$$V=R^{3}=A^{2}B. \tag{3.15}$$

4. Solutions and the Model

From equations (3.10) and (3.12), we get

$$2\left(\frac{\dot{A}\dot{B}}{AB}-\frac{\dot{A}}{A}\right)+\omega\phi^{n}\dot{\phi}^{2}=0. \tag{4.1}$$

The set of equations (3.11)-(3.14) is nonlinear, hence, we assume the linear relationship between the metric potentials A and B, that is,

$$A=nB, \tag{4.2}$$

where $n\neq 0$ is a constant.

We solve the above set of equations with the help of special law of variation of Hubble's parameter proposed by Berman [20] yielding constant declaration parameter model of the universe defined by

$$q = \frac{R\ddot{R}}{\dot{R}^2}, \tag{4.3}$$

this admits the solution

$$R = (at + b)^{\frac{1}{1+q}}, \tag{4.4}$$

where $a \neq 0$ and b are constants of integration.

This implies that the condition for accelerated expansion of the universe is $1 + q > 0$.

Now, from equations (3.15), (4.3) and (4.4), we get

$$(AB)^{\frac{1}{3}} = (at + b)^{\frac{1}{1+q}}. \tag{4.5}$$

From equations (4.2) and (4.5), we obtain

$$A = c_1(at + b)^{\frac{1}{1+q}}, \tag{4.6}$$

where $c_1 = (n)^{\frac{1}{3}}$,

$$B = c_2(at + b)^{\frac{1}{1+q}}, \tag{4.7}$$

where $c_2 = (n)^{-\frac{2}{3}}$.

Using equations (4.6) and (4.7), the line element (3.1) can be written as

$$ds^2 = dt^2 - c_1^2(ax + b)^{\frac{2}{1+q}}[(dx^2 + dy^2) - c_2^2(ax + b)^{\frac{2}{1+q}}dz^2]. \tag{4.8}$$

Using the suitable transformation of the coordinates, equation (4.7) is reduced to

$$ds^2 = \frac{dT^2}{a^2} - c_1^2T^{\frac{2}{1+q}}[(dX^2 + dY^2) - c_2^2T^{\frac{2}{1+q}}dZ^2], \tag{4.9}$$

where $T = (at + b)$, $X = x$, $Y = y$, $Z = z$.

5. The Geometrical and Physical Significance of the Model

Using the Saez-Ballester scalar tensor theory of gravitation, some physical and kinematical properties of the model (4.9) are obtained as follows.

The physical quantities of observational interest in cosmology are the expansion scalar (θ), shear scalar (σ) and the mean anisotropic parameter (A_m) defined as

$$\theta = 3H = \left(2\frac{\dot{A}}{A} + \frac{\dot{B}}{B}\right), \tag{5.1}$$

$$2\sigma^2 = \sum_{i=1}^{3}\left(H_i^2 - \frac{\theta^2}{3}\right), \tag{5.2}$$

$$A_m = \frac{1}{3}\sum_{i=1}^{3}\left(\frac{H_i - H}{H}\right)^2. \tag{5.3}$$

Further, we find the volume, mean Hubble parameter, expansion scalar θ, shear scalar σ and mean anisotropic parameter A_m as

$$V = T^{\frac{3}{1+q}}, \tag{5.4}$$

$$H = \frac{1}{(1+q)T}, \tag{5.5}$$

$$\theta = 3H = \frac{3}{(1+q)T}, \tag{5.6}$$

$$\sigma^2 = 0, \tag{5.7}$$

$$A_m = 0. \tag{5.8}$$

From equations (3.15) and (4.2), we obtain a scalar function for Saez-Ballester scalar tensor theory of gravitation as

$$A^3\phi^{\frac{n}{2}}\dot{\phi} = K, \tag{5.9}$$

where K is a constant of integration, which, on integrating equation (5.9) and inserting the value of A^3, give

$$\phi = \left[\frac{n+1}{2}\frac{T^{-(2+3q)}}{-(2+3q)}K_2 + K_3\right]^{\frac{2}{n+2}}, \quad n \neq 2, \tag{5.10}$$

where $Kc_1^3 = K_2$, and K_3 are constants of integration.

The pressure density p_{WDF} and energy density ρ_{WDF} of the model (4.9) are, respectively, given by

$$p_{WDF} = \frac{H^2}{8\pi A^2} + \frac{q}{(1+q)^2T^2} + \frac{\omega}{2}\left[\frac{K_2(n+1)}{2}\frac{T^{-(2+3q)}}{-(2+3q)} + K_3\right]^{\frac{2n}{n+2}}$$

$$\cdot\left[\frac{T^{-2(3+q)}K_2(n+1)}{2}\frac{T^{-(2+3q)}}{-(2+3q)} + K_3\right]^{\frac{4}{n+2}}, \tag{5.11}$$

$$\rho_{WDF} = \frac{H^2}{8\pi A^2} - \frac{3}{(1+q)^2T^2} - \frac{\omega}{2}\left(\frac{n+1}{2}\frac{T^{-(2+3q)}}{-(2+3q)}K_2 + K_3\right)^{\frac{2n}{n+2}}$$

$$\cdot\left(T^{-(2+3q)}\frac{n+1}{2}\frac{T^{-(2+3q)}}{-(2+3q)}K_2 + K_3\right)^{\frac{4}{n+1}}. \tag{5.12}$$

6. Conclusion

In this paper, we have investigated a plane symmetric cosmological model with wet dark fluid and electromagnetic field in Saez-Ballester scalar tensor theory of gravitation. We have used a special law of variation of the Hubble parameter proposed by Berman [20]. The model which is presented in this paper could give an appropriate description of the evolution of the

universe. It is observed from the result (5.4) that the model is expanding with time, since $1 + q > 0$. At initial moment, when time $T = 0$, the proper volume will be zero, whereas when T tends to zero, the expansion scalar θ, Hubble's parameter H and shear scalar σ tend to infinity and for large value of T, we observe that the expansion scalar θ, Hubble's parameter H and shear scalar σ become zero. Hence, the model approaches isotropically for the large value of T. Thus, the present model may be a useful tool for describing the early stages of the evolution of the physical universe.

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1. Name of Organising Department : **Mathematics**

2. Name of Activity : Mathematical charts and Models Competition

3. Place of Activity : A.V.Theatre, SGBAU,Amravati

4. No. of Participant : Students: 114, Teachers: 16

5. Date of Activity : 21st December,2018

Details of Activity (In Brief):

University Level "Mathematical Charts and Models Competition" was organized on December 21, 2018, in collaboration between the Department of Mathematics ,Sant Gadge Baba Amravati University, Amravati, and Adarsha Mahavidyalaya, Dhamangaon Rly, as per the MOU. The competition was attended by prominent examiners. A total of 114 postgraduate students, along with faculty members from affiliated colleges participated in this event.

Outcome of the Programme :

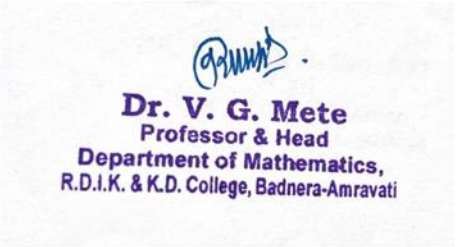
- To motivate the students to participate in the inter-collegiate level competitions.
- To build different mathematical skills and concepts.
- To help the students to learn best when presented with a concept they can visualize.
- Now they can use language creatively and imaginatively in text transaction and performance of activities.
- All students participated in all the events enthusiastically and it was a great learning experience for all of them.
- Student received certificate of participation.

Name & Contact No. of Expert (if any):

Dr. A.S. Gudadhe,Associate professor & Head, GVISH, Amravati,Contact No. 9422917233

Dr. S.P. Kandalkar, Associate professor, GVISH, Amravati, Contact No. 9423426316

Dr. M.S. Desale, Assistant professor, SGBAU, Amravati, Contact No. 9421743937



SANT GADGE BABA AMRAVATI UNIVERSITY
MATHEMATICS TEACHER'S ASSOCIATION, AMRAVATI

To,

The Hon'ble Principals of all Affiliated Colleges, SGBAU,AMRAVATI

Respected Sir,

We have the honor to inform you that, on the eve of National Mathematics Day-2018 and Ramanujan's Birth Anniversary, the Department of Mathematics & IQAC, Sant Gadge Baba Amravati University, Amravati is organizing University level **Exhibition: Mathematical Charts and Models Competition on December 21, 2018 in collaboration with Department of mathematics, R.D.I.K & K.D. College, Badnera and Adarsha Science, J.B.Arts & Birla Commerce Mahavidyalaya, Dhamangaon (Rly.) and SGBAU Mathematics Teachers Association.**

You are request to please encourage and depute **P.G. students** for exhibition. Your active cooperation shall be highly appreciated and will make this event successful.

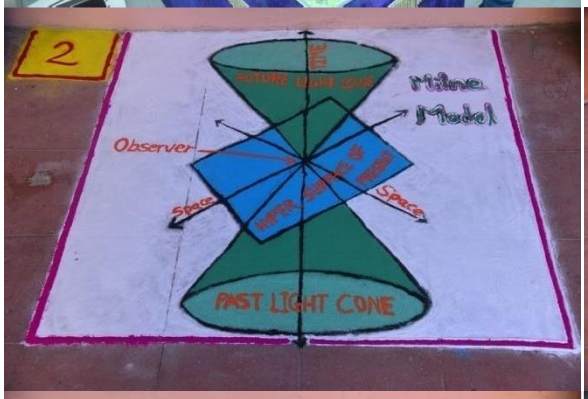
- Certificates will be issued to all participants
- Prizes of exhibition will be distributed in valedictory function of workshop on December 22,2018.
- T.A./D.A. will not be paid.

