Centenary Celebrated Sharnabasaveshwar Vidya Vardhak Sangha,s

SHARANABASVESHWAR COLLEGE OF SCIENCE

(Affiliated to Gulbarga University, Diamond Jubilee Celebrated & ISO Certified)

Vidya Nagar, Kalaburagi-585103, Email Id:sbcscg@gmail.com

Under IQAC Initiative

Department of Mathematics

organizes

ONE DAY NATIONAL WEBINAR

On

"Recent Advances in Mathematics"

With the Divine Blessings of

Poojya Dr.Sharnbaswappa Appaji

Mahadasoha Peetadipathi,Sharanabasveshawara Samasthana
President, Sharanabasveshwara Vidhya Vardhak Sanga
Chancellor, Sharnbasva University, kalaburagi

In the August presence of

Sri. Basawaraj S. Deshmukh

Secretary, Sharnabasaveshwar Vidhya Vardhak Sangha, Kalaburagi

Session -I

Dr. N.B. Naduvinamani

Professor, Department of Mathematics,
Gulbarga University, Kalaburagi

Session-II

Dr.Sunilkumar M. Hosamani

Assistant Professor, Department of Mathematics
Rani Channamma University, Belagavi

President

Dr. S. G. Dollegoudar Patil

Principal, Sharanabasaveshwara College of Science, Kalaburagi

Date: 11 June, 2020. **Time: 11.00 A. M.**

Join through link:

Meeting ID: **Password:**

Reg. Link :

Note: E-Certificate Will be issued to all Registered and Active participants after the Submission of Feedback Form (Feedback link will be sent through respective E-mail id)

Dr. T. V. Biradar	Dr.Omprakash S.	Dr. T. V. Biradar	Dr. S G Dollegoudar Patil
Organizing Secretary	IQAC Co-ordinator	Academic Activities Co-ordinator	Principal

****All Are Cordially Invited****

Centenary Celebrated Sharanabasaveshwar Vidhya Vardhak Sangha's

SHARANABASAVESHWAR COLLEGE OF SCIENCE

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Vidya Nagar, Kalaburagi-585103, Email Id:sbcscg@gmail.com

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Dept. of Mathematics

Organizes

One Day National Webinar on "Recent *Advances in Mathematics*"

In the August Presence of
Sri. Basawaraj S. Deshmukh
Secretary
Sharanabasaveshwar
Vidhya Vardhak Sangha
Kalaburagi

Session 1: Topic:
Indeterminate Equations and Their Solution.
Dr. N.B. Naduvinamani
Professor Dept. of Mathematics,Gulbarga University, Kalaburagi

Session 2:
Topic: A Method for Developing a New Parameter in Chemical Graph Theory.
Resource Person
Dr.Sunilkumar Hosamani
Assistant Prof. Dept. of Mathematics
Rani Channamma University, Belagavi

Organising Secretary
Dr. T. V. Biradar.
Assistant. Professor, Dept. of Mathematics
Sharanabasaveshwar College of Science, Kalaburagi.

Registration Link:
https://docs.google.com/forms/d/1BXSzPwHUOi8dGNNo6OegRbMOfx3hNg63hNmw3tROZaE

Principal
Dr. S G Dollegoudar Patil
Sharanabasaveshwar
College of Science, Kalaburagi.

SHARANABASAVESHWAR COLLEGE OF SCIENCE, KALABURAGI

Under IQAC Initiative

Department of Mathematics

Organizes a one Day Webinar on "Recent Trends in Mathematics"

Through : ZOOM APP

Date: 11-06-2020 **Time: 11.00Am to 1.00 Pm**

Program Schedule:

1. **Welcome of the Guests by Dr. T.V. Biradar**
   Head Department of Mathematcis
2. **Introduction of Guests by Dr. Basavaraj Nariboli**
   Prof. Chemistry Department
3. **Address by Honorable Secretary sir Sri. Basavaraj Deshmukh**
4. **Commencement of Session-I by**

   Dr. N.B. Naduvinamani, Professor, Department of Mathematics, GUK
5. **Commencement of Session-II by**

   Dr. Sunilkumar Hosamani, Asst. Prof. Department of Mathematics, Rani Channamma University, Belagavi.
6. **Presidential Remark by Dr. S.G. Dollegoudar, Principal Sharanabaveshwar College of Science, Kalaburagi**
7. **Vote of Thanks by Dr. Ramesh K.B, Deprtment of Chemistry**

Estd. 1956

Sharnbasveshwar
College of Science
Kalaburagi-585 103
(Karnataka) - India

ಶರಣಬಸವೇಶ್ವರ
ವಿಜ್ಞಾನ, ಮಹಾವಿದ್ಯಾಲಯ,
ಕಲಬುರಗಿ- ೫೮೫ ೧೦೩.
(ಕರ್ನಾಟಕ) - ಭಾರತ

(Affiliated to Gulbarga University, Kalaburagi and Recognised by the Government of Karnataka)
☎: (08472) 221941, • Fax : 08472-241492, • email: sbcscg@rediffmail.com, www.sharnscience.org

Institutions Run by Centenary Celebrated Shambasveshwar Vidya Vardhak Sangha, Kalaburagi

Sharnbasva University, Kalaburagi	2017
1. Shambasveshwar Vidya Vardhak Sangha, Kalaburagi	1903
2. Godutai Engineering College for Women, Kalaburagi	2011
3. Appa Institute of Engineering & Technology, Kalaburagi	2002
4. Appa Institute of Engineering Science & Technology MTech. in Comp. & Digital Electronics	2011
5. Veerappa Nisty Engineering College, Shorapur	2010
6. Lingraj Appa Engineering College, Bidar	2011
7. Doddappa Appa Institute for MCA, Kalaburagi	1999
8. Doddappa Appa Institute of MBA, Kalaburagi	1998
9. Appa Institute of MBA (VTU) Kalaburagi	2007
10. Godutai Institute of MBA (For Women) Kalaburagi	2011
11. Lingarajappa Institute of MBA, Bidar	2011
12. Veerappa Nisty Institute of MBA, Shorapur	2011
13. Appa Research Institute, Kalaburagi (Recognized by Mysore University, Mysore)	2012
14. Shambasveshwar Science College, Kalaburagi	1956
15. Post Grduate studies in Computer Sciece Shambasveshwar College of Science, Kalaburagi	2012
16. Post Grduate studies in Master of Tourism Administration 5 year integrated Course (MTA)	2007
17. Post Graduate Studies in Master of Arts in Journalism & Mass Communication, Godutai College,Klb.	2009
18. Post Graduate Studies in Master of Fine Arts, Shambasveshwar Arts College, Kalaburagi	1957
19. Shambasveshwar Residential Public School, with State & CBSC Syllabus, Kalaburagi	1967
20. Shambasva Public School Residential Indipendent Junior Science College, Shorapur	2011
21. Shambasva Public School's Residential Indipendent Junior Science College, Bidar	2011 2011
22. Shambasveshwar Antharwani Community Radio,(FM) Klb.	2009
23. Mahadevi Girls Higher Primary School, Kalaburagi	1934
24. Mahadevi Girls High School, Kalaburagi	1960
25. Shambasveshwar Composite P.U. College, Kalaburagi	1949
26. Shambasveshwar Ind. P.U College of Science, Kalaburagi	1956
27. Shambasveshwar College of Commerce, Kalaburagi with Post-Graduate Diploma in Business Management	1961
28. SSK. Basveshwar College of Arts & Science, Basavakalyan	1967
29. Shambasveshwar Printing & Publication, Kalaburagi	1968
30. Godutai Doddappa Appa P.U.College for Women, Kalaburagi	1971
31. Godutai Doddappa Appa Arts & Commerce College for Women, Kalaburagi	1973
32. Shambasveshwar Granthavshwa Vidya Nilaya, Kalaburagi	1978
33. Shambasveshwar College of BBM, Kalaburagi	1996
34. Doddappa Appa Residential P.U. Science College,Kalaburagi	1999
35. Muktambika Residential Ind. P.U. Science College For Girls, Kalaburagi	1999
36. Godutai Doddappa Appa BCA College for Women, Kalaburagi	2001
37. Muktambika Residential BCA College for Women,Kalaburagi	2001
38. Doddappa Appa BCA College, Basavakalyan	2001
39. Sharnbasveshwar BCA College, Kalaburagi	2001
40. Muktambika Residential BBM College, Kalaburagi	2004
41. Shambasveshwar BBM College, Basavakalyan	2004
42. Godutai College of Education (B.Ed), Kalaburagi	2004
43. Shambasveshwar B.Ed. (E.M.), Kalaburagi	2004
44. Godutai D.Ed. College for Women, Kalaburagi	2004
45. Komalatai Resi. P.U. College for Girls, Basavakalyan	2006
46. Shambasveshwar Residential Public School, Basavakalyan	2006
47. Shambasveshwar D.Ed. College, Basavakalyan	2004
48. Doddappa Appa B.Ed. College, Basavakalyan	2004
49. Shambasveshwar Public Library, Kalaburagi	1918

Ref. No. SBCS 2020-21/31

Date 03.6.2020.

To

Dr. N. B. Naduvinamani
Professor, Department of Mathematics
Gulbarga University
Kalaburagi

Respected Sir,

Sub:- Invitation for one day Webinar on "Recent Advances in Mathematics".

It is a matter of privilege to invite you as a Resource Person for one day Webinar on "RECENT ADVANCES IN MATHEMATICS" organized by Department of Mathematics, Sharanabasaveshwar College of Science, Kalaburagi under the Initiatives of IQAC.

Your Acceptance of our Invitation will be highly appreciated and respected.

Thanking you,

Yours Sincerely,

PRINCIPAL

Sharnbasveshwar
College of Science
Kalaburagi-585 103
(Karnataka) - India

Estd. 1956

ಶರಣಬಸವೇಶ್ವರ
ವಿಜ್ಞಾನ, ಮಹಾವಿದ್ಯಾಲಯ,
ಕಲಬುರಗಿ- ೫೮೫ ೧೦೩
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4. Appa Institute of Engineering Science & Technology MTech. in Comp. & Digital Electronics 2011
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48. Doddappa Appa B.Ed. College, Basavakalyan 2004
49. Shambasveshwar Public Library, Kalaburagi 1916

Ref. No. SBCS '2020-21/32

Date 08.6.2020

To

Dr. Sunilkumar Hosamani
Assistant Professor,
Department of Mathematics
Rani Channamma University,
Belagavi

Respected Sir,

Sub: Invitation for one day Webinar on "Recent Advances in Mathematics".

It is a matter of privilege to invite you as a Resource Person for one day Webinar on "RECENT ADVANCES IN MATHEMATICS" organized by Department of Mathematics, Sharanabasaveshwar College of Science, Kalaburagi under the Initiatives of IQAC.

Your Acceptance of our Invitation will be highly appreciated and respected.

