

**KRISHNA CHAITANYA DEGREE COLLEGE (A), NELLORE.
(AFFILIATED TO V.S. UNIVERSITY)**

**MINUTES OF THE MEETING OF THE BOARD OF STUDIES
(DEPARTMENT OF MATHEMATICS – UG)**

The first board of studies (BoS) meeting in the department of mathematics (UG) was held on 11-11-2025 at 11:30 AM in the College premises under the Chairmanship of the BoS in Mathematics for the preparation of Course Structure, Syllabus and Model Question Papers for the Academic Year 2025-26.

The following members were present in the meeting.

1. Dr. R.V Krishna Reddy – Chairman.
2. Prof. V. Sugunamma – Member (University Nominee).
3. Dr. S. Nanda Kishore – Member (Subject Expert from outside the parent university Nominated by the Academic Council).
4. Dr. Dhananjaya Reddy – Member (Subject Expert from outside the parent university Nominated by the Academic Council).
5. Smt. B. Hari Priya Reddy – Member (Faculty of the Department).
6. Sri. D.V. Kishore Kumar – Member (Faculty of the Department).
7. Sri. S. Ashok Kumar – Member (Faculty of the Department).
8. Sri. P. Subba Reddy – Member (Representative from Industry).
9. Prof. Ch. Kalyani – Member (College Alumni).

Members Absent:

- Nil -

At the opening of the meeting of the BoS, Dr. R.V. Krishna Reddy, the Chairman of the BoS and Incharge of the Department welcomed the members and introduced the members of BoS. He requested for the approval of Course Structure, Syllabus and Model Question Papers for the Academic Year 2025-26.

Agenda:

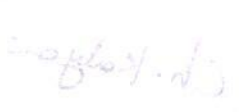
1. To finalize B.Sc (Applied Mathematics) R25 Course Structure and syllabus for semesters I & II.
2. To finalize the Blue print and Model Question Paper.
3. Approval of Panel of Examiners.
4. Any other proposal with the permission of the Chair.

Modifications:

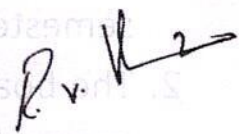
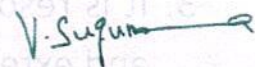
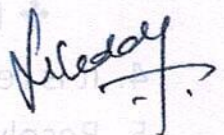
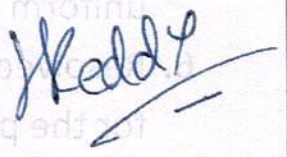
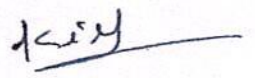
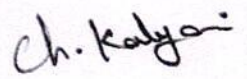
Semester	Course	Unit	Modification
I	I	I	No Changes were made.
		II	No Changes were made.
		III	No Changes were made.
		IV	One topic, "Solution of the non-homogeneous linear differential equation of second order with constant co-efficient by means of polynomial operators $Q(x)=x^V$ " of Unit-V had been shifted to Unit – IV.
		V	One topic "Legenders Equations" had been added to Unit - V
	II	I	No Changes were made.
		II	No Changes were made.
		III	No Changes were made.
		IV	No Changes were made.
		V	No Changes were made.
II	III	I	No Changes were made.
		II	Unit – III has been added to Unit – II
		III	Unit – IV has been shifted to Unit – III
		IV	Unit – V has been shifted to Unit – IV
		V	One new topic, "cylinder" has been designed as Unit - V
	IV	I	No Changes were made.
		II	No Changes were made.
		III	No Changes were made.
		IV	No Changes were made.
		V	No Changes were made.

Resolutions:

1. After careful review and discussion, the board discussed and prepared the course structure (for semesters I & II) and the syllabus (for I & II semesters) for B.Sc (Applied Mathematics) R25.
2. The board discussed and prepared the blue print and model question papers (for I & II semesters) for B.Sc (Applied Mathematics) R25.
3. It is resolved the following with regard to the distribution of internal and external marks.
 - ❖ Internal Assessment : 30 Marks.
 - ❖ External Examination : 70 Marks.
4. It is resolved and approved the list of panel of examiners.
5. Resolved to suggest that the scheme of valuation should be given by the paper setter for uniform evaluation. If the paper setter fails to supply the scheme of valuation, the chairman of BoS / BoS Member should take the responsibility to prepare the scheme of valuation for uniform evaluation.
6. Resolved to request the Dean (Academics) to think about possibility for the preparation of Question Bank for the benefit of slow learners.