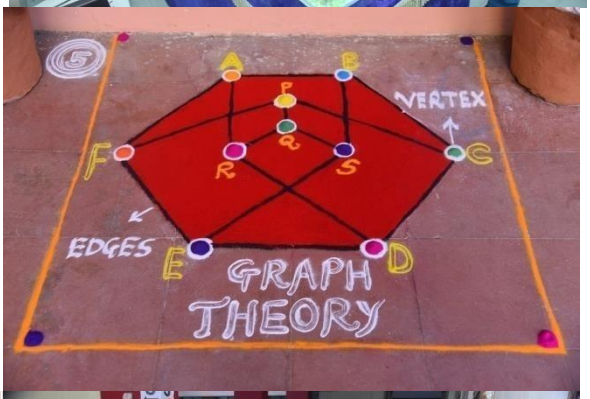
Venue: A.V. Theater , SGBAU, Amravati **Time: 2.00 P.M.**

Soliciting your positive and active response.
Thanks,
Sincerely yours ,

Dr. V.G.Mete
Associate Professor and Head,
Dept.of Mathematics (U.G. & P.G.),
R.D.I.K & K.D. College, Badnera

Photo Gallery



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Department of Mathematics
Sant Gadge Baba Amravati University, Amravati
Session 2018 – 19
Mathematical Flex Competition Participants List

Date :- 21-12-2018

Sr.no	Name of participants	Class	Marks out of 5
1 (1)	1)Ankush Roundale 2)Parag Ghait 3)Dnyaneshwar Gaygole 4)Nikhil Mankar	M.Sc I	04 → Winner
2 (2)	1)Ashwini Raut 2)Dipali Fulzele 3)Rashmi Awandkar 4)Manisha Pathak 5)Ratnamala Kokate	M.sc II	02
3 (3)	1)Madeeha Mahrosh 2)Monika Karade 3)Vishakha Deshpande 4)Shubhangi Marodkar 5)Shivani Kapade	M.sc II	01
4 (4)	1)Bhagyashri Deshmush 2)Kalyani Kshirsagar	M.sc II	02
5 (5)	1)Shital Zode 2)Roshni Kubde 3) Monika Shelke 4)Megha Fengade	M.Sc I	03

Name of Winner :-
1) No (1)

Name & signature of judges
1) _____
2) _____

Name and Signature of Incharge :-
1)Miss. S. D. Ramteke
2)Mrs. A. M. Pokale

HOD

Sant Gadge Baba Amravati University, Amravati
University Level Workshop on NET/SET Guidance in Mathematics
Department of Mathematics
Session :- 2018 – 19

Mathematical Rangoli Competition Participants List

Date :- 21-12-2018

Sr. No	Name of Participants	Class	Marks Out of 5
1.	Ku.Shivani Kapade Ku.Vishakha Deshpande Ku.Shubhangi Marodkar	M.Sc-II	02
2.	Miss. Manisha Pathak Miss. Rashmi Awandkar Miss. Priti Dipake	M.Sc-II	03
3	Miss. Priyanka Kale Miss. Ratnmala Kokate Miss. Megha Tale	M.Sc-II	02
4.	Miss. Komal Gupta Miss. Nikita Maske	M.Sc-I	02
5.	Miss. Sushama Tidke Miss. Vaishnavi Lawhale	M.Sc-I	04 winner

Name of Winner :-

1) Shushma Tidke
Vaishnavi Lawhale.

Name and Signature of In charge :-

Ku. S. D. Ramteke

Name and Signature of Judges

1) _____

2) _____

3) _____

Sant Gadge Baba Amravati University, Amravati
University Level Workshop on NET/SET Guidance in Mathematics
Department of Mathematics
Session :- 2018 – 19

Mathematical Model Competition Participants List

Date :- 21-12-2018

Sr. No	Name of Participants	Class	Marks out of (05)
1. (1)	Miss. Kanchan Bathe Miss. Komal Gupta Miss. Nikita Maske Miss. Vaishnavi Lawhale Miss. Dipali Chopade	M.Sc-I	03
2. (2)	Mr. Ankush roundhale Mr. Nikhil Mankar Mr. Parag Ghait Mr. Dynanshwar Gaigole	M.Sc-I	03
3. (3)	Miss.Sushama Tidke Miss. Snehal Waghmare Miss Pragati Kadu	M.Sc-I	03
4. (4)	Miss. Diksha Meshram Miss. Nital Patil	M.Sc-II	02
5. (5)	Mr. Charudatta Walthare Mr. Sagar Kharode	M.Sc-II	02
6. (6)	Miss.Kalyani Kshirsagar Miss. Bhagyashri Deshmukh	M.Sc-II	03
7. (7)	Miss. Dipali Fulzele Miss. Ashwini Raut Miss. Shital Zode Miss. Bhagyashri Bargat	M.Sc-II	03

Name and Signature of Judges

1) _____

2) _____

3) _____

Name of Winner :-

1) Nil (10)

2) _____

Name and Signature of In charge :-

Ku. S. D. Ramteke

Sant Gadge Baba Amravati University, Amravati
University Level Workshop on NET/SET Guidance in Mathematics
Department of Mathematics
Session :- 2018 – 19

Mathematical Rangoli Competition Participants List

Date :- 21-12-2018

Sr. No	Name of Participants	Class	Marks Out of 5
1.	Ku.Shivani Kapade Ku.Vishakha Deshpande Ku.Shubhangi Marodkar	M.Sc-II	
2.	Miss. Manisha Pathak Miss. Rashmi Awandkar Miss. Priti Dipake	M.Sc-II	
3	Miss. Priyanka Kale Miss. Ratnmala Kokate Miss. Megha Tale	M.Sc-II	
4.	Miss. Komal Gupta Miss. Nikita Maske	M.Sc-I	
5 ✓	Miss. Sushama Tidke Miss. Vaishnavi Lawhale	M.Sc-I	I Winner.

Name of Winner :-

1) Miss Sushama Tidke
" Vaishnavi Lawhale

Name and Signature of In charge :-

Ku. S. D. Ramteke

Name and Signature of Judges

1) _____

2) _____

3) _____

Sant Gadge Baba Amravati University, Amravati
University Level Workshop on NET/SET Guidence in Mathematics
Department of Mathematics
Session :- 2018 – 19

Mathematical Chart Competition Participants List

Date :- 21-12-2018

Sr. No.	Name of participants	Class	Marks out of (05)
1 A	Miss. Rohini Chopade Miss. Samiksha Pakhale (A)	M.sc II	
2 B	Miss. Shivani Kapade Miss. Shubhangi Marodkar (B)	M.sc II	
3 C	Miss. Smita Nagle Miss. Vishakha Deshpande (C)	M.sc II	
4 D	Miss.Priyanka Kale Miss. Megha Tale (D)	M.sc II	
5 E	Miss. Shwetabdee Jumale (E)	M.sc II	Absent
6 F	Miss. Ashwini Dahikar (F)	Msc. II	
7 G	Miss. Dimpal Ughade Miss. Snehal Waghmare Miss. Ravina Jumbad (G)	Msc. I	
8 H	Miss. Bhagyashri Bargat. Miss. Shital Zode. Miss. Monika Shelke (H)	Msc. I	
9 I	Ku Dipali chopade Ku.Kanchan Bathe Ku.Megha Fengade (I)	Msc. I	

Name of Winner :-

1) Group (O)

2) Group (M)

Name and Signature of Incharge :-

Ku. S. D. Ramteke

Name and Signature of Judges :-

1) BSD

2) SB Lubal

3) _____

Sant Gadge Baba Amravati University, Amravati
University Level Workshop on NET/SET Guidance in Mathematics
Department of Mathematics
Session :- 2018 – 19

Mathematical Model Competition Participants List

Date :- 21-12-2018

Sr. No	Name of Participants	Class	Marks out of (05)
1. (1)	Miss. Kanchan Bathe Miss. Komal Gupta Miss. Nikita Maske Miss. Vaishnavi Lawhale Miss. Dipali Chopade	M.Sc-I	
2. (2)	Mr. Ankush roundhale Mr. Nikhil Mankar Mr. Parag Ghait Mr. Dynanshwar Gaigole	M.Sc-I	
3. (3)	Miss.Sushama Tidke Miss. Snehal Waghmare Miss Pragati Kadu	M.Sc-I	
4. (4)	Miss. Diksha Meshram Miss. Nital Patil	M.Sc-II	
5. (5)	Mr. Charudatta Walthare Mr. Sagar Kharode	M.Sc-II	
6. (6)	Miss.Kalyani Kshirsagar Miss. Bhagyashri Deshmukh	M.Sc-II	
7. (7)	Miss. Dipali Fulzele Miss. Ashwini Raut Miss. Shital Zode Miss. Bhagyashri Bargat	M.Sc-II	

Name of Winner :-

1) (10)

Name and Signature of In charge :-

Ku. S. D. Ramteke

Name and Signature of Judges

1)

2)

3)

Sant Gadge Baba Amravati University, Amravati
University Level Workshop on NET/SET Guidence in Mathematics
Department of Mathematics
Session :- 2018 – 19

Mathematical Chart Competition Participants List
Date :- 21-12-2018

	Sr. No.	Name of Participants	Name of college	Class	Signature
J]	1)	Mr. Amit Rajput	R.D.I.K. & N.K.D college Badnera, Amt.	M.Sc. IIyr	
	2)	Mr. Shubham Ghatole			
	3)	Mr. Yogesh Dole			
	4)	Mr. Sohail Raza			
	5)	Mr. Pathmesh Dhenaskar			
K]	1)	Ku. Reshma. A. Saiyyad.	R.D.I.K & N.K.D college Badnera	M.Sc. Iyr	
	2)	Gaurav D. Tiwalkar			
K]	1)	Ku. Ashwini R. Dethe	R.D.I.K & N.K.D college Badnera	M.SG Ist yr	
	2)	Nikhil Vedulkar			

K]	1.		Ku. Mayuri D. Dhonde Ku. Puja V. Hirulkar.	Arts, Commerce & Science College, Kiran nagar Amravati	
	2.		Ku. Disha M. Nebhnani ku. Bhakti S. Badgujar Aditya M. Joshi	Govt. Vidarbh Institute of Science & Humanities Amravati	
L]	1)		Ku. Mayuri Tekkal	R.D.I.K. of N.K.D College Badnera	
M]	2)		Snehal Bhoyar	A.M.V	→ Win
N]			Akshay Wakekar	A.M.V.	
O]	1)		Adity Joshi	G.V.I.S.H.	→ Winne
	2)		Dikshya		
P]	1)		Ku. Snehal Bhoyar	A.M.V.	