Thanking you,

Yours Sincerely,

PRINCIPAL

Brief Bio-Data of
Prof. N.B.Naduvinamani

Date of Birth : 1st June 1964

Qualifications : M.Sc., Ph.D. , PGDCA (Karnatak University, Dharwad

Teaching Experience: 28 Years

Positions held: Lecturer (1991-1997) ;

Senior Lecturer (1997-2002),

Reader ((2002-2005) ;

Associate Professor (2006- 2008)

Professor (2009 onwards)

Life Member of Academic Bodies:

- Life Member of ***Indian Science Congress***
- Life member of ***Indian Society of Theoretical and Applied Mechanics***
- Life Member of ***Swadeshi Vijnan Andolan"***
- Life Member of ***"Forum for Interdisciplinary Mathematics"***

Prof. N.B.Naduvinamani has a rich administrative experience and has worked in various capacities in the University System

- **Chairman,** Department of Mathematics, Gulbarga University, Kalaburagi since 1st Sept. 2017.
- **Officer on Special Duty to Vice-Chancellor,** Gulbarga University, Kalaburagi since 01.09.2016
- **Coordinator ICT,** Gulbarga University, Kalaburagi since 4th April 2016**.**
- **Registrar(Evaluation)**, Tumkur University, Tumkur since 3rd February 2014 to 28th Feb. 2016.
- **Member of Syndicate,** Tumkur University, Tumkur
- **Member of Academic Council**, Tumkur University, Tumkur
- **Member of Finance Committee**, Tumkur University, Tumkur
- **Coordinator,** Internal Quality Assurance Cell (**IQAC**), Gulbarga University, Gulbarga, during 18th June 2013 to 3rd February 2014.
- **Nodal Officer,** Right To Information (***RTI***) Cell, Gulbarga University, Gulbarga 27th August 2013 to 3rd February 2014.
- **Special Officer**, **Development Branch**, Gulbarga University, Gulbarga during 6th June 2009 to 7th December 2012.

RESEARCH GUIDANCE:

1. **M. Phil. : 09**

2. Ph.D. : 18

REVIEWER FOR THE INTERNATIONAL JOURNALS

- Tribology International (***Elsevier***)
- Tribology Transactions (***ASLE***)
- Lubrication Science (***John Wiley***)
- Engineering Applications of Computational Fluid Mechanics (***China)***
- Applied Mathematical Modeling (***Elsevier***)
- Applied Mathematics and Computations(***Elsevier***)
- Recent Patents on Engineering
- Indian Journal of Pure and Applied Mathematics (***Springer***)
- Advances in Mechanical Engineering ***(Many Publishing, U.K.***

FORGIEN COUNTRIES VISITED

Visited **Imperial College**, **London, United Kingdom** during 18-21 September 2011 and presented a research paper in an International Conference on Biotribology.

RESEARCH PUBLICATIONS:

Published 130 Research Papers in reputed Journals

NUMBER OF CITATIONS

There are **more than 800 citations** of the research papers published by me in the literature with an ***h-index = 14***

BRIEF BIODATA of Dr. Sunilkumar M.Hosamani

Dr. Sunilkumar M. Hosamani, hails from Ukumanal village of Vijayapur district, Karnataka. He completed his graduation from BLDE's S. B. Arts and K. C. P. Science College, Vijayapur in the year 2006. Then he moved to Karnatak University, Dharwad to join Master's Program in Mathematics. After, post-graduation, he earned his Ph.D for the thesis titled "On Some Advances in Theory of Graphs" under the guidance of Prof. B. Basavanagoud.

Dr. Hosamani has done tremendous work in the field of domination theory as well as in chemical graph theory, as a witness to this, he has published more than 50 research articles in reputed national and international journals(SCOPUS/Web of Science indexed journals). Recently he solved three open problems posed by Prof. V. R. Kulli and E. Sampathkumar in their articles published in the year 1998 and 1999, respectively. These problems were tried by various graph theorists but they couldn't succeed. As a result of continuous effort, Dr. Hosamani was able to solve these problems in the year 2014 and 2018 respectively and those papers have been published in the journals ***Bulletin Of The International Mathematical Virtual Institute*** and National ***Academy Science Letters (Springer)*** respectively**.** .

He has written two books titled "**Degree Equitable Domination and Topological Indices in Graphs**" and "**QSPR Analysis Through Topological Indices of Molecular Graphs**". These books were published by Lambert Academic Publishing, Co. Germany. In the year 2018 and 2019 respectively.

Dr. Sunilkumar M. Hosamani, currently working as a Assistant Professor of Mathematics at Rani Channama University Belagavi since 30th Nov-2012 and he is a leading researcher in the Department of Mathematics, RCUB. Apart from academics, he has involved in various administrative assignments of the Rani Channamma University as well as member of the various statutory bodies:

1. Nodel Officer, Sevasindhu, Rani Channamma University, Belagavi
2. Member, Board of Studies, P. G. Department of Mathematics, RCU, Belagavi.
3. Member, Board of Examination, P. G. Department of Mathematics, RCU, Belagavi.
4. Executive member, **Academia for Advanced Research in Mathematics**, Tirupattur, Tamil Nadu.

SHARANABASAVESHWAR COLLEGE OF SCIENCE, KALABURAGI

Department of Mathematics

WELCOME and Introduction:

Seeking the Blessings of Lord Sharanabasaveshwar and Poojya Dr. Sharanabasawappa Appaji, President of Sharanabasaveshwar Vidhya Vardhak Sangha, Kalaburagi.

Honorable Secretary of Sharanabasaveshwar Vidhya Vardhak Sangha, Sangha , Sri. Basavaraj Deshmukh Sir, Guests Speakers of Today's Webinar Dr. N.B.Naduvinamani sir, Professor, Department of Mathematics, Gulbarga University Kalaburagi and Dr. Sunilkumar Hosamani, Asst. Professor, Department of Mathematics, Rani Channamma University, Belagavi , Respected Principal sir of Sharnbasveshwar College of Science Dr. S. G. Dollegoudar Sir, Esteemed Faculty members of the Institution, and All Participants, Good Morning to all

Aryabhata , Brahmagupta , Bhaskaracharyas , Varahamihir and Ramanujam are the Great Indian Mathematician contributed a lot in the field of Mathematics. Bhaskaracharyas (1114-1185) contribution in the field of Mathematics and Astrronomy is phenomenal, as who is from Vijayapur of North Karnataka. Mathematics also provides a means by which a high degree of precision can be maintained when describing and analyzing reality—despite the inadequacies of the measurement apparatus itself. It is for this reason that mathematics is the language of science and Engineering. Mathematics is used in all subjects, such as Physical and Social Science, Hence Mathematics has great Importance in every walk of life.

Today's First Session of this Webinar Focuses on "Indeterminent Equations and their Solutions", We are Fortunate have an Eminent Speaker and my research Guide Dr. N. B. Naduvinamani sir, Professor, Department of Mathematics, Gulbarga University Kalaburagi.

Similarly for the II Session – we have another Eminent Guest Speaker , Dr. Sunilkumar Hosamani, Asst. Professor, Department of Mathematics, Rani Channamma University, Belagavi , Sir Will Speak on the Topic " A Method for Developing a New parameter in Chemical Graph Theory.

On behalf of the Management and on behalf of the Sharanabasaveshwar College of Science Kalaburagi, I whole heartedly welcome you all to the One Day National Webinar on "Recent Advances in Mathematics" Organized Under IQAC Initiative by Department of Mathematics Welcomes you all once again.

(Now I Request our Secretary Sri. Basavaraj Deshmukh Sir to Bless this event speaking Few words.)

Address By Honorable Secretary Sir.

Sri. Basavaraj Deshmukh

Introduction of Guest Speakers

Now I request Dr. Basavaraj Nariboli sir to Introduce todays Guest Speakers

Over to Dr. Basavaraj Nariboli

Introduction:

Session First-I **Introduction of Dr. N.B Naduvinamani Sir**

Dr. N.B. Naduvinamani, Sir Born on 1st June 1964

Sir Passed M.Sc., Ph.D., PGDCA from Karnataka University Dharwad

Sir has 29 years of Teaching Experience

Sir also worked as

Chairman: Dept. Of Mathematics, Gulbarga University, Kalaburagi

Officer on Special duty to Vice Chancellor, Gulbarga University, Kalaburagi

Coordinator for ICT, IQAC Gulbarga University, Kalaburagi

Nodal Officer and Special Officer, Development Branch

Registrar (Evaluation) Tumkur University, Tumkur.

Member Syndicate, Academic Council, Finance Committee Tumkur Uninversity

Sir Guided : 09 M. Phil**., 18** PH.D**. and Published** 130 Papers **in Reputed Journals**

Sir is Reviewer for the 09 Reputed International Journals

Sir is Life Member of Academic Bodies Like

India Science Congress

Indian Society of Theoretical and Applied Mechanics

Swadeshi Vignan Andolan and

Forum of Interdisciplinary Mathematics

Sir Visited Imperical College LONDON , United Kingdom

Introduction to Speaker of II Session

Dr.Sunilkumar Hosmani sir

Completed UG from BLDE College of Science Vijaypura,

PG and Ph.D. from Karnataka University, Dharwad

Sir has Published more than 50 Research Articles in Reputed International Journals

Sir has solved three open problem posed by Prof. V.R Kulli and E.Smapthkumar

Sir has Written Two Books on Graph theory

Sir also Worked as

Nodal Officer, Sevasindhu Rani chennamma Univ. Belagavi

Member BOS and BOE PG Dept of Mathematics RCU, Belagavi

Executive Member, Academia for Advanced Research in Mathematics Tirupattur, Tamilnadu.

Indeterminate Equations/ Diophantine Equations –

Analytical Approach for the Solution

Prof. N.B.Naduvinamani

Department of Mathematics
Gulbarga University
Kalaburagi-585 106

Introduction

- There are many constraints in a single astronomical problem. To arrive at a solution various Mathematician of different eras have approached in diverse ways to solve the problems in the ways discovered by them.

- There would have been much more advancement in this field if one would have taken up the previous Mathematicians work and advance further on it.

Introduction

- Indeterminate equation or Diophantine equation is a polynomial equation with two or more unknowns and usually the integer or sometimes natural or whole number.
- The existence of Diophantine goes back to 200AD in Alexandria Egypt by Diophantus (200AD – 284AD) in his work ***Arithmetica.***
- The main purpose of any Diophantine equation is to solve all the unknown present in that equation, however he used to consider all the unknown to be one term to solve the problem.
- Many problems which exists in today's modern Mathematics are addressed in Arithmetica of Diophantus.
- One more thing which can be noted from his work is he never gave two solutions for the quadratic equations i.e. negative solution was not dealt by him.

- Indians were the first to systematically investigate methods for determination of integral solutions of the Diophantine equations.
- Diophantus had actually investigated solutions in rational numbers(not integers)
- Rational solutions of equations are of considerable geometric interest.
- For homogeneous equations, the two problems are equivalent; but, in general, the problem of finding integer solutions to an equation is much more difficult than that of finding rational solutions.
- For example, it is trivial to describe all rational solutions of a linear equation $ax - by = c$ (a, b, c integers); Whereas to describe all integer solutions requires some effort.