6.	Member	Dr. D.V. Kishore Kumar, Dept. of Mathematics, Krishna Chaitanya Degree College, Nellore.	Offline	
7.	Member	Dr. S. Ashok Kumar, Dept. of Mathematics, Krishna Chaitanya Degree College, Nellore.	Offline	
8.	Member	Dr. P. Subba Reddy, Vice President, Brainwave Infotech, Pvt. Ltd., Mumbai.	Online	
9.	Member	Prof. Ch. Kalpana, Professor & HOD, Dept. of Mathematics, Vishwam Engineering College, Madanagalli.	Online	

Members Present (Online / Offline)

S.No	Cadre in BoS	Name	Mode of attendance	Signature
1.	Chair Person	Dr. R.V Krishna Reddy Dept., of Mathematics, Krishna Chaitanya Degree College, Nellore.	Offline	
2.	Member	Prof. V. Sugunamma, Dept., of Mathematics, Sri Venkateswara University, Tirupati.	Online	
3.	Member	Dr. S. Nanda Kishore, Associate Professor, Dept., of Science & Humanities, NBKR Institute of Science and Technology, Vidyanagar.	Online	
4.	Member	Dr. Dhananjaya Reddy, Associate Professor, Dept., of Mathematics, Govt. Degree College, Karvetinagaram, Chithoor (Dt.)	Online	
5.	Member	Smt. B. Hari Priya Reddy, Dept., of Mathematics, Krishna Chaitanya Degree College, Nellore.	Offline	
6.	Member	Sri. D.V. Kishore Kumar, Dept., of Mathematics, Krishna Chaitanya Degree College, Nellore.	Offline	
7.	Member	Sri. S. Ashok Kumar, Dept., of Mathematics, Krishna Chaitanya Degree College, Nellore.	Offline	
8.	Member	Sri. P. Subba Reddy, Vice President, Brainvire Infotech Pvt. Ltd., Mumbai	Online	
9.	Member	Prof. Ch. Kalyani, Professor & HOD, Dept. of Mathematics, Viswam Engineering College, Madanapalli.	Online	


Chairman

BoS – Mathematics – (UG)



Krishna Chaitanya Degree College(Autonomous)
(Affiliated to V.S University, Nellore)
NELLORE.

**Syllabus for 4-Year UG Honours in B.Sc. (Applied Mathematics) as Major in
 consonance with Curriculum framework w.e.f. AY 2025-26**

COURSE STRUCTURE (for Semester I & II)

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. credits	Max Marks Internal Assessment	Max Marks University Exam	Total Marks
I	I	1	Differential Equations	5	4	30	70	100
		2	Real Analysis	5	4	30	70	100
	II	3	Analytical Solid Geometry	5	4	30	70	100
		4	Abstract Algebra	5	4	30	70	100

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SEMESTER-I
COURSE 1: DIFFERENTIAL EQUATIONS

Theory	Credits: 4	5hrs/week
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Course Objective:

The central objective of differential equations are important for many physical system, one can subject to suitable idealization, formulate a differential equations that describes how the system changes in time, understanding the solutions of differential equation is then of paramount interest.

Course outcomes:

After successful completion of this course, the student will be able to;

1. Will be able to explain to the concept of differential equations and to solve first order ordinary differential equations.
2. To find orthogonal trajectories and Solve exact differential equations.
3. Convert separable in homogeneous to exact Solve exact differential equations by integrating factors and Solve Bernoulli's differential equations.
4. Solve homogeneous linear differential equations with constant coefficients.
5. Solve non-homogeneous differential equations using the method of variation of parameters and other applicable techniques.

UNIT – I - Differential Equations of first order and first degree:

Exact Differential Equations; Integrating Factors, Equations Reducible To Exact Equations by Integrating Factors:

1. $1/Mx+Ny$
2. $1/Mx-Ny$

Linear differential equations, Bernoulli's equations

UNIT – II - Orthogonal Trajectories.

Trajectory definition, orthogonal trajectory definition,

Orthogonal trajectories: Cartesian co-ordinates, self orthogonal Family of curves.

Orthogonal trajectories - polar co- ordinates.

UNIT – III - Higher order linear differential equations-I :

Solutions of homogeneous linear differential equations of second and higher order with constant coefficients $f(D)y = 0$ - Solutions of non-homogeneous linear differential equations $f(D)y = Q(x)$ of second order with constant coefficients by means of polynomial operators (i) $Q(x) = b e^{ax}$ where b is a real constant (ii) $(x) = \sin ax$ (or) $\cos ax$ where a is a real constant.

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UNIT – IV- Higher order linear differential equations-II:

Solution to a non-homogeneous linear differential equations of second order with constant coefficients by means of polynomial operators $Q(x) = X^k$, $Q(x) = e^{ax} V$, where V is a function of x , $Q(x) = x V$, where V is a function of x

UNIT – V - Higher order linear differential equations-III:

Method of Variation of parameters to find solutions of linear differential equations with constant coefficients - Legendre's equations

Prescribed Text Book:

1. A text book of mathematics for BA/BSc Vol 1 by N. Krishna Murthy & others, published by S. Chand & Company, New Delhi.