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University Level Workshop on NET/SET Guidence in Mathematics
Department of Mathematics
Session :- 2018 – 19

Mathematical Model Competition Participants List
Date :- 21-12-2018

Sr. No.	Name of Participants	Name of college	Class	Signature
8] 1	ku. Kshitija Deshmukh ku. Shivani Kadu	R.D.I.K & K.D college, Badnera	M.Sc II nd year	Kadu
	ku. Priyanka Pande ku. Sneha Shebe ku. Dipika Tarale			
9] 2.	ku. Dhanshri Dahokar ku. Sakshi Kale	R.D.I.K & K.D college, Badnera	M.Sc II nd year	Kale
	ku. Dhanshri Dalvi ku. Shreya Pathak ku. Komal Sonone ku. Kajal Panjwani			

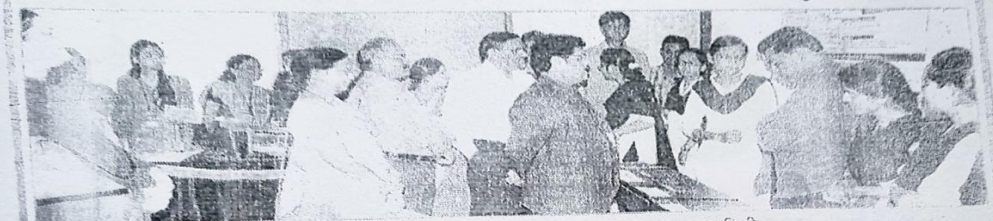
10>	1> Vaishnavi Pohokar 2] Gayatri Thak.	R. D I. K & K. D. college.	M. Sc. - II nd	Thak
	3] Aditi Bhagat 4] Prathamesh Dhanaskar	—		
	5] Mayuresh Khethe			
11>	1) Dhanshri V. Dalvi. 2) Kajal Panjwani.	R.D.I.K & K.D college.	M.Sc - II nd	Dalvi
	3) Dhanshri D. Dahokar. 4) Sakshi N. Kale			
	5) Shreya Pathak 6) Komal Sonone			
12>	1) Poonam Akhare	R.D.I.K & K.D. college	M.Sc - II yr	Akhare
	2) Aishwarya Khatale 3) Poonam Deotale			

वृत्त केसरी

शनिवार, 29 डिसेंबर 2018

अमरावती विद्यापीठात

गणित प्रदर्शनीचे थाटात उद्घाटन



अमरावती : गणित प्रदर्शनीचे उद्घाटन करताना प्र-कुलगुरू राजेश जयपूरकर व अन्य मान्यवर अतिथी.

प्रतिनिधी/२८ डिसेंबर

अमरावती : संत गाडगेबाबा अमरावती विद्यापीठामध्ये गणित विषयातील विविध संकल्पनेवर आधारित प्रदर्शनीचे आयोजन करण्यात आले. विद्यार्थ्यांनी ग्राफथेअरी, अॅबकस गणित, जनरल रॅलेटिव्हिटी विषयावर उत्कृष्ट रांगोळ्या काढल्या. तसेच इन्कलानीमीटर मल्टिप्लिकेशन मॉडेल, हॉट डॉग आदी संकल्पनेवर आधारित मॉडेल प्रदर्शित केले. प्रदर्शनीचे आयोजन विद्यापीठाचा गणित विभाग व आयक्यूएसी विभाग तसेच गणित विभाग आरडीआयके व केडी महाविद्यालय बडनेरा, आदर्श महाविद्यालय धामणगाव (रेल्वे) यांच्या संयुक्त विद्यमाने करण्यात आले. प्रदर्शनीचे उदघाटन प्र-कुलगुरू डॉ. राजेश जयपूरकर

रांगोळी, फ्लेक्स, मॉडेल्सचा सहभाग

यांच्या हस्ते करण्यात आले.

प्रदर्शनीला डॉ.ए.एस.गुडधे, माजी गणित विभाग प्रमुख विदर्भ महाविद्यालय अमरावती, डॉ. एस.एन. कांडलकर, गणित विभाग प्रमुख शासकीय विदर्भ ज्ञान विज्ञान संस्था अमरावती, डॉ.एम.एस.देसले हे परीक्षक म्हणून लाभले प्रदर्शनीत विद्यापीठांतर्गत येणाऱ्या पाच जिल्ह्यातील विद्यार्थ्यांनी सहभाग नोंदविला.

रांगोळी स्पर्धेत प्रथम क्रमांक सुषमा तिडके व वैष्णवी लव्हाळे यांना प्राप्त झाला. चार्टमध्ये प्रथम क्रमांक आदित्य जोशी, द्वितीय क्रमांक स्नेहल भोयर यांना प्राप्त झाला. मॉडेल्समध्ये प्रथम क्रमांक वैष्णवी पोहोकार व समूह

विद्यार्थी, यांना प्राप्त झाले व फ्लेक्स स्पर्धेत प्रथम क्रमांक अमरावती विद्यापीठ अमरावती गणित विभागातील विद्यार्थी पराग घाईत व समूह यांना प्राप्त झाला. रामानुजन जयंती आयोजित भव्य विद्यापीठ स्तरीय गणितीय प्रदर्शिनी अवलोकन विद्यापीठ स्तरीय नेट-सेट मार्गदर्शन कार्यशाळेकरिता आलेल्या सन्माननीय अतिथी आणि विद्यार्थ्यांनी घेतला. सर्व तज्ज्ञ मंडळींनी त्यांच्या अतिथी संवादातून विद्यार्थ्यांचे कौशल्य व गुणांचे कौतुक केले. या कार्यशाळेच्या आयोजनाकरिता विद्यापीठामधील संबंधित सन्माननीय अधिकाऱ्यांचा व आयोजक शिक्षकवृंदांचा सहभाग लाभला.

माझा विदर्भ

विद्यार्थ्यांनी रांगोळी आणि मॉडेल्सच्या माध्यमातून मांडले शास्त्रज्ञांचे सिद्धांत

प्रतिनिधी । अमरावती

1. Name of Organising Department	:	**Mathematics**
2. Name of Activity	:	Workshop on NET/SET Guidance in Mathematical Sciences
3. Place of Activity	:	AV Theatre, SGBAU,Amravati
4. No. of Participant	:	Students: 168, Teachers: 2Resource persons: 13
5. Dateof Activity	:	22nd Dec., 2018

Details of Activity (In Brief):

On the occasion of 'National Mathematics Day' one day workshop on NET/SET guidance in mathematical sciences under MOU, was organized on 22nd Dec., 2018 in collaboration with department of mathematics, Sant Gadge Baba Amravati University, Amravati, Adarsha Mahavidyalaya, Dhamangaon Rly. About 169 members including Faculty members and Research Scholars, PG students from various colleges participated in the workshop. Resource persons were invited from various reputed institutions. This programe was carried out in four sessions.

Outcome of the Programme:

- This workshop will help the students to make them ready to face the challenging questions, thereby crack the examination.
- Participants got motivated to clear the CSIR-UGC NET / SET Exams.
- Studentsgot inspired to organize such type of useful workshops in future.

Name & Contact No. of Expert (if any):

Dr.S.R.Choudhary ,Director,
School of Mathematical Sciences, KBC, North Maharashtra University, Jalgaon.
Contact No. 9420129704
Dr.J.N.Chaudhary , Professor , M.J.College, Jalgaon , Contact No.9404490800
H.G.Parlikar, Assistant Professor, Brijlal Biyani College, Amravati, Contact No.9561125053
N.A.Niwalkar,Research Scholar, Contact No.8668931691
Dr.M.D.Netnaskar ,Assistant Professor,Bapumiya Science College, Pimpalgaon Kale, Dist.Buldana, Contact No.9604335210
Dr.R.V.Mapari, Assistant Professor, GVISH,Amravati, Contact No.9604335210
S.B.Thool,Assistant Professor, GVISH, Amravati, Contact No.7276947010
S.V.Gore,Assistant Professor,Indira Gandhi Arts Science College, Ralegaon
Dist. Yavatmal, Contact No. 9673211011

(Name & Signature of Concern Teacher)

Dr.Sangita Yawale, Principal,Sidnehum Commerce College, Mumbai, on the occation of Inaugural function

Dr.Ajay Deshmukh, Registrar, SGB,Amravati, delivering his presidential speech

Resource person: Dr.J.N.Choudhary, Jalgaon, delivering his Lecture

Resource person: Harshal Parlikar, Amravati, delivering his Lecture

To,
The Head,
P.G. Department of Mathematics,
Sant Gadge Baba Amravati University, Amravati

Subject: Organization of workshop on "NET/SET guidance for P.G. mathematics students and Exhibition of mathematical model.

It gives me an immense pleasure that your department is esteemed in the university with all facilities, you always organized various activities in the interest of people of mathematics.

Therefore you are requested to organize Exhibition of mathematical model on 21st December, 2018 and one day workshop on "**NET/SET guidance** for P.G. mathematics students" on **22nd December, 2018** on the eve of Ramanujan birth anniversary in collaboration with our institute, we are ready to provide financial help and co-operation.

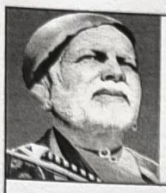
We anticipate your valuable co-operation and help.

Thanking You

o/c

Sincerely Yours,

PRINCIPAL
Shri. Ramrao Deshmukh Arts,
Smt. Indiraji Kapadiya Commerce &
Ryayamurti Krushnarao Deshmukh
Science College, Amravati.



SANT GADGE BABA AMRAVATI UNIVERSITY

MATHEMATICS TEACHER'S ASSOCIATION , AMRAVATI

To,
The **Hon'ble Principals** of all Affiliated Colleges, SGBAU,AMRAVATI

Respected Sir,

We have the honor to inform you that, on the eve of National Mathematics Day-2018 and Ramanujan's Birth Anniversary, the Department of Mathematics & IQAC, Sant Gadge Baba Amravati University, Amravati is organizing University level **4th Workshop on "NET/SET Guidance in Mathematics" on December 22, 2018 in collaboration with Department of Mathematics, R.D.I.K & K.D. College, Badnera and Department of Mathematics, Adarsha Science, J.B.Arts & Birla Commerce Mahavidyalaya, Dhamangaon (Rly.) and SGBAU Mathematics Teachers Association.** The eminent speakers, several distinguished academicians and researchers from our university and other university will deliver their valuable guidance in the workshop.

You are request to please encourage and depute **P.G. students** for the workshop. Your active cooperation shall be highly appreciated and will make this event successful.

- Certificates will be issued to all participants.
- Delicious Breakfast/Lunch have been organized.
- T.A./D.A. will not be paid.