While Diophantus was interested in finding one rational solution, Indians investigated all integral solutions of Diophantine equations of first and second degree

By fifth century AD, the Indians had discovered a general method for the solution of the first degree Diophantine equation in two variables.

No general method is as yet known for solving general quadratic or higher Diophantine equations.

Introduction

- The work of ancient Indian Mathematician never stopped it continued relentlessly with further working and finding solution of linear, quadratic, simultaneous equations.
- They further went in search of treatment for indeterminate equations to solve their unknown variables in astronomical problems.
- The analysis of indeterminate equation is considered to be very important search in the field of Mathematics by Hindu Mathematician.
- Many Mathematicians including Aryabhata-II (950AD/1500 AD) and Bhaskara-II(1114 AD -1200 AD) have inculcated the treatment of indeterminate equation in their work.

Introduction

- **Equations with integer coefficients whose solutions are to be found in integers are called Dophantine equations in the honour of Diophantus of Alexandria (250AD)**

- **The adjective 'Diophantine' pertains not so much to the nature of the equations as to the nature of the admissible solutions of the equation.**
- **Problems in Diophantine equations are easy to state but usually hard to solve.**
- **The difficulty arises due to the stringent restriction of admitting only integer solution.**
- **Often it is difficult to ascertain whether an integer solution exists or not**

Ex. An extreme example is the famous Diophantine equation for arbitrary *n (>2)*

$$x^n + y^n = z^n$$

Introduction

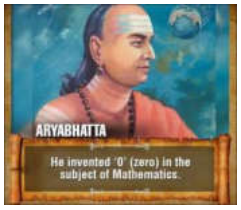
- However the credit of being pioneer in finding the solution of indeterminate equation goes back to Aryabhata-I by the method called Kuttaka meaning Pulverizer *i.e.* to get solution by breaking into smaller fragments.
- One of the commentator of Aryabhata-I (499 AD), Devaraja has entitled the work of treatment of this topic as Kuttakara Siromani.
- The indeterminate analysis of the first degree is known by different names including Kuttaka, Kuttakara, Kuttikara, Kutta etc.
- Kuttaka and Kuttakara are the terms used by commentator of Aryabhatiya, Brahmagupta (628 AD) used Kuttaka, Kuttakara and Kutta while Kuttikara is the term used by Mahavira.

Meaning of Kuttaka

- Kutta, Kuttaka, Kuttakara and Kuttikara are all Sanskrit words which is derived from the root Kutt which symbolizes to crush, to grind or to pulverize.

The search for getting better solution for indeterminate equation started by Aryabhata -I (476 AD – 550 AD) and further work was carried by different Mathematician like Brahmagupta (628 AD), Bhaskara-I (629AD) and Bhaskara-II (114-1200AD), Aryabhata-II (950/1500 AD), Mahavira etc.

Brahmagupta (ब्रह्मगुप्त)
Born: c. 598 AD in Billamala
Died: c. 670 AD in Ujjain



(476 AD – 550 AD)

Bhaskara II (AD. 1114–1185)

Linear Diophantine Equation

The simplest type of Diophantine equation that we shall consider is the linear Diophantine equation in two unknown:

A linear Diophantine equation of two variables is ax + by = c.

where *a,b,c* are given integers and *a, b* are not both zero.

Indeterminate Equations

An indeterminate equation of the form

$$by - ax = c$$

Can be expressed as congruence equation of the form By

$$by \equiv c \bmod b$$

i.e. linear congruence equation.

An indeterminate equation of the form

$$ax^2 + c = by$$

can be expressed as quadratic congruence equation of the form

$$ax^2 \equiv c \bmod b$$

Indeterminate Equations – difficulty in solving

- Following two peculiar properties of these indeterminate equations makes difficult to solve them
  - The number of equation is less than the number of unknown variables.
  - The indeterminate equation has no unique solution they have many finite solutions.

Methods of Solution

- One of the methods followed in modern Mathematics for solving indeterminate equation is Euclidean algorithm which is described by Greek Mathematician Euclid in his work ***Elements*** in 300BC.
- The Euclidean algorithm involves continues diving and collecting reminders.
- Centuries later the same type of algorithm was discovered independently in India as well as in China without getting any references to the previous work of Euclid to solve indeterminate equation or Diophantine equation that arose in astronomical problems and for precise calendar making.
- In India Aryabhata had used same type of algorithm i.e. Pulverizer algorithm or Kuttaka algorithm to solve the indeterminate equation, which was very effective to solve this type of equations.
- At the same period Chinese Mathematician Su Tzu also came up with the Chinese Reminder theorem to solve congruence equation.

Distinction between Euclid and Kuttaka algorithm

Both follows the successive division and reminder collection method but they both are independent of each other

Euclid's Method	*Aryabhata Kuttaka Method*
1. After completing the continuous division method follows backtrack method to find solution	1. Quotients were arranged in the columnar form and reduced one by one.
2. Made use of reminder to get the solution.	2. Given importance to quotients and made use of it to solve the indeterminate. equation

- Aryabhata in Aryabhatiya has taken the indeterminate equation of the form $by - ax = c$ where a, b and c are integral values.
- His disciple Bhaskara-I has also followed the same method of solving as of Aryabhata but the equation taken was by – ax = -c.
- Brahmagupta also adopted the same method of Aryabhata and Bhaskara.
- Aryabhata-II also used the same method with some minor improvements.

Categorization of Indeterminate Equations

The problems which were taken up by early Indian Mathematicians can be categorized into following categories

Category-I : Indeterminate equation of first degree of the form $by - ax = \pm c$

Category-II : Indeterminate equation of first degree of the form $by + ax = \pm c$

Category-III: Indeterminate equation of first degree of the form $\frac{ax \pm r}{b} = y$

Category-IV: Indeterminate quadratic equation of the type $Nx^2 \pm c = y^2$

Category-V: Simultaneous Indeterminate quadratic equation of type

$$x \pm a = y^2$$

$$x \pm b = z^2$$

Aryabhata Method

- Aryabhata is probably the first Mathematician to come up with the solution of indeterminate equation.
- In his '*Aryabhatiya*' (verses 32 and 33 of the section *Ganita*) he gives the method of finding the solution of positive integers of the simple indeterminate equation of the type

  $by - ax = c$ where a,b and c are integrgal values

Sutra : Aryabhatia:II-32-33

English Translation of Aryabhatiya – II 32-33

- *Divide the divisor which is corresponding to the larger remainder (a) by the divisor which is corresponding to smaller (b).The residue and the divisor which is corresponding to the smaller remainder is mutually divided until the remainder becomes zero.*
- *The last residue (r1) is multiplied by an optional integer and then added or subtracted by the remainder difference i.e. 'c'. Added if the quotient number after the sequence of division is even and subtracted if the quotient number is odd.*
- *Now place all the quotients which are found after sequence of division one below the other in columnar form, below that place the result which is obtained and then the integer.*
- *Below number is multiplied by the number above and added by the number below it.*
- *Divide the last number (which is obtained by doing so repeatedly) by divisor which is corresponding to smaller remainder then multiply the residue by the divisor which corresponding to the greater reminder and add the greater remainder. The result which is obtained is the number corresponding to two divisors.*

Problem :

Let the linear indeterminate equation be 109x + 4 = 93y

Aim is to find $n = 109x + 10 = 93y + 6$

Where $a = 109 = divisor\ corresponding\ to\ greater\ remainder.$

Aim is to find $n = 109x + 10 = 93y + 6.$

Where $a = 109 = divisor\ corresponding\ to\ greater\ remainder$

$R_1 = 10 = greater\ remainder.$

$b = 93 = divisor\ corresponding\ to\ smaller\ remainder.$

$R_2 = 6 = smaller\ remainder.$

Step – I

- Divide the divisor which is corresponding to the larger remainder (a) by the divisor which is corresponding to smaller remainder (b). The residue and the divisor which is corresponding to the smaller remainder is mutually divided until the remainder becomes zero.

```
93) 109 ( 1
    93
    -----
 16)93 (5
    80
    ------
 13 ) 16 ( 1
      13
      ------
   3 ) 13 ( 4
        12
        -----
         1
```

Step – II

- The last residue (r1) is multiplied by an optional integer and then added or subtracted by the remainder i.e. 'c'. Added if the quotient number after the sequence of division is even and subtracted if the quotient number is odd.

```
93) 109 ( 1
    93
    -----
 16)93 (5
    80
    ------
    13 ) 16 ( 1
         13
         ------
          3 ) 13 ( 4
               12
               -----
 1 x 7 – 4 = 3) 3 ( 1
                  3
                  ---------
                  0
```

Where 7 is an optional integer and 4 is difference of remainder

Step – III

- Now place all the quotients which are found after sequence of division one below the other in columnar form and below that the result which is obtained and the integers are placed.

1
5
1
4
7 optional integer
1

Step – IV

- Below number is multiplied by the number above and added by the number below it.

1	1	1	1	245 (1x209+36)
5	5	5	209 (5x36+29)	209
1	1	36 (1x29+7)	36	x
4	29 (1x29+7)	29	x	x
7	7	x	x	x
1	x	x	x	x

Step – V

- Divide the last number (which is obtained by doing so repeatedly) by divisor which is corresponding to smaller remainder then multiply the residue by the divisor which is corresponding to the greater remainder and add the greater remainder. The result which is obtained is the number corresponding to two divisors.
- Divide the last number (209) by divisor corresponding to smaller remainder (93) and get the remainder i.e. $209 = 93 \times 2 + 23$
- There fore Residue = Remainder = 23
- Multiply the residue (23) by divisor corresponding to greater remainder (109) and add by greater remainder (10).

$$n = 23 \times 109 + 10$$
$$= 2507 + 10$$
$$= 2517$$

The number corresponding to two divisor is 2517

- Bhaskara I also followed the same method of Aryabhata to solve Kuttaka *but his intension was not to get the value of 'n' rather to find the value of x and y.*
- Bhaskara I steps were similar to Aryabhata steps till step-IV, after that in step-V he divided the first number i.e. 245 with divisor corresponding to greater remainder (109) to get the remainder which is the value of y.

  i.e. *y= remainder (245/109) = 27*
- The second remainder i.e. 209 is divided with the divisor corresponding to smaller remainder i.e. 93 and the remainder arrived at is the value of x.

  i.e. *x = remainder (209/93) = 23.*

General Description of the Method

- The above sutra is basically the working to find the solution of indeterminate equation.
- The problem can be described in the following ways:

  Aim is to find a number 'n' which is divided by two numbers a and b and which will leave two remainder R1 and R2 i.e.

  n= qx + R1 = by + R2

  Where R1 is larger remainder and a is divisor connected to large remainder,

  R2 is smaller remainder and b is a divisor related to smaller remainder.