Reference Books:

1. Differential Equations and Their Applications by Zafar Ahsan, published by Prentice-Hall of India Learning Pvt. Ltd. New Delhi-Second edition.
2. Ordinary and Partial Differential Equations Raisinghania, published by S. Chand & Company, New Delhi.
3. Differential Equations with applications and programs – S. Balachandra Rao & HR Anuradha-universities press.
4. Telugu Academy Text Book for Differential Equations.
5. I-B.Sc A text Book of a Mathematics Deepthi Publications.

P.V. Ravi V. Sugun R. Suresh Ch. Kalpana K. Reddy K. S. S. Adhikari

BLUE PRINT OF QUESTION PAPER

DIFFERENTIAL EQUATIONS

UNIT	TOPICS	4 MARKS QUESTIONS	10 MARKS QUESTIONS
UNIT-I	Exact equations	1(problem)	1(problem)
	Linear equations	1(problem)	----
	Bernoulli's Equation	-----	1(problem)
UNIT-II	Orthogonal Trajectories, Cartesian coordinates	1(problem)	1(problem)
	OT polar coordinates	1(problem)	1(problem)
UNIT-III	General solution of $f(D)y = 0$	1(problem)	---
	$f(D)y = Q$ when $Q = be^{ax}$	1(problem)	1(problem)
	$f(D)y = Q$ when $Q = b \sin ax$ or $b \cos ax$	---	1(problem)
UNIT-IV	$f(D)y = Q$ when $Q = bx^k$	1(problem)	---
	$f(D)y = Q$ when $Q = e^{ax}V$	1(problem)	1(problem)
	$f(D)y = Q$ when $Q = xV$	---	1(problem)
UNIT-V	Method of variation of parameters	1(problem)	1(problem))
	Legendre's equations	1(problem)	1(problem)

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COURSE 1: DIFFERENTIAL EQUATIONS

Time: 3 Hrs

Max Marks: 70

Answer any FIVE of the following questions

5 X 4 = 20 Marks

1. Solve $x \frac{dy}{dx} + 2y - x^2 \log x = 0$
2. Solve $(e^y + 1) \cos x \, dx + e^y \sin x \, dy = 0$
3. Find the Orthogonal trajectories of the family of curves $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ where 'a' is a parameter.
4. Find the Orthogonal trajectories of the family of curves $r = a(1 - \cos \theta)$ where 'a' is a parameter.
5. Solve $(D^4 - 4D^3 + 6D^2 - 4D + 1)y = 0$
6. Solve $(D^2 - 5D + 6)y = e^{4x}$
7. Solve $(D^2 - 3D + 2)y = 2x^2$
8. Solve $(D^2 - 2D)y = e^x \sin x$
9. Solve $(D^2 + a^2)y = \cos ax$ by using method of variation of parameters.
10. Solve $[(5 + 2x)^2 D^2 - 6(5 + 2x)D + 8]y = 0$.

Answer FIVE of the following questions, Choosing ONE question from each unit.

5 X 10 = 50 Marks.

11. Solve $x^2 y dx - (x^3 + y^3) dy = 0$

(OR)

12. Solve $\frac{dy}{dx}(x^2y^3 + xy) = 1$

13. Find the orthogonal trajectories of the family of coaxial circles $x^2 + y^2 + 2gx + c = 0$ where 'g' is a parameter.

(OR)

14. Find the orthogonal trajectories of the families of curves $r = \frac{2a}{1 + \cos \theta}$ when “a” is parameter

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UNIT-III

15. Solve $(D^3 + 1)y = (e^x + 1)^2$

(OR)

16. Solve $(D^2 - 3D + 2)y = \cos 3x \cdot \cos 2x$

UNIT-IV

17. Solve $\frac{d^2 y}{dx^2} - 6\frac{dy}{dx} + 13y = 8e^{3x} \sin 2x$

(OR)

18. Solve $(D^2 - 4D + 4)y = 8x^2 e^{2x} \sin 2x$

UNIT-IV

19. Solve $(D^2 + 1)y = \sec x$ by using method of variation of parameters.

(OR)

20. Solve $\left[(1+x)^2 D^2 + (1+x)D + 1\right]y = 4 \cos \log(1+x)$

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SEMESTER-I

COURSE 2: REAL ANALYSIS

Theory

Credits: 4

5hrs/week

Course Objective:

Real Analysis, this course is designed to provide fundamental concepts of analysis, theory of functions of a real variable, differentiation and integration of real functions as well as some mean value theorems and Riemann integrable concepts.