Venue: A.V. Theater, SGBAU, Amravati **Time: 10.00 A.M.**

Soliciting your positive and active response.
Thanks,
Sincerely yours ,

Dr. S. D. Katore
Professor and Head,
Dept. of Mathematics , SGBAU Amravati
President
SGBAU Mathematics Teachers' Association

On the eve of National Mathematics Day-2018

UNIVERSITY LEVEL WORKSHOP
ON
NET/SET GUIDANCE IN MATHEMATICS

(Organized under Best Practices in the University)

Saturday, December 22, 2018

Organized by

Department of Mathematics,
Sant Gadge Baba Amravati University & IQAC, Amravati
NAAC Re-accredited with 'A' grade

in collaboration with Department of Mathematics, R D I K & K D College, Badnera (Rly.)
NAAC accredited with 'B' grade

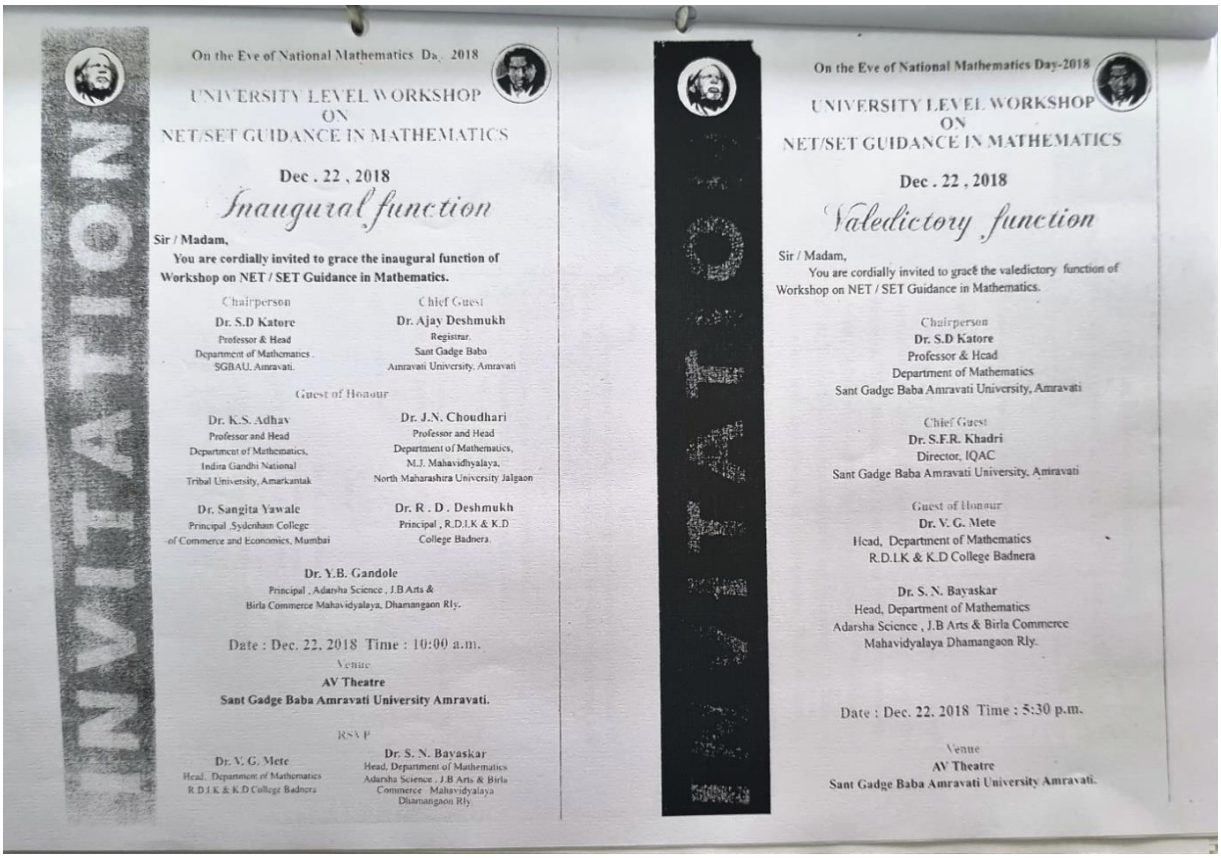
and

Adarsha Science , J.B. Arts & Birla Commerce Mahavidyalaya, Dhamangaon (Rly.) ,
NAAC Re-accredited with 'B' grade

UNIVERSITY LEVEL WORKSHOP
ON
NET/SET GUIDANCE IN MATHEMATICS
22 Dec, 2018

Program Schedule

9.00-9.45 am.	**Registration , Tea and Break fast**
	Session - I
Time	**Program** **Chief Guest/Guest of Honours**
	Inauguration of Workshop
10.00 – 11.00 am.	**Chairperson:** **Dr. S.D.Katore** Prof.& Head Department of Mathematics, Sant Gadge Baba Amravati University, Amravati. **Chief Guest:** **Dr. A. P. Deshmukh** Registrar, Sant Gadge Baba Amravati University, Amravati **Guest of Honours:** **1) Dr.K.S.Adhav** Professor and Head Department of Mathematics Indira Gandhi National Tribal University, Amarkantak **2) Dr. J. N. Chaudhari** Professor and Head , Department of Mathematics, M.J. Mahavidyalaya , North Maharashtra University, Jalgaon. **3) Dr.Sangita Yawale** Principal, Sydenham College of Commerce and Economics, Mumbai & science. **4) Dr. R.D.Deshmukh** Principal, Ramrao Deshmukh Arts, Smt. Indiraji Kapadiya Commerce College, Badnera . **5) Dr. Y.B.Gandole** Principal, Adarsh Science, Jairamdas Bhagchand Arts & Birla Commerce College, Dhamangaon(Rly) .
	Session - II
Time	**Speakers/ Resource Persons**
11.00 – 2.00 pm.	**Dr.K.S.Adhav** Professor and Head, Department of Mathematics, Indira Gandhi National Tribal University, Amarkantak, **Dr. J. N. Chaudhari** Professor and Head , Department of Mathematics, M.J. Mahavidyalaya , North Maharashtra University, Jalgaon. **Dr. J. N. Salunke** Ex. Professor and Head, Department of Mathematics, S.R.T.M.U, Nanded .
2.00 – 2.30 pm.	**Lunch Break**
	Session - III
2.30 –5.00 pm	Speaker Dr. J. N. Chaudhari Shri. H. G. Paralikar Shri. S. V. Gore. Shri. S. B. Thool, GVISH, Amravati. Shri. N.A. Niwalkar Shri. M. D. Netnaskar Ku. Manjusha Turak
	Session -IV
5.00-6.00	**Valedictory Function**



INVITATION

On the Eve of National Mathematics Da 2018

UNIVERSITY LEVEL WORKSHOP
ON
NET/SET GUIDANCE IN MATHEMATICS

Dec . 22 , 2018

Inaugural function

Sir / Madam,

You are cordially invited to grace the inaugural function of Workshop on NET / SET Guidance in Mathematics.

Chairperson
Dr. S.D Katore
Professor & Head
Department of Mathematics .
SGBAU, Amravati.

Chief Guest
Dr. Ajay Deshmukh
Registrar.
Sant Gadge Baba
Amravati University, Amravati

Guest of Honour

Dr. K.S. Adhav
Professor and Head
Department of Mathematics,
Indira Gandhi National
Tribal University, Amarkantak

Dr. J.N. Choudhari
Professor and Head
Department of Mathematics,
M.J. Mahavidhyalaya,
North Maharashtra University Jalgaon

Dr. Sangita Yawale
Principal ,Sydenham College
of Commerce and Economics, Mumbai

Dr. R . D . Deshmukh
Principal , R.D.I.K & K.D
College Badnera.

Dr. Y.B. Gandole
Principal , Adarsha Science , J.B Arts &
Birla Commerce Mahavidyalaya, Dhamangaon Rly.

Date : Dec. 22, 2018 Time : 10:00 a.m.

Venue
AV Theatre
Sant Gadge Baba Amravati University Amravati.

RSVP

Dr. V. G. Mete
Head , Department of Mathematics
R.D.I.K & K.D College Badnera

Dr. S. N. Bayaskar
Head, Department of Mathematics
Adarsha Science , J.B Arts & Birla
Commerce Mahavidyalaya
Dhamangaon Rly.

On the Eve of National Mathematics Day-2018

UNIVERSITY LEVEL WORKSHOP
ON
NET/SET GUIDANCE IN MATHEMATICS

Dec . 22 , 2018

Valedictory function

Sir / Madam,

You are cordially invited to grace the valedictory function of Workshop on NET / SET Guidance in Mathematics.

Chairperson
Dr. S.D Katore
Professor & Head
Department of Mathematics
Sant Gadge Baba Amravati University, Amravati

Chief Guest
Dr. S.F.R. Khadri
Director, IQAC
Sant Gadge Baba Amravati University, Amravati

Guest of Honour
Dr. V. G. Mete
Head, Department of Mathematics
R.D.I.K & K.D College Badnera

Dr. S. N. Bayaskar
Head, Department of Mathematics
Adarsha Science , J.B Arts & Birla Commerce
Mahavidyalaya Dhamangaon Rly.

Date : Dec. 22, 2018 Time : 5:30 p.m.

Venue
AV Theatre
Sant Gadge Baba Amravati University Amravati.