  Let c= difference between R1 and R2, c has to be positive which give rise to two cases

Case-I ***: If R1 > R2, then ax + R1 = by + R2***

by – ax = R1 – R2

by – ax = c

by = ax + c

Terefore R1>R2 → by = ax + c

Now the problem reduce to y=((ax+c)/b)

Case-II: ***If R1 < R2, then ax + R1 = by + R2***

ax – by = R2-R1

ax – by = c

ax = by +c

Therefore for R1<R2 → ax = by +c

Problem reduce to x = ((by+c)/a)

- Continuing with the case-I. If R1>R2 then to solve the equation by = ax+c where a and b are prime to each other.

```
b) a ( q
   bq
  ------
r1) b ( q1
      r1q1
      ----------
      r2) r1 ( q2
          r2 q2
          -----------
          r3
      ........
          rm-1) rm-2 (qm-1
                rm-1 qm-1
                ----------------
                rm) rm-1 (qm
                    rm qm
                    ------------
                    rm+1
```

Note: when a<b then q=0 r1=a

$$a = bq + r_1$$
$$b = r_1 q_1 + r_2$$
$$r_1 = r_2 q_2 + r_3$$
$$r_2 = r_3 q_3 + r_4$$
$$.....$$
$$r_{m-2} = r_{m-1} q_{m-1} + r_m$$
$$r_{m-1} = r_m q_m + r_{m+1}$$

$Consider\ by = ax + c\ \ put\ \ a = bq + r_1$

$Then\ by = (bq + r_1)x + c$

$$by = bqx + r_1 x + c$$
$$y = qx + \frac{r_1}{b}x + \frac{c}{b}$$
$$y = qx + y_1$$

Where $y_1 = \frac{r_1}{b}x + \frac{c}{b}$

$$by_1 = r_1 x + c$$

Now consider $by_1 = r_1 x + c$ *put* $b = r_1 q_1 + r_2$

$$(r_1 q_1 + r_2) y_1 = r_1 x + c$$

$$r_1 x = r_1 q_1 y_1 + r_2 y_1 - c$$

$$x = q_1 y_1 + \frac{r_2}{r_1} y_1 - \frac{c}{r_1}$$

$$x = q_1 y_1 + x_1$$

Where $x_1 = \frac{r_2}{r_1} y_1 - \frac{c}{r_1}$

$$r_1 x_1 = r_2 y_1 - c$$

Now consider $r_1 x_1 = r_2 y_1 - c$ *put* $r_1 = r_2 q_2 + r_3$

$$(r_2 q_2 + r_3) x_1 = r_2 y_1 - c$$

$$y_1 = q_2 x_1 + y_2$$

where $y_2 = \frac{r_3}{r_2} x_1 + \frac{c}{r_2}$

$$r_2 y_2 = r_3 x_1 + c$$

And so on ....

Write the above equation in columnar form to get

Equation No.	*Equation – I*	*Equation – II*
1	$y = qx + y_1$	$by_1 = r_1x + c$
2	$x = q_1y_1 + x_1$	$r_1x_1 = r_2y_1 - c$
3	$y_1 = q_2x_1 + y_2$	$r_2y_2 = r_3x_1 + c$
4	$x_1 = q_3y_2 + x_2$	$r_3x_2 = r_4y_2 - c$
5	$y_2 = q_4x_2 + y_3$	$r_4y_3 = r_5x_2 + c$
6	$x_2 = q_5y_3 + x_3$	$r_5x_3 = r_4y_3 - c$
.....		
$2n$	$x_{n-1} = q_{2n-1}y_n + x_n$	$r_{2n-1}x_n = r_{2n}y_n - c$
$2n+1$	$y_n = q_{2n}x_n + y_{n+1}$	$r_{2n}y_{n+1} = r_{2n+1}x_n + c$

Now this continuos can be continued to the finish or stop after getting a certain number of quotients

Case – A: (Assume that the division is continued till zero remainder is obtained)

In this case since a and b are coprime the remainder at the end will be unity

If the quotient number is even then $r_{2n} = 1$ $r_{2n+1} = 0$, $q_{2n} = r_{2n-1}$

then the equation equation II $2n$ *and I* $2n+1$ *from the above table will reduce to*

$$r_{2n-1}x_n = r_{2n}y_n - c$$

$$\therefore\ q_{2n}x_n = 1.y_n - c$$

$$\therefore\ y_n = q_{2n}x_n + c$$

From I $2n+1$

$y_n = q_{2n}x_n + y_{n+1}$

Put the value of $y_n = q_{2n}x_n + y_{n+1}$ *in equation* $I.2n+1$

$q_{2n}x_n + c = q_{2n}x_n + y_{n+1}$

$\therefore\ y_{n+1} = c$

Take any arbitrary integral *value for* x_n *say* u, *by putting the value of* $x_n = u$ *and* $y_{n+1} = c$ *in equation* $I.2n+1$, *get the value of* y_n *in equation* $I.2n+1$ *get the value of* x_{2n+1} *and* y_n *in equation*$I.2n+1$ *get* $y_{n-1.}$

Continueing in this manner using backward substitution method, x *and* y *value can be found*.

If the quotient number is odd then $r_{2n-1}=1,\ r_{2n}=0,\ q_{2n-1}=r_{2n-2}$ *then equation* $II.2n-1$ *and* $I.2n$ *fron the table will reduce to*

$$x_{n-1}=q_{2n-1}y_n-c$$

From $I.2n$ *we get* $x_n=-c$

Then by back substitition by putting arbitrary value v *for* y_n *weget the values of* x *and* y.

Case-B: Assume the sequence of division procedure is stopped after getting even or odd number of quotients

- If the quotient number is even then the equation II.2n+1 reduce to

$$r_{2n}y_{n+1}=r_{2n+1}x_n+c$$

$$\therefore y_{n+1}=\frac{r_{2n+1}x_n+c}{r_{2n}}$$

Take any arbitrary value $x_n=s$

$$\therefore y_{n+1}=\frac{r_{2n+1}s+c}{r_{2n}}=cons\tan t\ number$$

Put the value of x_n *an* y_n *in equation* $I.2n$ *to get the value of* x_{n-1}. *continue the process to get ultimately the value of* x *and* y.

If $x=\alpha$ *and* $y=\beta$ *is the least integral solution of* $ax+c=by$
then $a\alpha+c=b\beta$.
$\therefore a\alpha+c=b\beta$
Add both side with abq *where* q *is any integer*.
$\therefore a\alpha+c+abq=b\beta+abq$
$\therefore a(\alpha+bq)+c=b(\beta+aq)$
Comparing with $ax+c=by$ *get* $x+\alpha+bq$ *and* $y=\beta+bq$.
But by previous calculations $x=q_1y_1+x_1$
$\therefore q_1y_1+x_1=\alpha+\beta q$
Whichimplies α *is a remainder when* b *divides* $q_1y_1+x_1$
thus α *is minimum of* x
$\therefore$ *Minimum value of* $n=ax+R_1$ *is* $n=a\alpha+R_1$
Similarly for case II, i.e. for $ax=by+c$
one can easily find that β *is minimum of* y *and*
minimum value of $n=by+R_2$ *is* $n=b\beta+R_2$

Pulverizer Algorithm or Kuttaka Algorithm

Following steps are involved in Pulverizer algorithm:

Step-I: Let the equation be by=ax+c where a,b and c arecoefficients of unknown variables x and y and c is the difference of remainder

Step-II: Apply continuous division process on by=ax+c
repeat this for even number of quotient.

$$a=bq_1+r_1$$
$$b=r_1q_2+r_2$$
$$r_1=r_2q_3+r_3$$
$$r_2=r_3q_4+r_4$$
$$\ldots\ldots\ldots\ldots$$
$$r_{2n-2}=r_{2n-1}q_{2n}+r_{2n}$$

Step-III: The last residue (r_{2n})obtained by the reciprocal division after an even number of quotient has been obtained is multiplied by optional integer and the product is added with difference of remainder (c) i.e. $(r_{2n} \times A) + c = r_{2n-1}$ where A is selected in such a way that the output received after multiplying with r_{2n} and then adding this product with c is r_{2n-1} or exactly equal to the dividend of that step.

Step-IV: Number obtained in step-II exactly divides the dividend to give remainder zero and quotient one. Let this quotient be q_{2n-1}

Step-V: Arrange all the quotient up to q_{2n} in vertical order

q_1
q_2
q_3
..
..
q_{2n}

Pulverizer Algorithm or Kuttaka Algorithm

Step-VI: After q_{2n} put optional integer in vertical order and finally the quotient obtained at the stage i.e. one, hence the list of quotient obtained is

q_1
q_2
q_3
..
..
q_{2n}
p_0
q_{2n+1}

Pulverizer Algorithm or Kuttaka Algorithm

Step-VI: Now proceed from lower term to upper term by the penultimate multiply the term just above it and then add to the lower term. Repeat this process till two terms are remaining

q_1	q_1	q_1	....	q_1	$p_{2n} = q_1 \times p_{2n-1} + p_{2n-2}$
q_2	q_2	q_2	....	$p_{2n-1} = q_{2n21} \times p_{2n-2} + p_{2n-3}$	p_{2n-1}
q_3	q_3	q_3	....	p_{2n-2}	
. . . .	. . . .	$p_2 = q_{2n-1} \times p_1 + p_0$	. . . .	------	-----
$q_{2n}\, q_{2n-1}$ q_{2n-1}	$p_1 = q_{2n} \times p_0 + q_{2n+1}$	p_1		------	-----
p_0	p_0			----	----
q_{2n}	po	---		----	----
$q_{12n+1} = 1$	----	----		----	----

Pulverizer Algorithm or Kuttaka Algorithm

Step-VII: Calculate x and y where x is equal to remainder of the second term (p_{2n-1}) divide by divisor (b) i.e. Remainder of $(\frac{p_{2n-1}}{b})$ and y is equal to remainder of first term (p_{2n}) divide by a i.e. Remainder of ($\frac{p_{2n}}{a}$) .

Kuttaka and Continued Fractions

- Continued fractions is an useful topic in number theory. Incedentally, Ramanujan had a phenomenal mastery of continued fractions.
- The Kuttaka may be interpreted as a technique in the theory of continued fractions
- In fact Aryabhata's formulation $y = \frac{bx+c}{a}$ and method of solution strongly suggests that the discovery of kuttaka algorithm was preceded by discovery of the basic principles of continued fractions.
- Knowledge of continued fractions is even more apparent in some of the later Indian works.
- In the original Kuttaka of Aryabhata, after obtaining the quantities $a_1, a_2, \ldots a_n$ one computes quantities $x_n, x_{n-1},$ in the backwards direction.

Brahmagupta Methods for treatment of various types of indeterminate equations:

- Brahmagupta in his *Brahmsphuta Siddhanta* gives the solution of different types of indeterminate equations
  - Indeterminate equations of first degree
  - One linear equation with two unknowns
  - One linear equation with more than two unknowns
  - Quadratic equation with two unknowns
  - Simultaneous quadratic equation with two unknowns

Theorem(a):

The Diophantine equation *ax+by=c* has a solution if and only if d|c, where *d=gcd(a,b)*. *If x0,y0 is is any particular solution of this equation, then all other solutions are given by x= x0+(b/d) t , y= y0- (a/d)t*

where t is an arbitrary

The following theorems have been in the proof of above theorem

Theorem (b):

Let a and b be integers, not both zero. Then a and b are relatively prime if and only if there exist integers x and y such that 1=ax+by.