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
R. D. I. K. And K. D. College, Badnera
University Level Workshop on NET/SET Guidance in Mathematics
22nd December 2018

r. o	Name of Students	Name of Institute	Class	Mobile No.	Signature
1.	ku. kshitija M. Deshmukh	M.Sc II Yr. RDIK & KD college, Badnera	2 nd year	8805817405	
2.	ku. shivani S. kadu	M.Sc IInd yr. R.D.I.k & K.D College, Badnera	2nd year	9049581971	
3.	ku. sneha shebe priyanka	M.Sc IInd Yr. R.D.I.k & KD clg. Badnera.	2nd year	7875938058	
4.	ku. priyanka pande	M.Sc IInd yr RDIK & KD clg Badnera	2nd year	7083452616	
5.	ku. Deepika Tarale	MSc. IInd year R.D.I.K. & K.D clg Badnera			
6.	ku. sakshi N.kale	M.Sc IInd yr RDIK & KD Clg Badnera	2nd year	9503728785	
7.	ku. kajal. K. Pan...	Msc IInd yr RDIK & KD college, badnera	IInd year	9657783744	
8.	ku. Dhanshri V. Dalvi	Msc IInd yr RDIK & KD college badnera	2nd year	7028212349	

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R. D. I. K. And K. D. College, Badnera

University Level Workshop on NET/SET Guidance in Mathematics

22nd December 2018

Sr. No	Name of Students	Name of Institute	Class	Mobile No.	Signature
9	Ku. Komal S. Sonone	MSc IInd Year RDIK & KD college Badnera	MSc 2nd year	7169070960	
10	Ku Shreya D. Patnak.	MSc IInd year RDIK & KD college Badnera	M.Sc.2nd year	9767465883	
11	Ku. Dhanshri Dasokar	MSc IInd yr RDIK & KD college, Badnera	MSc 2nd yr	8600039588	
12	Ku. Aditi S. Bhagat	M.Sc IInd yr R.D.I.K & K.D College Badnera	M.Sc 2nd yr	9763891019	
13	Ku. Utkarsha M. Chaudhary	M.Sc IInd yr R.D.I.K & K.D College, Badnera	M.Sc 2nd yr	7411681981	
14	Ku. Ashwini R. Dethe	MSc Ist yr RDIK & KD college Badnera	MSc Ist yr	7774983440	
15	Miss. Reshma A. Saiyyad	R.D.I.K & N.K.D college Badnera	M.Sc Ist yr	8329616064	
16	Ku. Ekta P. Shewtkar	R.D.I.K & K.D college badnera	MSc I st Year	9545190138	

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University Level Workshop on NET/SET Guidance in Mathematics

22nd December 2018

Sr. No	Name of Students	Name of Institute	Class	Mobile No.	Signature
17	Ku. Aishwarya R. Gulhane	MSc Part I Semm-IInd	1st year	8625011555	
18	Ku Gayatri A. Thak.	M.Sc- IIn Sem-IIIed	IInd year	8329711729	
19	Ku. Vaisharavi A. Pohokar	M.Sc- Part-IInd	IInd year	8329711729	
20	Mr. Mayuresh G. Kache	M.Sc.- Part-IInd	IInd yr	8806088788	
21	Ms. Shubham P. Ghatole	M.Sc - Part -IInd	IInd yr.	9561967473	
22	Amit A. Rajput	MSc - Part - IInd.	IInd yr	7058182525	
23	Soheil Paras A. Haq	MSc. IInd	IInd yr	8668403360	
24	Mr. Yogesh S Dole	MSc-IInd yr	IInd yr	8556626885	

23

SANT GADGE(BABA AMRAVATI UNIVERSITY(AMRAVATI

R. D. I. K. And K. D. College, Badnera

University Level Workshop on NET/SET Guidance in Mathematics

22nd December 2018

Sr. No	Name of Students	Name of Institute	Class	Mobile No.	Signature
5	Ku. Shrutika A. Gawande	R.DIK , Badnera	MSc-Ist (IInd sem)	7709531811	
1	Ankush N. Ghode	R.D.I.K , Badnera	Staff.	7887837257	
2.	Rupali J. Bhelkar	—11—	—11—	9767425932	
3.	Snehal R. Palaskar	—11—	—11—	8806957296	

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
Adarsh Science,J. B. Arts & Birla Commerce College, Dhamangaon(Rly)
University Level Workshop on NET/SET Guidance in Mathematics
22nd December 2018

Sr. No	Name of Students	Name of Institute	Class	Mobile No.	Signature
1	Shubham M. Mishra	AMV college DMN RLY	MSc II	9373416379	
2	Sandeep R. Chavan	R.L.T. Science College	M.Sc I	9579991106	
3)	Akshay P. Galbekar	A.M.V college DMNRly	M.Sc II	7709750076	
4)	Puja S. Alone	A.M.V college DMNRly	M.Sc II	9049396764	
5)	Snehal R. Solanki	A.M.V. college DMNRly	MSc II	9404882268	
6)	Namrata V. Talkhandkar.	A.M.V. College DMNRly	M.Sc.-II	7058983707	
7)	Aarti D. Ramchande	A.M.V college DMNRly	M.Sc-II	9623768569	
8)	Yuga B Ghate	A —11—	MSC-I	9146332193	

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
Adarsh Science J. B. Arts & Birla Commerce College, Dhamangaon(Rly)
University Level Workshop on NET/SET Guidance in Mathematics
22nd December 2018

Sr. No	Name of Students	Name of Institute	Class	Mobile No.	Signature
9)	Uzza Afshin Abdul Salam	—11—	MSc I st	7219422996	
10)	Saema Anjum Ali	—11—	—11—	9764977886	
11)	Neha Shyam Panpaliya	—11—	—11—	9373677507	
12)	Tejaswini N. Matire	—11—	—11—	8603203505	
13)	Kanchan S. Kathale	—11—	—11—	7410750771	
14)	Gayatri P. Dehankar	—11—	—11—	8600696933	
15)	Vaishali S. Chakodhare	—11—	—11—	9767029680	
16)	Pooja R. Hajare	—11—	—11—	9922246106	

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
Adarsh Science J. B. Arts & Birla Commerce College, Dhamangaon(Rly)
University Level Workshop on NET/SET Guidance in Mathematics
22nd December 2018

Sr. No	Name of Students	Name of Institute	Class	Mobile No.	Signature
17)	Geeta D. Gadekar	—11—	Msc 1st	9960355142	
18)	Asmita S. Kamble	—11—	—11—	7768070291	
19)	Kunjwani. V. Jogave	—11—	—11—	9284396521	
20)	Aabha R. choudhari	—11—	—11—	9767117125	
21)	Swati D Jawale	—11—	M.Sc-IInd	9552080017	
22)	Anuradha H. Patil	—11—	—11—	9156376016	
23	Ruposh T. Dhole	—11—	MSc.I	8390462883	
24)	Aditya S Madame	—11—	—11—	9552567542	

11

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
Adarsh Science J. B. Arts & Birla Commerce College, Dhamangaon(Rly)
University Level Workshop on NET/SET Guidance in Mathematics
22nd December 2018

Sr. No	Name of Students	Name of Institute	Class	Mobile No.	Signature
25	Shubham Subhash Junghare	A.m.v. D.man	MSc 1	7263886954	
26	Dnyaneshwar D. Awchar	R.A. College Washim	MSc - II	9850807706	
27	Akash Sanjay Kshirsagar	R.A. College Washim	M.Sc I	8308191595	
28)	Aniket A. Badkas.	Adharsh College. Dhamangaon Rly	M.Sc I	8390350852	
29)	Pallavi R. Jichkar	Adarsha college DMN(Rly)	MSc 1	9145090193	
30)	Mayuri B. Wankhade	Adarsha college DMN(Rly)	MSc I	9112306480	
31)	Rani S. Daswat	Adarsh college DMN(Rly)	MSc I	9503514559	
32)	Rasika P. Belsare	Adarsh college DMN (Rly)	M.Sc. I	9561753458	

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SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
Adarsh Science J. B. Arts & Birla Commerce College, Dhamangaon(Rly)
University Level Workshop on NET/SET Guidance in Mathematics
22nd December 2018

Sr. No	Name of Students	Name of Institute	Class	Mobile No.	Signature
33)	Ku. Vaishali K. Kajalkar	Aadarsh College Dhamangaon Rly.	MSc I	7507008092	
34)	Ku. Divya A. Pacle	Aadarsh College. Dhm	MSc-I	7385978246	
35)	ku. Vaishnavi R. Tidke	Adarsh college. Dha. Rly	M.Sc-I	9604814990	V.R.Tidke
36)	ku. Radha J. Deshmukh.	Adarsh college Dha Rly	M.Sc II	7709873658	
37)	ku. Samiksha K. Dhok	Adarsh College Dha-Rly.	M.Sc. II	9175582026	
38	Liladhar R. Chundhari	A.M.V. Dhamangaon rly	M.Sc-II	9096499214	
39	Khalb Akhtar	A.M.V Dhamangaon Rly		7843065047	
40)	Shraddha Zade	—11—		9405811193	

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SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
Adarsh Science J. B. Arts & Birla Commerce College, Dhamangaon(Rly)
University Level Workshop on NET/SET Guidance in Mathematics
22nd December 2018

Sr. No	Name of Students	Name of Institute	Class	Mobile No.	Signature
41)	Ku. Rasika Suhas Katekar	Adarsh College, Dhamangaon Rly		7058549973	
42)	Ku. Sonal P. Dalponi	—11—		7276955987	S. P. Malpani
43)	Ashwina Rangari	—11—	Asst. professor Adarsh college DMN Rly	8805637738	Rangari
44)	Aditi A. Utane	—11—		8605526099	
45)	Advita Y. Deshmukh	—11—		9145762339	
46)	Vruttika R. Wankhade	—11—		9975160096	
47)	Pranali D. Khairkar	—11—		9145779534	
48)	V. S. Thool	Adarsh mahavidyalaya, Dhamangaon Rly		9923621629	

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SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
University Level Workshop on NET/SET Guidance in Mathematics
22nd December 2018

Sr. No	Name of Students	Name of Institute	Class	Mobile No.	Signature
01	Yogesh Harishchandra Ingole	Shri. R.L.T College of Science, Akola	M.Sc (I) (Mathematics)	8275400811	
02	Nagesh Ashok Bhagat	-11-	-11-	9850415810	
03	Krushna Ramchandra Gawande	-11-	-11-	9881127991	
04	Saba Parveen SK Tazeem	Shri Dr R G Rathod College Murtizapur	M.Sc (I) (Mathematics)	9527363685	
05	Ku Ganga Vasudeo Lanjulkar	Shri. Dr. R.G Rathod College Murtizapur	M.Sc (I) (Math)	9561117304	
06	Ku. Bhoshi Vidhyadhar Umbale	Shri Dr. R. G. Rathod college, Murtizapur.	M.Sc. (I) (Math)	9373832159	
07	Ku Mayuri Gajanan Dhoye	Shri Dr R. G. Rathod college, Murtizapur	M.Sc I (math)	8857057149	
08	Ku Pushpa Arun Gawai	Shri. Dr. R. G. Rathod College Murtizapur	M.Sc I (Math)	7083014508	
09	Ku. Mayuri D. Thonde	Arts, Commerce & Science College, Kiran nagar Amt	M.Sc I Maths	9175781318	

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Sr. No	Name of Students	Name of Institute	Class	Mobile No.	Signature
10	Ku. Anagha P. Padwad	Arts, commerce & Science college, kiran nagar Amt	M.Sc I	8625096514	
11)	Rohit V. Ingole	Arts, commerce and science college kiran nagar	M.Sc - I st	7775907500	
12)	Niraj R. Darokar	Arts commerce and science, college kiran nagar	M.Sc - I st	8485005013	
13)	Puja V. Hirulkar	Arts, Commerce and Scienct college, Kiran nagar	M.Sc. I st year	9767182431	
14)	Ku. Priya. Avadhut Gawande	R.A. college. Washim	M.Sc. I st year	9673109428	
15)	Ku. Pragati. Sureshrao Ughade	R.A. College. Washim	M.Sc. II nd year	9552910477	
16)	Ku. Lachi Rajendra Tondwal	Amolakchand Mahavidyalaya Yavatmal.	M.Sc. I st year	7775872552	
17)	Ku. Poonita Digambar Darokar	Arts. commerce & scierce College Kiran nagar Amt.	M.Sc I st year	9637205972	
18)	Ku. Yogita Sureshrao Narthe	Shri R.L.T college of science Akola.	M.Sc II nd yr	9822188288	

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SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
University Level Workshop on NET/SET Guidance in Mathematics
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Sr. No	Name of Students	Name of Institute	Class	Mobile No.	Signature
19)	Ku. Nikita Vitthalrao Gawande	Shri R.L.T College of Science, Akola	M.Sc. II	9689119785	
20)	Rahul Raju Raut	R.A. college, Washim	M.Sc II	8888955767	
21)	Ku. Deepali Wankhade	R. A. College. Washim	M.Sc II	9168829377	
22)	Ku. Shubhangi S. Sitaye.	R.A. college. Washim	M.Sc II	9096114524	
23)	Ku Pramali A. Tayne	Amolakchand College Yvt	M.Sc II	9011553204	
24)	Ku. Pratiksha A. Gawande	Shivaji clg Akola	M.Sc I	9130999302	
25)	Ku. Rakhi R Gaykwad	R.A. college, washim	M.Sc II	9552386036	
26)	Ku. Preeti D Mahatre	Amolakchand clg Yvt	M.Sc. II	8605095716	
27)	Ku. Sukhada A. Nahar	Amolkchand clg Yvt	M.S. II	7030897998	

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SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
University Level Workshop on NET/SET Guidance in Mathematics
22nd December 2018

Sr. No	Name of Students	Name of Institute	Class	Mobile No.	Signature
28	Ku. Pranjali G. Tundalwar	Amolakchand Cg Ytl	M.Sc II	7499243799	P.G.Tundalwar
29	Ku. Darshana D. Zambad	Amolakchand cg. Ytl	M.Sc. II	7756081121	Zambad
30	Ku. Prajakta R. Gayakwad	Amolakchand Cg Ytl	M Sc II	7507706093	Dwad
31	Ku. Monali A. Vighe	R.A. College, Washim	M. Sc. II	9665515511	Vighe
32	Ku. Avantika S. Mankar	Biyani College — Amt	M Sc I	8805523290	
33	Saba Tanveer Saifuddin	Brijlal Biyani Amt	MSc I	9960178008	Saba
34	Namrata Dola	Brijlal Biyani, Amravati	M.Sc I	9765813358	
35	Sagar P. Dharelar	— 11 —	— 11 —	7767035185	
36	Ankush P. Mahalle	B. B. Amravati	— 1 —	9545242360	

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SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
University Level Workshop on NET/SET Guidance in Mathematics
22nd December 2018

Sr. No	Name of Students	Name of Institute	Class	Mobile No.	Signature
37)	Ku. Shivani G. Udapurkar	Brijlal Biyani Amravati	MSc I Yr	8308611236	
38)	Ku. Aishwarya Naik	— 11 —	MSC I Yr	9156841342	
39)	Ku. Aarati Deshamukh	— 11 —	MSc I Yr	9657222831	
40)	Ku. Manisha D. Patange	R. A. College Washim	M.Sc II Yr	8806838285	
41)	Ku. Rupali H. Ganathe	R.A College Washim	MSC II Yr	8550963572	
42)	Sandesh S. Thakare	Brijlal Biyani clg. Amt	M.Sc. I st	9552224998	
43)	Abhijeeb D. Padhye	Brijlal Biyani sc. College Amt	M-Sc I st	9145265782	
44)	Sarang S. Gorte	Brijlal Biyani sc. college Amt	M-Sc I st	8007899322	
45)	Lokesh U. Paliwal	— 11 —	M-Sc-I st	7775870912	

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University Level Workshop on NET/SET Guidance in Mathematics
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Sr. No	Name of Students	Name of Institute	Class	Mobile No.	Signature
46]	Rupesh M. Bajaj	Brijlal Biyani sci-college	M Sc I st	9595117288	
47)	Chaitali G. Gawande	R. A. college, Washim	M.Sc - II nd	8975136049	Gawande
48)	Lokesh D. Gotaphode	R.A. College, Washim	M.Sc, II nd yr	7875054257	
49)	Snehal R. Tanjule	R.A. College Washim	M.Sc. II nd yr	9545397702	Tanjule
50)	Jiveshwar P. Zade	Vidybharti college, Amt	M.Sc. I st yr	7743909016	
51)	Keshav JAgrawal	Vidyabharti College Amt	M.Sc I st	7507523249	
52]	Poornima S. Gawande	R. A. College Washim	M.Sc. II nd yr	7744048425	
53]	Anjali S. Dongardive	R.A. College, Washim	MSc-2nd yr.	9405881509	
54.	~~Bhakti~~ Sr. Badgujar	Govt. Vidarbh Institute of sci & Humani. Herbut	M.Sc. 2nd yr	7758801458	

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SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
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Sr. No	Name of Lecturer	Name of Institute and Designation	Qualification	Mobile No.	Signature
55)	~~Aditya M. Joshi~~	G.V.I.S.H. Amravati.	M.Sc. 2nd yr	832 993 1771	A.M.Joshi
56)	~~Disha M. Nebhnani~~	G.V.I.S.H. Amravati.	M.Sc. 2nd yr.	8087108111	D. M. Nebh
57)	SYED AHRAZ SY PARVEZ	Shri Shivaji College Akola	M.Sc. II	7972215126	
58)	Nageer Ahmed Abdul Rehman	Shri Shivaji College Akola	M.Sc IInd	7841927707	
59)	Sohail Ali Riyaz Ali	Shri R.L.T college Akola	M.Sc IInd	9623038508	
60)	Yogesh . o. Hoda	R.L.T college Akola (C.H.S)	M.Sc	9604036386	
61)	Dhananjay R. Sakhare	Shri. Shivaji College Akola.	M.Sc	9552739394	
62)	~~Pratiksha A Gawande~~	Shivaji clg Akola			

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SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
University Level Workshop on NET/SET Guidance in Mathematics
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Sr. No	Name of ~~Students~~ Teachers	Name of Institute	Class	Mobile No.	Signature
1.	Dr. S. R. Kumbhare	Amolakchand Mahavidyalaya, Yavatmal		9890000949	
2.	Ku. N. M. Tade	S.P.G. Department of Mathematics S.G.B.A.U. Amt.		7775989093	
3.	Ms. S. P. Saraogi	P.G Teaching Department of Mathematics, Sant Gadge Baba Amravati University, Amravati		9404545235	
4.	Ms. A. M. Pokale	—11—		9970849240	
5	Abhishek K. Dabre Mr. A. K. Dabre	P.G.T. Dept. of Mathematics, SGBAU		8888697936	
6.	Mr. Dnyaneshwar P. Rathod	P.G.T.D. of Mathematics SGBAU, Amt.		9623478094	
7	Ku. S. D. Ramteke	PGTD of Mathematics			
8	N.A. Niwalkar	—11—		9881024668	

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
Department of Mathematics
University Level Workshop on NET/SET Guidance in Mathematics
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Sr. No	Name of Students	Name of Institute	Class	Mobile No.	Signature
1	Monika U. Shelke	SGBAU	M.Sc I	9763293694	
2.	Pragati A. Kadu	—11—	I —11—	9370338563	
3.	Shital D. Zode.	—11—	—11—	7350647560	
4.	Bhagyashri M. Bargat	—11—	—11—	9922286181	
5.	Ravina A. Jumbad	—11—	—11—	9604313590	
6	Dimpal D. Ughade	—11—	—11—	7075929077	
7.	Snehal R. Waghamare	—11—	—11—	9657816074	
8.	Dnyaneshwar M. Gaygole	—11—	—11—	8788078634	

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SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
Department of Mathematics
University Level Workshop on NET/SET Guidance in Mathematics
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Sr. No	Name of Students	Name of Institute	Class	Mobile No.	Signature
9	Ankush S. Rovadale	SGBAU	MSC-I	3412851204	
10	Nikhil Haridas Mankar	SGBAU	M.Sc-I	9834995615	
11	Parag W. Ghait	SGBAU	M.Sc. I	9146476494	
12	Kanchan N. Bathe	SGBAU	M.Sc I	9570375244	
13	Ku Dipali A. chopade	SGBAU	MSC-I	8669724709	D.A. chopad
14	Ku. Megha. R. Fengade	SGBAU	MSc - I	7028249451	
15.	Ku. Kalyani P. Kshirsagar	SGBAU	M.Sc. II	9763315431	
16.	Ku. Manisha A. Pathak	SGBAU	M.Sc-II	7218070249	

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SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
Department of Mathematics
University Level Workshop on NET/SET Guidance in Mathematics
22nd December 2018

Sr. No	Name of Students	Name of Institute	Class	Mobile No.	Signature
17)	Ku. Komal S. Gupta.	SGBAU, Amt.	M.Sc I st	7066421532	Gupta.
18)	Miss. Nikita P. Maske	SGBAU, Amt	Msc I st	7414972719	
19)	Miss. Vaishnavi N. Lawhale	SGBAU, Amt	MSC. I st	9552423171	
20)	Ku Sushama D. Tidke	SGBAU Amaravti	M.sc I st	7522931174	
21)	ku. Ashvini L. Raut	-11-	M.sc II nd	8421796358	
22)	Ku. Shwetabdee K. Jamnale	SGBAU AMRAVATI	M.Sc - II	9604231808	
23)	Ku. Rohini B. Chopade	SGBAU AMRAVATI	M.Sc - II	9545685838	
24.	Kusha Khushal. P. Rathod	SGBAU, Amt	M.Sc I	7385839797	