Theorem(c):

If gcd(a,b)=d, then gcd(a/d,b/d)=1. There exist relatively prime integers r and s such that a=dr , b=ds

Note

Particular solution:
$x_0 = (c/d)s$ and $y_0 = (c/d)t$

Note

General solutions:
$x = x_0 + k(b/d)$ and $y = y_0 - k(a/d)$
where k is an integer

Diophantine Equation *Continued*

Example 2.12

Find the particular and general solutions to the equation $21x + 14y = 35$.

Solution

Particular: $x_0 = 5 \times 1 = 5$ and $y_0 = 5 \times (-1) = -5$
General: $x = 5 + k \times 2$ and $y = -5 - k \times 3$

Diophantine Equation *Continued*

Example -13

For example, imagine we want to cash a Rs.100 check and get some Rs.20 and some Rs.5 bills.

We have many choices, which we can find by solving the corresponding Diophantine equation $20x + 5y = 100$.

Since $d = \gcd(20, 5) = 5$ and $5 \mid 100$, the equation has an infinite number of solutions, but only a few of them are acceptable in this case

The general solutions

with x and y nonnegative are

(0, 20), (1, 16), (2, 12), (3, 8), (4, 4), (5, 0).

Among the quadratic equations, the most famous are the special equations of the form

$$x^2 - Dy^2 = 1$$

known as the Pell equation, for which Indians had evolved a brilliant algorithm during the 7^{th} – 11^{th} century AD .

Systematic investigation of integral solutions began in Europe only in the 17^{th} century when interest in number theory was rekindled with the publication of Bachet's translation of Diophantus with a commentary.

FERMAT'S LAST THEOREM

Fermat was simply asserting that, if n >2, then the Diophantine equation

$$x^n + y^n = z^n$$

has no solution in the integers, other than the trivial solutions in which at least one of the variables is zero.

The above theorem is also known as Fermat's conjecture.

Fermat

Arithmeticorum Liber II. 61

IN QVÆSTIONEM VIII.

QVÆSTIO VIII.

OBSERVATIO DOMINI PETRI DE FERMAT.

QVÆSTIO IX.

This 1670 edition of Diophantus' *Arithmetica* includes Fermat's infamous note along with the original text. Translated, it reads: "*It is impossible for a cube to be the sum of two cubes, a fourth power to be the sum of two fourth powers, or in general for any number that is a power greater than the second to be the sum of two like powers. I have discovered a truly marvelous demonstration of this proposition that this margin is too narrow to contain.*"

FERMAT'S LAST THEOREM

- By 1992, Fermat's conjucture was known to be true for exponent up to 4000000.
- In 1993, it appeared that the final breakthrough had been made. At the conclusion of 3 days of lectures in Cambridge, U.K., Andrew Wiles of Princeton University stunned his colleagues by announcing that he could favorably resolve Fermat's conjecture.
- His proposed proof take 7 years to prepare, was an artful blend of many sophisticated techniques developed by other mathematicians only within the preceding decade.
- The key insight was to link equations of the kind proposed by Fermat with the much-studied theory of elliptic curves; i.e., curves determined by cubic polynomials of the form $y^2 = x^3 + ax + b$, where a and b are integers.

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Thank
You

Estd. 1956

Sharnbasveshwar
College of Science
Kalaburagi-585 103
(Karnataka) - India

ಶರಣಬಸವೇಶ್ವರ
ವಿಜ್ಞಾನ. ಮಹಾವಿದ್ಯಾಲಯ.
ಕಲಬುರಗಿ- ೫೮೫ ೧೦೩.
(ಕರ್ನಾಟಕ) - ಭಾರತ

(Affiliated to Gulbarga University, Kalaburagi and Recognised by the Government of Karnataka)
☎: (08472) 221941, • Fax : 08472-241492, • email: sbcscg@rediffmail.com, www.sharnscience.org

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Sharnbasva University, Kalaburagi 2017

1. Sharnbasveshwar Vidya Vardhak Sangha, Kalaburagi 1903
2. Godutai Engineering College for Women, Kalaburagi 2011
3. Appa Institute of Engineering & Technology, Kalaburagi 2002
4. Appa Institute of Engineering Science & Technology M'Tech. in Comp. & Digital Electronics 2011
5. Veerappa Nisty Engineering College, Shorapur 2010
6. Lingraj Appa Engineering College, Bidar 2011
7. Doddappa Appa Institute for MCA, Kalaburagi 1999
8. Doddappa Appa Institute of MBA, Kalaburagi 1998
9. Appa Institute of MBA (VTU) Kalaburagi 2007
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11. Lingaraajappa Institute of MBA, Bidar 2011
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13. Appa Research Institute, Kalaburagi (Recognized by Mysore University, Mysore) 2012
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15. Post Grduate studies in Computer Scece Sharnbasveshwar College of Science, Kalaburagi 2012
16. Post Grduate studies in Master of Tourism Administration 5 year integrated Course (MTA) 2007
17. Post Graduate Studies in Master of Arts in Journalism & Mass Communication, Godutai College,Klb. 2009
18. Post Graduate Studies in Master of Fine Arts, Sharnbasveshwar Arts College, Kalaburagi 1957
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28. SSK. Basveshwar College of Arts & Science, Basavakalyan 1967
29. Sharnbasveshwar Printing & Publication, Kalaburagi 1969
30. Godutai Doddappa Appa P.U.College for Women, Kalaburagi 1971
31. Godutai Doddappa Appa Arts & Commerce College for Women, Kalaburagi 1973
32. Sharnbasveshwar Granthavishwa Vidya Nilaya, Kalaburagi 1978
33. Sharnbasveshwar College of BBM, Kalaburagi 1996
34. Doddappa Appa Residential P.U. Science College,Kalaburagi 1999
35. Muktambika Residential Ind. P.U. Science College For Girls, Kalaburagi 1999
36. Godutai Doddappa Appa BCA College for Women, Kalaburagi 2001
37. Muktambika Residential BCA College for Women,Kalaburagi 2001
38. Doddappa Appa BCA College, Basavakalyan 2001
39. Sharnbasveshwar BCA College, Kalaburagi 2001
40. Muktambika Residential BBM College, Kalaburagi 2004
41. Sharnbasveshwar BBM College, Basavakalyan 2004
42. Godutai College of Education (B.Ed), Kalaburagi 2004
43. Sharnbasveshwar B.Ed. (E.M.), Kalaburagi 2004
44. Godutai D.Ed. College for Women, Kalaburagi 2004
45. Komalatai Resi. P.U. College for Girls, Basavakalyan 2006
46. Sharnbasveshwar Residential Public School, Basavakalyan 2006
47. Sharnbasveshwar D.Ed. College, Basavakalyan 2004
48. Doddappa Appa B.Ed. College, Basavakalyan 2004
49. Sharnbasveshwar Public Library, Kalaburagi 1916

Ref. No. SBCS /2020-21/31

Date :13-6-2020

To

Dr. N. B. Naduvinamani
Professor, Department of Mathematics
Gulbarga University
Kalaburagi

Respected Sir,

We the faculty, students and participants from various Colleges feel proud to Place on record our deep sense of gratitude to you as a Resource Person for one day National Webinar on "RECENT ADVANCES IN MATHEMATICS" held on 11th June 2020, organized by Department of Mathematics, Sharanabasaveshwar College of Science, Kalaburagi under the Initiatives of IQAC.

Thanking you,

Yours Sincerely,

PRINCIPAL

Sharnbasveshwar
College of Science
Kalaburagi-585 103
(Karnataka) - India

Estd. 1956

ಶರಣಬಸವೇಶ್ವರ
ವಿಜ್ಞಾನ. ಮಹಾವಿದ್ಯಾಲಯ.
ಕಲಬುರಗಿ- ೫೮೫ ೧೦೩.
(ಕರ್ನಾಟಕ) - ಭಾರತ

(Affiliated to Gulbarga University, Kalaburagi and Recognised by the Government of Karnataka)
☎: (08472) 221941, • Fax : 08472-241492, • email: sbcscg@rediffmail.com, www.sharnscience.org

Institutions Run by Centenary Celebrated Sharnbasveshwar Vidya Vardhak Sangha, Kalaburagi

Sharnbasva University, Kalaburagi 2017

1. Sharnbasveshwar Vidya Vardhak Sangha, Kalaburagi 1903
2. Godutai Engineering College for Women, Kalaburagi 2011
3. Appa Institute of Engineering & Technology, Kalaburagi 2002
4. Appa Institute of Engineering Science & Technology MTech. in Comp. & Digital Electronics 2011
5. Veerappa Nisty Engineering College, Shorapur 2010
6. Lingraj Appa Engineering College, Bidar 2011
7. Doddappa Appa Institute for MCA, Kalaburagi 1999
8. Doddappa Appa Institute of MBA, Kalaburagi 1998
9. Appa Institute of MBA (VTU) Kalaburagi 2007
10. Godutai Institute of MBA (For Women) Kalaburagi 2011
11. Lingarajappa Institute of MBA, Bidar 2011
12. Veerappa Nisty Institute of MBA, Shorapur 2011
13. Appa Research Institute, Kalaburagi (Recognized by Mysore University, Mysore) 2012
14. Sharnbasveshwar Science College, Kalaburagi 1956
15. Post Grduate studies in Computer Scece Sharnbasveshwar College of Science, Kalaburagi 2012
16. Post Grduate studies in Master of Tourism Administration 5 year integrated Course (MTA) 2007
17. Post Graduate Studies in Master of Arts in Journalism & Mass Communication, Godutai College,Klb. 2009
18. Post Graduate Studies in Master of Fine Arts, Sharnbasveshwar Arts College, Kalaburagi 1957
19. Sharnbasveshwar Residential Public School, with State & CBSC Syllabus, Kalaburagi 1967
20. Sharnbasva Public School Residential Indipendent Junior Science College, Shorapur. 2011
21. Sharnbasva Public School's Residential Indipendent Junior Science College, Bidar 2011 2011
22. Sharnbasveshwar Antharwani Community Radio,(FM) Klb. 2009
23. Mahadevi Girls Higher Primary School, Kalaburagi 1934
24. Mahadevi Girls High School, Kalaburagi 1960
25. Sharnbasveshwar Composite P.U. College, Kalaburagi 1949
26. Sharnbasveshwar Ind. P.U.College of Science, Kalaburagi 1956
27. Sharnbasveshwar College of Commerce, Kalaburagi with Post-Graduate Diploma in Business Management 1961
28. SSK. Basveshwar College of Arts & Science, Basavakalyan 1967
29. Sharnbasveshwar Prinsing & Publication, Kalaburagi 1969
30. Godutai Doddappa Appa P.U.College for Women, Kalaburagi 1971
31. Godutai Doddappa Appa Arts & Commerce College for Women, Kalaburagi 1973
32. Sharnbasveshwar Grandhavishwa Vidya Nilaya, Kalaburagi 1978
33. Sharnbasveshwar College of BBM, Kalaburagi 1996
34. Doddappa Appa Residential P.U. Science College,Kalaburagi 1999
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37. Muktambika Residential BCA College for Women,Kalaburagi 2001
38. Doddappa Appa BCA College, Basavakalyan 2001
39. Sharnbasveshwar BCA College, Kalaburagi 2001
40. Muktambika Residential BBM College, Kalaburagi 2004
41. Sharnbasveshwar BBM College, Basavakalyan 2004
42. Godutai College of Education (B.Ed), Kalaburagi 2004
43. Sharnbasveshwar B.Ed. (E.M.), Kalaburagi 2004
44. Godutai D.Ed. College for Women, Kalaburagi 2004
45. Komalatai Resi. P.U. College for Girls, Basavakalyan 2006
46. Sharnbasveshwar Residential Public School, Basavakalyan 2006
47. Sharnbasveshwar D.Ed. College, Basavakalyan 2004
48. Doddappa Appa B.Ed. College, Basavakalyan 2004
49. Sharnbasveshwar Public Library, Kalaburagi 1918

Ref. No. SBCS /2020-21/32

Date :13.06.20

To

Dr. Sunilkumar Hosamani
Assistant Professor, Department of Mathematics
Rani Channamma University,
Belagavi.

Respected Sir,

We the faculty, students and participants from various Colleges feel proud to Place on record our deep sense of gratitude to you as a Resource Person for one day National Webinar on "RECENT ADVANCES IN MATHEMATICS" held on 11th June 2020, organized by Department of Mathematics, Sharanabasaveshwar College of Science, Kalaburagi under the Initiatives of IQAC.

Thanking you,

Yours Sincerely,

PRINCIPAL

Dept. of Mathematics, Sharnabasaveshwara College of Science, B.Sc. Vth Semester DSE.

215 responses

Publish analytics

Name of the Student

Pooja

Samiksha s k

Deepak kumar

Vinod

Manjunat

Bhagyalaxmi

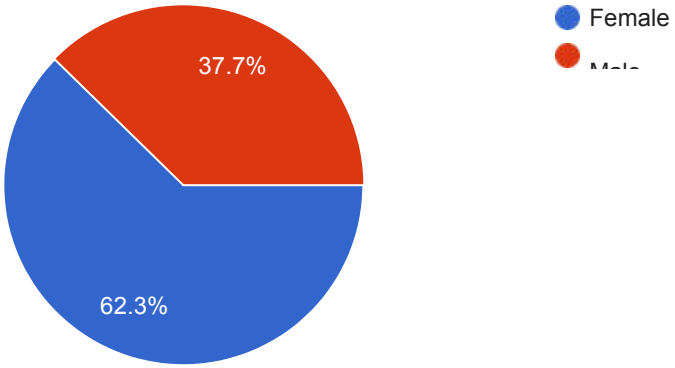
Basavara

Bhagyashre

Apoorva

Gender

215 responses



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215 responses

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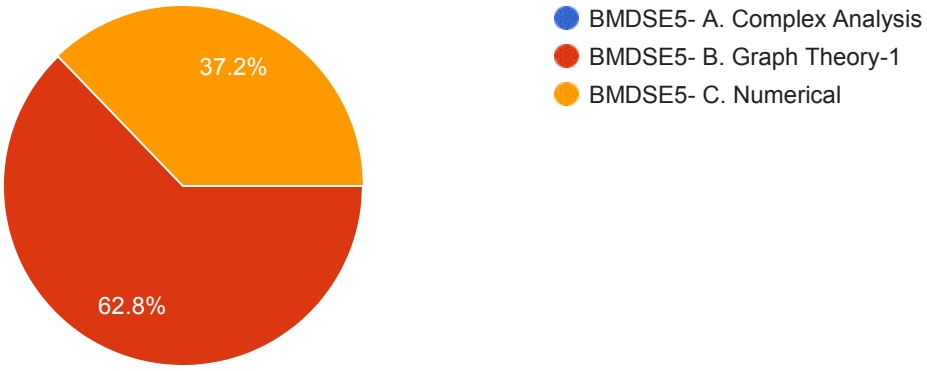
91949771

91949715

919732

B. Sc Fifth Semester Discipline Elective contains three papers. select any one as a core subject.

215 responses



Mobile Number

215 responses

7022338717

9481507892

9480636223

7259527204

9632789448

9901495807

9886850001

9901300765

9900731082

Google Forms

Timestamp	Email Address	Name of the Student	Gender	Examination Register Nu	B. Sc Fifth Semester Discipline Elective cont	Mobile Number
9/2/2020 16:23:38	sachinsonu850@gmail.com	Sachin chavan	Male	91949787	BMDSE5- C. Numerical Analysis-I	803359196
9/2/2020 16:24:34	shivaleelagyargol@gmail.com	Shivaleela G Y	Female	91949796	BMDSE5- B. Graph Theory-I	9380652388
9/8/2020 15:22:00	767deepak@gmail.com	Deepak kumar	Male	91949737	BMDSE5- B. Graph Theory-I [1]	9480636223
9/2/2020 16:25:30	nhonagond@gmail.com	Naveen	Male	91949770	BMDSE5- B. Graph Theory-I	9886454024
9/2/2020 16:25:46	ashus194329@gmail.com	Ashwini Somashekhar	Female	91949847	BMDSE5- C. Numerical Analysis-I	7349396255
9/2/2020 16:26:30	positiveswati11@gmail.com	Swati R Biradar	Female	91949822	BMDSE5- B. Graph Theory-I	6362074050
9/2/2020 16:27:14	devangaonashwini@gmail.com	Ashwini	Female	91949726	BMDSE5- B. Graph Theory-I	9980150909
9/2/2020 16:27:30	niruhindoddi1234@gmail.com	NIRANJAN R HINDODDI	Male	91949981	BMDSE5- B. Graph Theory-I	7795779886
9/2/2020 16:27:31	neelupatil08313@gmail.com	Laxmi. J. S	Female	91949758	BMDSE5- B. Graph Theory-I	9632695231
9/2/2020 16:28:53	koanguttisamiksha@gmail.com	Samiksha s k	Female	91949789	BMDSE5- B. Graph Theory-I	7022338717
9/2/2020 16:29:20	ahganesh0@gmail.com	Ganesh A H	Male	91949740	BMDSE5- C. Numerical Analysis-I	9353538154
9/2/2020 16:29:30	devarajbiradar696@gmail.com	Devaraj Biradar	Male	91949738	BMDSE5- C. Numerical Analysis-I	8147309726
9/2/2020 16:29:34	priyankasonawane9353@gmail.com	Priyanka R Sonawane	Female	91950024	BMDSE5- B. Graph Theory-I	6360682601
9/2/2020 16:30:05	shivanandbingoli@gmail.com	Soumyashree S B	Female	91950026	BMDSE5- C. Numerical Analysis-I	8147136566
9/2/2020 16:30:08	vinayakguttedar0@gmail.com	Vinayak Guttedar	Male	91949900	BMDSE5- B. Graph Theory-I	9980928896
9/2/2020 16:30:46	rachayyashivanand@gmail.com	Rachayya S Hiremath	Male	91950037	BMDSE5- B. Graph Theory-I	7411710809
9/2/2020 16:31:09	tejashwinidm2000@gmail.com	Tejashwini.D.M	Female	91949897	BMDSE5- C. Numerical Analysis-I	8088202512
9/2/2020 16:31:12	aishupanagaon2000@gmail.com	Aishwarya S P	Female	91949715	BMDSE5- B. Graph Theory-I	9901300765
9/2/2020 16:31:30	vijayeendrajoshi506@gmail.com	Vijayeendra Joshi	Male	91950042	BMDSE5- B. Graph Theory-I	9380825559
9/2/2020 16:31:31	anusuyavishwa@gmail.com	Sneha I B	Female	91950030	BMDSE5- B. Graph Theory-I	9740570210
9/2/2020 16:31:50	gunduraogola@gmail.com	Nagaveni s	Female	91949767	BMDSE5- B. Graph Theory-I	9535033666
9/2/2020 16:32:19	poojajaladi778@gmail.com	Pooja r.j	Female	91950028	BMDSE5- B. Graph Theory-I	7899540481
9/2/2020 16:32:26	mashaqnadaf2000@gmail.com	MASHAQ	Male	91949765	BMDSE5- C. Numerical Analysis-I	9535833047
9/2/2020 16:32:41	archanarshrichand09@gmail.com	Arachana Ravindra	Female	91950006	BMDSE5- B. Graph Theory-I	9148935221
9/2/2020 16:32:45	sanketkumar7799@gmail.com	Sanketkumar	Male	91949791	BMDSE5- B. Graph Theory-I	9686651430
9/2/2020 16:32:49	sumanchavan07@gmail.com	Suman chavan	Female	91949814	BMDSE5- B. Graph Theory-I	9663711750
9/2/2020 16:33:20	vaishnavijoshi93870@gmail.com	Vaishnavi joshi	Female	91950078	BMDSE5- B. Graph Theory-I	8861382528
9/2/2020 16:33:27	shwetamadari48@gmail.com	Shweta	Female	91949804	BMDSE5- C. Numerical Analysis-I	7760460442
9/2/2020 16:33:59	pramodinimudkan@gmail.com	Pramodini V Mudkan	Female	91949869	BMDSE5- C. Numerical Analysis-I	7411724579
9/2/2020 16:33:59	babusaradagi@gmail.com	Babu	Male	91949727	BMDSE5- C. Numerical Analysis-I	9739898660
9/2/2020 16:34:58	geetasarjapur223@gmail.com	Geeta sarjapur	Female	91949743	BMDSE5- B. Graph Theory-I	7411176895
9/2/2020 16:35:13	jayashreeangadi34@gmail.com	Jayashree R Angadi	Female	91950053	BMDSE5- B. Graph Theory-I	8310800727
9/2/2020 16:35:15	brunda.h03@gmail.com	BRUNDA HIREMATH	Female	91949730	BMDSE5- B. Graph Theory-I	8951907792
9/2/2020 16:35:23	anushakalshetty4646@gmail.com	Anusha S Kalshetty	Female	91950047	BMDSE5- B. Graph Theory-I	8861612950
9/2/2020 16:35:31	soumyakambalimath61@gmail.com	Soumya S K	Female	91949810	BMDSE5- C. Numerical Analysis-I	9113696971
9/2/2020 16:35:45	snehasanjeev798@gmail.com	Sneha Sanjeev	Female	91949809	BMDSE5- C. Numerical Analysis-I	9071094598
9/2/2020 16:35:51	sumapatilpatil473@gmail.com	Sumalata	Female	91950017	BMDSE5- C. Numerical Analysis-I	9380093313
9/2/2020 16:35:56	sindhupolicepatil1999@gmail.com	Sindhu policepatil	Female	91949806	BMDSE5- C. Numerical Analysis-I	7760645132
9/2/2020 16:37:22	nagaratnavmetri2000@gmail.com	Nagaratna V Metri	Female	91949990	BMDSE5- B. Graph Theory-I	9606332209
9/2/2020 16:37:36	rashmirj973@gmail.com	RASHMI	Female	91949786	BMDSE5- C. Numerical Analysis-I	9353864906
9/2/2020 16:38:12	sonyragho4467@gmale.com	Shreedevi	Female	91949811	BMDSE5- C. Numerical Analysis-I	6362960064
9/2/2020 16:38:20	vandanakatke01@gmail.com	Vandana	Female	91949826	BMDSE5- B. Graph Theory-I	6363521225
9/2/2020 16:38:32	sapnamanohar1234@gmail.com	Sapna Manohar kumbar	Female	91949792	BMDSE5- B. Graph Theory-I	8277144671
9/2/2020 16:38:35	anjalisk286@gmail.com	Anjali	Female	1949975	BMDSE5- B. Graph Theory-I	9480998819
9/5/2020 13:22:01	shrinivaspoojarishrinivas@gmail.com	Shrinivas Poojari	Male	91949800	BMDSE5- C. Numerical Analysis-I	6362161416
9/2/2020 16:39:01	sunitakalshetty780@gmail.com	Sunita Kalshetty	Female	91949894	BMDSE5- C. Numerical Analysis-I	9019536660
9/2/2020 16:39:18	laxmigogi2000@gmail.com	Mahalaxmi.R.Gogi	Female	91949863	BMDSE5- B. Graph Theory-I	8310825197
9/2/2020 16:39:41	snehapanagaon@gmail.com	Sneha N Panagaon	Female	91949808	BMDSE5- B. Graph Theory-I	9108141131
9/2/2020 16:39:44	shwetaaloor8845@gmail.com	Shweta J Aloor	Female	91949803	BMDSE5- B. Graph Theory-I	6363558845
9/2/2020 16:39:52	reddycm913@gmail.com	Mamata	Female	91949762	BMDSE5- C. Numerical Analysis-I	9108413459
9/2/2020 16:40:07	nagaraj12uppin@gmail.com	Nagaraj s	Male	91949865	BMDSE5- B. Graph Theory-I	6361936965
9/2/2020 16:40:09	ashwinibgodi@gmail.com	Ashwini B Godi	Female	91949908	BMDSE5- C. Numerical Analysis-I	8147224375
9/2/2020 16:40:45	shreelaxmil81@gmail.com	Shreelaxmi R S	Female	91949996	BMDSE5- B. Graph Theory-I	7625054488
9/2/2020 16:41:00	bhagyakanalli@gmil.com	Bhagyashee k	Female	91950034	BMDSE5- C. Numerical Analysis-I	7338144597
9/2/2020 16:41:01	roopak.sk29@gmail.com	Roopa	Female	91949878	BMDSE5- C. Numerical Analysis-I	6360441447
9/2/2020 16:41:05	Jyotipattar19@gmail.com	Jyoti. S. Pattar	Female	91949747	BMDSE5- B. Graph Theory-I	7619128476
9/2/2020 16:42:10	poojagkotali95@gmail.com	Pooja	Female	91949991	BMDSE5- B. Graph Theory-I	7406512097
9/2/2020 16:42:13	simranishath2000@gmail.com	Simra.Nishath	Female	91949805	BMDSE5- B. Graph Theory-I	9980347731
9/2/2020 16:42:29	vinodtandur77@gamil.com	Vinod	Male	91949901	BMDSE5- C. Numerical Analysis-I	9663353308
9/2/2020 16:42:46	naveenkalshetty4567@gmail.com	Naveenkumar Ashok	Male	91950018	BMDSE5- B. Graph Theory-I	6363745828
9/2/2020 16:42:49	sbhavanab@gmail.com	Bhavana B Sannur	Female	91949853	BMDSE5- B. Graph Theory-I	9880715079