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SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
Department of Mathematics
University Level Workshop on NET/SET Guidance in Mathematics
22nd December 2018

Sr. No	Name of Students	Name of Institute	Class	Mobile No.	Signature
25	Bhagyashri D. Deshmukh	SGBAU	M.Sc. IInd	8390292596	
26	Nital V. Patil	SGBAU	M.sc IInd	8788880157	
27	Kailas A. Rindhe	SGBAU	M.Sc IInd	8668396453	
28.	Shubhangi N. Manoolkar	-11-	-11-	8381098920	
29.	Vishakha S. Deshpande	-11-	-11-	7350586317	
30.	Shiwani V. Kapade.	-11-	-11-	7083163295	
31.	Smita. K. Nagle.	-11-	-11-	7083187562	
32	Sagar V. Kharode	-11-	-11-	9503956662	

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मातृभूमि
बुधवार, दि. २६ डिसेंबर [illegible]

विद्यापीठातील गणित विभागात राष्ट्रीय गणित दिवस उत्साहात साजरा

■ गणित तज्ञ डॉ.रामानुजन यांच्या जयंती प्रित्यर्थ गणित तज्ञांची उपस्थिती

प्रतिनिधी / २५ डिसेंबर

अमरावती -संत गाडगे बाबा अमरावती विद्यापीठातील गणित विभाग व या अंतर्गत येणारे संलग्नित महाविद्यालय आर.डी.आय.के. आणि के.डी. कॉलेज बडनेरा तसेच आदर्श महाविद्यालय धामणगाव रेल्वे यांच्या संयुक्त विद्यमानाने राष्ट्रीय गणित दिवस उत्साहात साजरा करण्यात आला.

महान गणित-तज्ञ डॉ. श्रीनिवासा रामानुजन यांचा जन्मदिन २२ डिसेंबर राष्ट्रीय गणित दिवस म्हणून दरवर्षी सर्वत्र साजरा करण्यात येतो. मागील ३ वर्षाप्रमाणे या वर्षीही संत गाडगे बाबा अमरावती विद्यापीठातील गणित विभागाद्वारे या दिवसा निमित्य नेट-सेट मार्गदर्शन कार्यशाळेचे आयोजन करण्यात आले. गणित क्षेत्रातील रोजगाराच्या संधी तसेच त्यासाठी असलेले नेट-सेट परीक्षेचे महत्त्व तसेच हि परीक्षा

उत्तीर्ण करण्यासाठी कोणत्या गोष्टी अंगीकृत केल्या पाहिजे हे विद्यार्थ्यांना सहज [illegible] भारत पटवून देणे हा या [illegible] होता. हा कार्यक्रम [illegible] टप्प्यात पार पडली. [illegible] कार्यशाळेच्या उद्घाटना [illegible] पार पडला हा कार्यक्रम [illegible] कतोरे विभाग प्रमुख गणित विभाग संत गाडगे बाबा अमरावती विद्यापीठ

अमरावती यांच्या अध्यक्षतेखाली पार पडला. या कार्यक्रमाला उद्घाटक म्हणून डॉ. संगीता यावले प्राचार्य सिडनहॅम वाणिज्य महाविद्यालय मुंबई तसेच प्रमुख अतिथी म्हणून डॉ. अजयजी देशमुख कुलसचिव संत गाडगे बाबा अमरावती विद्यापीठ अमरावती, डॉ.जे.एन. चौधरी प्राध्यापक एम.जे. कॉलेज जळगाव, डॉ.वाय.बी. गांडोळे प्राचार्य आदर्श महाविद्यालय धामणगाव रेल्वे व डॉ.आर.डी. देशमुख प्राध्यापक आर.डी.आय.के. आणि के.डी. कॉलेज बडनेरा उपस्थित होते. सर्वप्रथम सर्व मान्यवरचांचे स्वागत पुष्पगुच्छ देऊन करण्यात आले. डॉ सुधिर वायस्कर गणित विभाग प्रमुख, आदर्श महाविद्यालय धामणगाव रेल्वे यांनी या कार्यक्रमाचे प्रास्ताविक केले. तसेच कार्यक्रमाला प्रमुख अतिथी म्हणून लाभलेले डॉ. अजयजी देशमुख यांनी विद्यार्थ्यांना मोलाचे मार्गदर्शन केले. त्यांनी गणिताल भाषा नसते पण गणित हे या विषयाची भाषा आहे असे आपल्या भाषणातून सर्वांना पटवून दिले तसेच प्रमुख पाहुणे म्हणून लाभलेले डॉ.जे.एन. चौधरी, डॉ.वाय.बी. गांडोळे व डॉ.आर.डी. देशमुख यांनी विद्यार्थ्यांना नेट-सेट परीक्षेविषयी मोलाचे मार्गदर्शन केले. या कार्यक्रमाचे आभार प्रदर्शन भाग्यश्री देशमुख (एम.एस्सी) हि करून कार्यक्रमाची सांगता झाली. या कार्यशाळेचे सूत्रसंचालन अक्ष तऱ्हेकर (एम.एस्सी) व मदि मेहरोश (एम.एस्सी.) यांनी केले. या प्रसंगी प्रा. डॉ. अश्विनी रंगारी, [illegible] देसले, प्रा. काटेकर, प्रा. झाडे निलेश निवलकर, ज्ञानेश्वर राठोड श्री. अभिषेक डायरे, कुशला[illegible] सारावगी, शैलजा रामटेके, नय[illegible] ताडे, अर्चना पोकळे आ[illegible] उपस्थित होते. अशा प्रकारे कार्यशाळा यशस्वी रित्या पार पडल[illegible]

राष्ट्रीय गणित दिवस कार्यशाळेत नेट-सेट परीक्षेसंदर्भात मार्गदर्शन

प्रतिनिधी

[illegible]

[illegible]

अमरावती झव्हिनिंग | २५ डिसेंबर २०१८

विद्यापीठातील गणित विभागात राष्ट्रीय गणित दिवस उत्साहात साजरा

अमरावती दि. २४ :– संत गाडगे बाबा अमरावती विद्यापीठातील गणित विभाग व या अंतर्गत येणारे संलग्नित महाविद्यालय आर. डी. आय. के. आणि के.डी. कॉलेज बडनेरा तसेच आदर्श महाविद्यालय धामणगाव रेल्वे यांच्या संयुक्त विद्यमानाने राष्ट्रीय गणित दिवस उत्साहात साजरा करण्यात आला. महान गणित–तज्ञ डॉ. श्रीनिवासा रामानुजन यांचा जन्मदिन २२ डिसेंबर राष्ट्रीय गणित दिवस म्हणून दरवर्षी सर्वत्र साजरा करण्यात येतो. मागील ३ वर्षांप्रमाणे या वर्षीही संत गाडगे बाबा अमरावती विद्यापीठातील गणित विभागाद्वारे या दिवसा निमित्य नेट–सेट मार्गदर्शन कार्यशाळेचे आयोजन करण्यात आले.

गणित क्षेत्रातील रोजगाराच्या संधी तसेच त्यासाठी असलेले नेट–सेट परीक्षेचे महत्व तसेच हि परीक्षा उत्तीर्ण करण्यासाठी कोणत्या गोष्टी अंगीकृत केल्या पाहिजे हे विद्यार्थ्यांना सहज व सुलभ भाषेत पटवून देणे हा या कार्यशाळेचा उद्देश होता. ही कार्यशाळा एकूण तीन टप्प्यात पार पडली.

पहिल्या टप्प्यात कार्यशाळेच्या उदघाटनाचा कार्यक्रम पार पडला हा कार्यक्रम डॉ. एस.डी. कतोरे विभाग प्रमुख गणित विभाग संत गाडगे बाबा अमरावती विद्यापीठ अमरावती यांच्या अध्यक्षतेखाली पार पडला. या कार्यक्रमाला उदघाटक म्हणून डॉ. संगीता यावले प्राचार्य सिडनहॅम वाणिज्य महाविद्यालय मुंबई तसेच प्रमुख अतिथी म्हणून डॉ. अजयजी देशमुख कुलसचिव संत गाडगे बाबा अमरावती विद्यापीठ ,अमरावती, डॉ.जे.एन. चौधरी प्राध्यापक एम.जे. कॉलेज जळगाव, डॉ.वाय.बी. गांडोळे प्राचार्य आदर्श महाविद्यालय धामणगाव रेल्वे व डॉ. बी. टेशम्सव प्राध्यापक प्रमुख, आदर्श महाविद्यालय धामणगाव रेल्वे यांनी या कार्यक्रमाचे प्रास्ताविक केले. या कार्यक्रमाच्या उद्घाटिका डॉ. संगीता यावले प्राचार्य सिडनहॅम वाणिज्य महाविद्यालय मुंबई यांनी विद्यार्थ्यांना मोलाचे मार्गदर्शन केले. कोणत्याही परीक्षेत उत्तीर्ण होण्यासाठी कठोर मेहनती शिवाय पर्याय नाही हे त्यांनी पटवून दिले. तसेच गणितासारख्या महत्वच्या विषयाचे महत्व पटवून दिले. स्पर्धा परीक्षेत टिकून राहण्यासाठी संयम असणे खूप आवश्यक आहे हे समजावून संगीतले. तसेच त्यांनी विदर्भात महत्वपूर्ण असलेले तीन ख यांची खूप छान संकल्पना सर्वांसमोर मांडली. ती म्हणजे संत गाडगे बाबा यांचा खराटा, तुकडोजी महाराज यांची खंजेरी व डॉ. पंजाबराव देशमुख यांचा खडू अशा प्रकारे त्यांनी मोलाचे मार्गदर्शन करून कार्यशाळेचे उदघाटन केले.

तसेच कार्यक्रमाला प्रमुख अतिथी म्हणून लाभलेले डॉ. अजयजी देशमुख यांनी विद्यार्थ्यांना मोलाचे मार्गदर्शन केले. त्यांनी गणिताला भाषा नसते पण गणित हे सर्व विषयाची भाषा आहे असे आपल्या भाषणातून सर्वांना पटवून दिले. तसेच प्रमुख पाहुणे म्हणून लाभलेले डॉ.जे.एन. चौधरी , डॉ.वाय.बी. गांडोळे व डॉ.आर.डी. देशमुख यांनी विद्यार्थ्यांना नेट–सेट परीक्षेविषयी मोलाचे मार्गदर्शन केले.