9/2/2020 16:42:57	venkateshbujji5582@gmail.com	Venkatesh R B	Male	91949830	BMDSE5- C. Numerical Analysis-I	9740625582
9/2/2020 16:42:58	reddyaishu16@gmail.com	Aishwarya Reddy	Female	91949841	BMDSE5- B. Graph Theory-I	9108718726
9/2/2020 16:43:16	snehamuttigi123@gmail.com	Sneha.R	Female	91950057	BMDSE5- B. Graph Theory-I	8088610456
9/2/2020 16:43:56	manishakatke44892@gmail.com	Manisha katke	Female	91950007	BMDSE5- B. Graph Theory-I	7349440550
9/2/2020 16:44:00	kaveridinni@gmail.com	Kaveri B dinni	Female	91949907	BMDSE5- C. Numerical Analysis-I	8147987482
9/2/2020 16:44:34	aishwaryabhusunage@gmail.com	Aishwarya S B	Female	91949842	BMDSE5- C. Numerical Analysis-I	9113965217
9/2/2020 16:45:06	wadedpooja@gmail.com	Pooja	Female	91950013	BMDSE5- C. Numerical Analysis-I	7483189871
9/2/2020 16:46:45	poojapujari1401@gmail.com	Pooja	Female	91949777	BMDSE5- B. Graph Theory-I	9972175464
9/2/2020 16:46:47	gangaganga94750@gmail.com	Gangamma v k	Female	91950054	BMDSE5- B. Graph Theory-I	7676648016
9/2/2020 16:46:57	vinayaksn2900@gmail.com	Vinayak s n	Male	91949837	BMDSE5- B. Graph Theory-I	9740850474
9/2/2020 16:47:07	shubhamamman2004@gmail.com	Shraddha Ashok Amman	Female	91949885	BMDSE5- C. Numerical Analysis-I	9448732549
9/2/2020 16:47:07	snehasinghrajput0612@gmail.com	Sneha singh	Female	91949888	BMDSE5- C. Numerical Analysis-I	7349344204
9/2/2020 16:47:52	chavanjyothi67@gmail.com	Jyothi chavan	Female	91949748	BMDSE5- B. Graph Theory-I	9916880503
9/2/2020 16:47:55	parmesh.yergol92@gmail.com	Parameshwar	Male	91949866	BMDSE5- B. Graph Theory-I	9242377793
9/2/2020 16:48:21	shrishailnks@gmail.com	Shrishail n k	Male	91949801	BMDSE5- B. Graph Theory-I	8971872196
9/2/2020 16:48:37	supriyabpatil00@gmail.com	Supriya.b.patil	Female	91949893	BMDSE5- C. Numerical Analysis-I	9380628011
9/2/2020 16:48:54	hulgerikavya1234@gmail.com	Kavya.A.H	Female	91949756	BMDSE5- B. Graph Theory-I	9481507892
9/2/2020 16:49:40	walikarmala1@gmail.com	Walikar Mala Sharanappa	Female	91949905	BMDSE5- C. Numerical Analysis-I	9353174653