कार्यक्रमाचे अध्यक्ष डॉ.एस.डी. कातोरे यांनी विद्यार्थ्यांना नेट–सेट परीक्षेचे असलेले महत्व तसेच या कार्यशाळेचा असलेला उद्देश सर्वांना स्पष्ट करून दिला. तसेच विद्यार्थ्यांना भविष्यासाठी शुभेच्छा दिल्या.

कार्यशाळेच्या पहिल्या टप्प्यातील कार्यक्रमाचे आभार प्रदर्शन डॉ.ए.एन. सोरी, आदर्श महाविद्यालय धामणगाव रेल्वे यांनी केले.

विद्यार्थ्यांसमोर मांडल्या.

ह्या सत्रामध्ये डॉ.किशोर अढाव विद्यापीठातील गणित विभागात राष्ट्रीय गणित दिवस उत्साहात साजराप्राध्यापक व विभाग प्रमुख गणित विभाग इंदिरा गांधी राष्ट्रीय जनजातीय विद्यापीठ अमरकंटक यांनी नेट–सेट परीक्षेबद्दल मार्गदर्शन केले व डॉ.जे.एन. चौधरी यांनी नेट–सेट परीक्षेत विचारण्यात येणारे प्रश्न कशा प्रकारे सोडवायचे तसेच त्यांनी विद्यार्थ्यांना विविध प्रश्नांबद्दल मोलाचे मार्गदर्शन केले. तसेच श्री हर्षद परळीकर बियाणी महाविद्यालय अमरावती यांनी नेट–सेट परीक्षेत वेळेचे नियोजन कशा प्रकारे करावे याबद्दल मार्गदर्शन केले. आयोजकांमधील सर्व गणित शिक्षक वृंदांनी नेट सेट विषयी मार्गदर्शन केले. अशा प्रकारे कार्यशाळेचा दुसरा टप्पा पार पडला.

कार्यशाळेचा तिसरा व शेवटचा टप्पा म्हणजे निरोप समारंभ या कार्यक्रमाला अध्यक्ष म्हणून डॉ.एस.डी. कतोरे, प्रमुख पाहुणे म्हणून डॉ.एस.एफ.आर. खाद्री संचालक ब्रह्मकुमार संत गाडगे बाबा अमरावती विद्यापीठ अमरावती, तसेच डॉ.एस.एन.बायस्कर व डॉ.वी.जी.मेटे उपस्थित होते.

कार्यक्रमाला प्रमुख पाहुणे लाभलेले डॉ.एस.एफ.आर. खाद्री यांनी विद्यार्थ्यांना मोलाचे मार्गदर्शन केले. गणित विषयाचे महत्व स्पष्ट करून दिले व विद्यार्थ्यांना भावी आयुष्यासाठी शुभेच्छा दिल्या. या कार्यक्रमाचे आभार प्रदर्शन कु. भाग्यश्री देशमुख (एम.एस्सी.) हिने करून कार्यक्रमाची सांगता झाली.

या कार्यशाळेचे सूत्रसंचालन अक्षय तऱ्हेकर(एम.एस्सी.) व कु.मदिहा मेहरोश (एम.एस्सी.) यांनी केले या प्रसंगी प्रा. डॉ. अविनी गोरी, प्रा. देसले , प्रा. काटेकर , प्रा. झाडे , श्री निलेश निवलकर , श्री. ज्ञानेश्वर राठोड , श्री. कु. अर्चना पोकळे आदी उपस्थित अभिषेक डाबरे , कु.शलाका सारडगी होते. अशा प्रकारे हि कार्यशाळा यशस्वी , कु.शैलजा रामटेके , कु.नयना ताडे , रित्या पार पडली.

On the eve of National Mathematics Day-2018

UNIVERSITY LEVEL WORKSHOP
ON
NET/SET GUIDANCE IN MATHEMATICS
22 Dec, 2018

Feedback Form

A. Personal information of the participants-

1. Name (Surname first) : Rahu Raju Raut
2. Designation/Class : M.Sc II
3. Institute/Organization : R.A. college, washim
4. Address (Residential) : Renuka chauk, ward no. 15, mehkar. dist. Buldhana.

   Contact No. : 8888955767
5. E-mail Id : Rahulraut1996@gmail.com.

B. Feed back about Workshop on NET/SET guidance with reference to—

1. Organization : ☑
2. Correspondence : ☑
3. Lectures/Talks : ☑
4. Breakfast/Lunch & Dinner : ☑

Please put options a, b, c you feel appropriate.

a. Excellent b. Good c. Adequate

C. Suggestions if any----------

Date : 22-12-2018 Signature: Raut

On the eve of National Mathematics Day-2018

UNIVERSITY LEVEL WORKSHOP
ON
NET/SET GUIDANCE IN MATHEMATICS
22 Dec, 2018

Feedback Form

A. Personal information of the participants-

1. Name (Surname first) : Awchar Jnyaneshwar Daduram
2. Designation/Class : MSc - MATH - II
3. Institute/Organization : R. A. College Washim
4. Address (Residential) : At post Wadgaon mali; Tq. Mehkar Dist. Buldhana,

   Contact No. : 9850807706
5. E-mail Id :

B. Feed back about Workshop on NET/SET guidance with reference to—

1. Organization : ☑
2. Correspondence : ☑
3. Lectures/Talks : ☑
4. Breakfast/Lunch & Dinner : ☑

Please put options a, b, c you feel appropriate.

a. Excellent b. Good c. Adequate

C. Suggestions if any----------

Date : 22/12/2018 Signature:

Bar. Ramrao Deshmukh Arts, Smt.Indiraji Kapadiya Commerce, &
Nya. Krushnarao Deshmukh Science College, Badnera
Academic Year 2018-19

1. Name of Organizing Department / Committee: Department of Computer Science
2. Name of Activity : M.Sc. Project
3. No. of Participants : Students 16 Teachers 04 Other
4. Details of Activity (In Brief):

The project duration will be from 3/1/2019 to23/3/2019.the training language in PHP and My SQL.

Outcome of the Program:

- Demonstrate working knowledge of dynamic website design.
- Ability to install to new technique at specified point.
- Improve the communication skill.
- To enhance knowledge in one technology.

Name & Contact No. of Expert:

Prashant. Narkhede (9552781708)

Pune Academy of Advance Computer Technologies (PACT)

Head
Department Of Computer Science
Bar. R.D. Arts,Smt. I.k.Commerce
& Nay. K.D. Science College
Badnera-Amravati

1. Name of Organizing Department : Department of Commerce & Management.
2. Name of Activity : **Workshop on Tally**
3. No. of Participants : Students **124** Teachers **04** Other **03**
4. Date of Activity : 18th January, 2019

Details of Activity :

One day workshop organized by Dept. of Commerce & Management in collaboration with UNIX Computers Institute, on dated 18.01.2019 on the topic"Workshop on Tally". 124 students of Commerce department were present for this workshop. The Resource person of this workshop Prof. Vishal Dongare Director UNIX Computer Institute, guided the students on awareness about Tally software. Prof Vishal Dongare in the first session described basic Concept of Tally. He provided knowledge of Voucher Entry, Inventory, Sales, Purchase, how to select a company, Create Company, how to apply Security Control, how to change Tally Vault, Split company Data, how to take back up and restore etc. In the second session Prof. Ambika Kulkarni gives hands on training on Tally to the students and threw light on Career opportunities after completing Tally Courses such as "Tally Operator", "GST & Accounting Consultant", Income Tax Practitioner" and for students how to launch startups and become an entrepreneur.

Outcome of the Program :

- Students' basic knowledge got enhanced of Accounting, Inventory Management, and Taxation. Students also became aware about Industry need, about Tally software.
- They came to know about basic concept of Tally and Tally Software.
- Students will learn to create company, enter accounting voucher entries including advance voucher entries, do reconcile bank statement, do accrual adjustments, and also print financial statements, etc.
- Students now can get better job opportunities with the knowledge of Tally.

5. Name & Contact No. of Expert : Prof.VishalDongare (9271220572)

Dr. Pravin Deshmukh
Professor & Head
Department of Commerce
R.D.I.K. & K.D. College,
Badnera-Amravati.

Report I

"Awareness among Tally for students" *Workshop*

Organized by – Commerce & Economics Students Association,

R.D.I.K.&.K.D. College,Badnera-Amravati

Workshop-Report Date : 18 /01/2019

The total number of students in Commerce Department was 332 in the session 2018-19. Every year some important activities are conducted for the students through the students Association. An important initiative among them is the formation of Commerce and Economics students Association. Some students were elected as astudents Association Executives.

A workshop was organized through this Commerce and Economics students Association and Unix Computer Institute, on dated18/01/2019 and a workshop was conducted by Mr. Vishal Dongre, Director, Unix Computer, on the topic of Awareness and job opportunities in Tally for students .

124 students of Commerce department were present for this workshop. Awareness among Tally for students workshop was organized in the Bar. R. D. I. K. college on 18/01/2019 under Commerce and Economics students Association.

The chief Speaker of this program was Mr. Vishal Dongre director Unix Computer was present. The chief guest of the program was Head of Department of Economics of the college.Prof. V.B. Gadikar was present. This programmed Dr. Pravin Deshmukh, Head of Department of Commerce attend as program chairmen. 124 Commerce students participated in this workshop.

Most of the students in Commerce department trend to go for Accounts field. Keeping this point of view in mind, the workshop was organized by the commerce department of the college in order to remove the fear from the minds of the students in the rural areas about this Tally software and to guide the students. The scope of this workshop was kept at the organization level. So that other students in the rural areas of the institution can also benefit from it.

This workshop was organized in two Seminars :

Morning : 8.00 am to 09.00 am.:- **Inauguration**

First session:

9.00 A.M.to 10.00 A.M. :- "**Basic Concept Of Tally**"

Speaker - Prof. Mrs. Pooja Pokle/ Prof. Mr. Dongare mountains

Second session:

10. 00 to 11. 00

Speaker - Prof. Ambika Kulkarni

12. 00 to 1. 00 hrs :- Tea and conclusion

124 students participated in this discussion session. Vishal Dongre and Ms. Pooja Pokle Ms. Ambika Kulkarni and Shri. Guided by Sachin Thawre. The present students responded well. Dr. Head of Commerce Department for all these activities. Praveen Deshmukh Prof. B. S. Gosavi Prof. Vaibhav Bhagat, Mohan Bhakere's valuable guidance and support are always beneficial to the students.