Timestamp	Email Address	Name of the Student	Gender	Examination Register Nu	B. Sc Fifth Semester Discipline Elective cont	Mobile Number
9/2/2020 16:49:56	laxmipadashetty11@gmail.com	Laxmi A Padashetty	Female	91949862	BMDSE5- B. Graph Theory-I	7996239113
9/2/2020 16:51:34	pruthvirajmaragutti@gmail.com	Pruthviraj S M	Male	1950039	BMDSE5- B. Graph Theory-I	9353516671
9/2/2020 16:51:45	hulgerianjali1234@gmail.com	Anjali.A.H	Female	91949717	BMDSE5- B. Graph Theory-I	9481507892
9/2/2020 16:52:11	shivakaithapurkar@gmail.com	Ashwitha SK	Female	91949848	BMDSE5- C. Numerical Analysis-I	9164464749
9/2/2020 16:52:31	tpayal042@gmail.com	Payal suresh tiwari	Female	91949867	BMDSE5- C. Numerical Analysis-I	9611809939
9/2/2020 16:52:58	bhagyakone@gmail.com	Bhagyashree	Female	91950052	BMDSE5- B. Graph Theory-I	9686678574
9/2/2020 16:53:26	ashivpuji@gmail.com	Aditya shivpuji	Male	91949754	BMDSE5- C. Numerical Analysis-I	8431495526
9/2/2020 16:53:31	cvikasc1999@gmail.com	Vikas	Male	91949836	BMDSE5- C. Numerical Analysis-I	8088487246
9/2/2020 16:54:01	supreethiremath2208@gmail.com	Supreet Hiremath	Male	91949816	BMDSE5- B. Graph Theory-I	7349476787
9/2/2020 16:54:04	sangubhalki0@gmail.com	Sangamesh s k	Male	91949995	BMDSE5- B. Graph Theory-I	9113020926
9/2/2020 16:54:30	bhagya2652@gmail.com	Bhagyashree Kalashetty	Female	91949729	BMDSE5- B. Graph Theory-I	9036781441
9/2/2020 16:55:16	prabhavatisagar21@gmail.com	Prabhavati sagar	Female	91950056	BMDSE5- B. Graph Theory-I	6363099554
9/2/2020 16:55:46	Vachanashree01@gmail.Com	Vachanashree patil	Female	91949825	BMDSE5- B. Graph Theory-I	6361318804
9/2/2020 16:56:11	snshubhangi2@gmail.com	Shubhangi	Female	91949988	BMDSE5- B. Graph Theory-I	9980474239
9/2/2020 16:57:59	priyankaniloor1999@gmail.com	Priyanka.K.N	Female	91949992	BMDSE5- B. Graph Theory-I	7483085161
9/2/2020 16:59:12	tippashettybhagya@gmail.com	Bhagyashree	Female	91949728	BMDSE5- B. Graph Theory-I	6363338571
9/2/2020 16:59:21	swatibkobal@gmail.com	Bhavani Baburao	Female	91949852	BMDSE5- B. Graph Theory-I	9538299527
9/2/2020 17:00:29	shivrajdhammure10@gmail.com	Shivraj h dhammure	Male	91949997	BMDSE5- C. Numerical Analysis-I	7411211681
9/2/2020 17:01:16	shilparm62@gmail.com	Shilpa mokalaji	Female	91949884	BMDSE5- C. Numerical Analysis-I	9353687189
9/2/2020 17:01:18	kaveripatil1532001@gmail.com	Kaveri	Female	91949752	BMDSE5- B. Graph Theory-I	9740625787
9/2/2020 17:02:06	keertinarboli2000@gmail.com	Keerti Narboli	Female	91949860	BMDSE5- C. Numerical Analysis-I	9742849701
9/2/2020 17:02:08	gumthegayatri741@gmail.com	Gayatri k gumthe	Female	91949741	BMDSE5- B. Graph Theory-I	9591510640
9/2/2020 17:02:27	priyakambar2000@gmail.com	Channamma haraval	Female	91949977	BMDSE5- B. Graph Theory-I	6360716416
9/2/2020 17:02:42	neelambikababa@gmail.com	Neelambika Prabhuling	Male	91949771	BMDSE5- B. Graph Theory-I	9886850001
9/2/2020 17:02:51	harshitamman@gmail.com	Harshita Amman	Female	91949858	BMDSE5- C. Numerical Analysis-I	9380512133
9/2/2020 17:03:38	ranichincholikar16@gmail.com	RANI SUBHASH	Female	91950087	BMDSE5- B. Graph Theory-I	9148431593
9/2/2020 17:03:42	ranjitambiradar@gmail.com	Ranjita Biradar	Female	91949785	BMDSE5- B. Graph Theory-I	9972057754
9/2/2020 17:04:23	kalyankadari1414@gmail.com	Kalyan kumar B K	Male	91949750	BMDSE5- B. Graph Theory-I	9353881080
9/2/2020 17:05:54	bharathdegaon35263@gmail.com	Bharath	Male	91949855	BMDSE5- C. Numerical Analysis-I	9148392676
9/2/2020 17:06:45	Vinaymathpati039@gmail.com	Vinay	Male	91950059	BMDSE5- B. Graph Theory-I	8970877077
9/2/2020 17:07:08	pavitrakumaris12000@gmail.com	Pavitra Kumari	Female	91953031	BMDSE5- B. Graph Theory-I	9380955050
9/2/2020 17:07:27	ullasr1234@gmail.com	Ullas rachagol	Male	91949823	BMDSE5- B. Graph Theory-I	7829041616
9/2/2020 17:08:09	bhagyamanthale27@gmail.com	Bhagyalaxmi	Female	91949851	BMDSE5- B. Graph Theory-I	9632789448
9/2/2020 17:08:26	usharanihk@gamil.com	Usharani hk	Female	1950001	BMDSE5- C. Numerical Analysis-I	9535050454
9/2/2020 17:08:29	bhagyashreesalolli@gmail.com	Bhagyashree A S	Female	91949850	BMDSE5- C. Numerical Analysis-I	6363018336
9/2/2020 17:09:00	radhikaambulgi200@gmail.com	Shalini .Ambulgi	Female	91949882	BMDSE5- B. Graph Theory-I	8660070359
9/2/2020 17:10:03	shrishailitagi98@gmail.com	Shrishail	Male	91949802	BMDSE5- B. Graph Theory-I	6363376761
9/2/2020 17:10:32	sharddhapatil27@gmail.com	Shraddha	Female	91949799	BMDSE5- C. Numerical Analysis-I	9019274179
9/2/2020 17:11:44	neelambikababa93@gmail.com	Neelambika Prabhuling	Female	91949771	BMDSE5- B. Graph Theory-I	9886850001
9/2/2020 17:12:47	Vivekanandbiradar271@gmail.com	Sugnyani V Biradar	Female	91949812	BMDSE5- B. Graph Theory-I	9980957010
9/2/2020 17:13:09	sunilsg8008@gmail.com	Sunilkumar Shivanand G	Male	91949815	BMDSE5- C. Numerical Analysis-I	7353012566
9/2/2020 17:14:05	veenashrichandriki24@gmail.com	Veenashri	Female	91949828	BMDSE5- B. Graph Theory-I	9731464090
9/2/2020 17:14:21	deepsbiradar50@gmail.com	Deepa Biradar	Female	91949856	BMDSE5- C. Numerical Analysis-I	6360802837
9/2/2020 17:16:11	Pramodshrigan780@gmail.com	Pramodshrigan	Male	91949780	BMDSE5- B. Graph Theory-I	6363979022
9/2/2020 17:16:17	bhagyamanthale27@gmail.com	Bhagyalaxmi	Female	91949851	BMDSE5- B. Graph Theory-I	9632789448
9/2/2020 17:16:18	rohinibpandre@gmail.com	Rohini B Pandre	Female	91949876	BMDSE5- C. Numerical Analysis-I	9380110155
9/2/2020 17:16:18	vinodhatti21@gmail.com	Vinod A H	Male	91949839	BMDSE5- C. Numerical Analysis-I	9900726234
9/2/2020 17:16:22	harkemanju014@gmail.com	Manjunath	Male	91949764	BMDSE5- B. Graph Theory-I	7259527204

9/2/2020 17:16:34	nageshkumabr7540@gmail.com	Sai charan	Male	91949788	BMDSE5- B. Graph Theory-1	9886734139
9/2/2020 17:16:35	soumyashrigiri2@gmail.com	Soumya Rajshekhar shrig	Female	91949890	BMDSE5- C. Numerical Analysis-1	6362805768
9/2/2020 17:20:18	bharmanichetan@gmail.com	Chetan B	Male	91949734	BMDSE5- B. Graph Theory-1	6363700674
9/2/2020 17:22:46	ranjusahukar99@gmail.com	Ranjeeta Ravindra	Female	91949871	BMDSE5- C. Numerical Analysis-1	7795063824
9/2/2020 17:23:02	mkharke18@gmail.com	Manjunath	Male	91949764	BMDSE5- B. Graph Theory-1	7259527204
9/2/2020 17:24:07	bharatmath797@gmail.com	Bharatkumar Math	Male	91950033	BMDSE5- B. Graph Theory-1	9591355530
9/2/2020 17:25:11	psunagar2000@gmail.com	Priya	Female	91949993	BMDSE5- B. Graph Theory-1	9740612594
9/2/2020 17:28:48	bharatisirasgi@gmail.com	Bharati G S	Female	91949854	BMDSE5- C. Numerical Analysis-1	9620246222
9/5/2020 12:03:33	shipujkt@gmail.com	Shivaputra jalakoti	Male	91949797	BMDSE5- B. Graph Theory-1	9148653679
9/2/2020 17:29:32	nabukousarnabu@gmail.com	Nabukousar C P	Female	91949766	BMDSE5- B. Graph Theory-1	9380076727
9/2/2020 17:31:30	apoorvavastrad456@gmail.com	Apoorva	Female	91949720	BMDSE5- B. Graph Theory-1	9113927656
9/2/2020 17:33:07	vjlaxmik2s@gamil.com	Vijayalaxmi K	Female	91949833	BMDSE5- C. Numerical Analysis-1	6362563551
9/2/2020 17:39:47	sanjukumarkalb@gmail.com	Sanjukumar	Male	91949790	BMDSE5- C. Numerical Analysis-1	9110666433
9/5/2020 18:27:02	annaraychincholi16@gmail.com	Annaray Chincholi	Male	91949719	BMDSE5- C. Numerical Analysis-1	7349684855
9/2/2020 17:48:53	neelupatil08313@gmail.com	Neelamma Patil	Female	91949772	BMDSE5- B. Graph Theory-1	9108184205
9/2/2020 17:49:20	sudhareddy152001@gmail.com	Sudharani.P Pavitra	Female	91950031	BMDSE5- B. Graph Theory-1	8867825229
9/2/2020 17:52:11	poojamagi69@gmail.com	magi	Female	91949775	BMDSE5- B. Graph Theory-1	7795468779
9/2/2020 17:53:40	shiv.margutti1717@gmail.com	Shivaraj s/o Siddanna	Male	91949798	BMDSE5- C. Numerical Analysis-1	9663670685
9/2/2020 17:57:14	bheemashankarladavanthi@gmail.com	Bheemashankar	Male	91949819	BMDSE5- C. Numerical Analysis-1	9901437619
9/2/2020 18:03:46	Rathodmamata560@gmail.com	Shilpa s Rathod	Female	91949794	BMDSE5- C. Numerical Analysis-1	9663069800
9/2/2020 18:05:03	umeshpk64@gmail.com	Umesh kumbar	Male	91949824	BMDSE5- C. Numerical Analysis-1	8746980093
9/2/2020 18:05:43	ambikakamalapur212@gmail.com	Ambika E.K.	Female	91950077	BMDSE5- B. Graph Theory-1	7483777826
9/2/2020 18:08:35	chandrikaschama@gmail.com	Chandrika s c	Female	91947336	BMDSE5- B. Graph Theory-1	9844883920
9/2/2020 18:08:41	Kalpanakulkarni643@gmail.com	KAVYA KULKARNI	Female	91949755	BMDSE5- B. Graph Theory-1	9901495807
9/2/2020 18:09:19	ravihirematharavihirematha@gmail.com	Aishwarya Basavaraj	Female	91949714	BMDSE5- B. Graph Theory-1	8050174257
9/2/2020 18:09:57	anujaanilk2728@gmail.com	Anuja	Female	91949845	BMDSE5- B. Graph Theory-1	7676407143
9/2/2020 18:12:21	Kalpanakulkarni643@gmail.com	KAVYA KULKARNI	Female	91949755	BMDSE5- B. Graph Theory-1	9901495807
9/2/2020 18:15:26	divitahiremath2000@gmail.com	Divita Revanayya	Female	91949739	BMDSE5- B. Graph Theory-1	9886241976
9/2/2020 18:18:53	vijaylaxmip2001@gmail.com	Vijayalaxmi Rajashekhar	Female	91949835	BMDSE5- B. Graph Theory-1	7411277448
9/2/2020 18:19:19	mulagelaxmi098@gmail.com	Laxmi J Mulage	Female	91949759	BMDSE5- B. Graph Theory-1	9380360737
9/2/2020 18:21:59	vijayalaxmisg3@gmail.com	Vijayalaxmi s guttaragi	Female	91949834	BMDSE5- B. Graph Theory-1	6363175556

[1] Responder updated this value.

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[3] Responder updated this value.

[4] Responder updated this value

Centenary Celebrated Sharanabasaveshwar Vidya Vardhak Sagha's

Sharanabasaveshwar College of Science

Kalaburagi - 585 103, Karnataka

Department of Mathematics

One Day National Webinar

on

Recent Advances in Mathematics

Certificate

This is to certify that Dr./Prof./Mr./Ms. **DR. N. B. NADUVINAMANI, Professor**

of **DEPARTMENT OF MATHEMATICS, GULBARGA UNIVERSITY KALABURAGI**

as a ***resource person*** *in One Day National Webinar on* ***Recent Advances in Mathematics*** *under IQAC initiative organized by Department of Mathematics on 11th June 2020 at Sharanabasveshwar College of Science, Kalaburagi, Karanatka.*

Dr. T. V. Biradar
Organizing Secretary

Dr. Omprakash S.
IQAC Coordinator

PRINCIPAL
(Dr. S.G. Dollegoudar)

Centenary Celebrated Sharanabasaveshwar Vidya Vardhak Sagha's

Sharanabasaveshwar College of Science

Kalaburagi - 585 103, Karnataka

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of **DEPARTMENT OF MATHEMATICS, RANI CHENNAMMA UNIVERSITY BELAGAVI**

as a ***resource person*** *in One Day National Webinar on* ***Recent Advances in Mathematics*** *under IQAC initiative organized by Department of Mathematics on 11th June 2020 at Sharanabasveshwar College of Science, Kalaburagi, Karanatka.*

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