Course outcomes:

After successful completion of this course, the student will be able to;

1. Understand the real number system, its axioms, and properties, including completeness, supremum, and infimum and Analyze sequences for boundedness and convergence using definitions and the Cauchy criterion.
2. Apply convergence tests such as P-test, Cauchy's root test, D'Alembert's ratio test, and Leibnitz test to analyze series.
3. Understand and evaluate limits of real-valued functions, including one-sided and infinite limits, and solve problems involving indeterminate forms.
4. Demonstrate knowledge of continuity, identify types of discontinuities, and apply theorems like Borel's and Bolzano's in analysis.
5. Evaluate Riemann integrals, verify conditions for integrability, and apply the Fundamental Theorem of Calculus in integration problems.

UNIT – I: REAL NUMBERS:

The algebraic and order properties of $\mathbb{R}$, Absolute value and Real line, Completeness property of $\mathbb{R}$, Applications of supreme property; intervals. **No Question is to be set from this portion.**

Real Sequences: Sequences and their limits, Range and Boundedness of Sequences, Limit of a sequence and Convergent sequence, Monotone sequences, Necessary and Sufficient condition for Convergence of Monotone Sequence, Limit and the Bolzano- weierstrass theorem . **No Question is to be set from this portion.**

Series: Introduction to series, convergence of series of Non-Negative Terms.

1. P-test
2. Cauchy's nth root test or Root Test.
3. D'Alembert's Test or Ratio Test

UNIT – II: LIMITS AND CONTINUITY :

Limits: Real valued Functions, Boundedness of a function, Limits of functions. Some extensions of the limit concept, Infinite Limits. Limits at infinity. **No Question is to be set from this portion.**

Continuous functions : Continuity and discontinuity of a function and examples - Modulus of a continuous function is a continuous function - Borel's theorem statement only -Every continuous function is bounded – Every continuous and bounded function defined on $[a,b]$ attains its bounds -Bolzano's theorem - Bolzano's

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intermediate value theorem

UNIT – III: DIFFERENTIATION:

The derivability of a function, on an interval, at a point, Derivability and continuity of a function, Graphical meaning of the Derivative, Problems on Differentiation.

UNIT – IV: MEAN VALUE THEORMS:

Mean value Theorems; Rolle's Theorem, Lagrange's Theorem, Cauchy's Mean value Theorem
Statement and their Applications.

UNIT – V: RIEMANN INTEGRATION:

Riemann Integral, Riemann integral functions, Upper and lower Riemann sums Necessary and sufficient condition for R- integrability, Darboux theorem statement only, Continuous Functions R-Integral, Monotonic Function R-Integrable constant function R-Integrable.- Fundamental theorem of integral calculus.

Prescribed Text Book:

- 1.** A Text Book of B.Sc Mathematics by B.V.S.S. Sarma and others, Published by S. Chand & Company Pvt. Ltd., NewDelhi.

Reference Books:

1. Real Analysis by Rabert & Bartely and .D.R. Sherbart, Published by John Wiley.
2. Elements of Real Analysis as per UGC Syllabus by Shanthi Narayan and Dr. M.D. Raisingkania Published by S.Chand & Company Pvt. Ltd., New Delhi.
3. Telugu Academy Text Book for Real Analysis.
4. I-B.Sc A text Book of a Mathematics Deepthi Publications.

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BLUE PRINT OF QUESTION PAPER

REAL ANALYSIS

UNITS	TOPICS	4 MARKS QUESTIONS	10 MARKS QUESTIONS
UNIT-1	Series	2(problem)	2(theorems)
UNIT-2	Continuity	2(problems)	1(problem)+1(theorem))
UNIT-3	Differentiation	2(problems)	2(problems)
UNIT-4	Mean Value Theorems	1(problem) +1(theorem)	2(theorems)
UNIT-5	Riemann Integration	1(problem) +1(theorem)	2(theorems)

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UNIT-II

$$\frac{x \left(e^{\frac{1}{x}} - e^{\frac{-1}{x}} \right)}{e^{\frac{1}{x}} + e^{\frac{-1}{x}}}$$

13. Discuss the continuity of $f(x) = \frac{1}{e^x + e^{-x}}$ for $x \neq 0$ and $f(0)=0$ at $x=0$.

OR

14. If f is continuous on $[a, b]$ and $f(a), f(b)$ having opposite signs then prove that there exist $c \in (a, b) \ni f(c) = 0$.

UNIT-III

15. Show that $f(x) = x \sin\left(\frac{1}{x}\right), x \neq 0, f(x) = 0$ when $x=0$ is continuous but not derivable at $x=0$.

OR

16. Show that $f(x) = |x-1| + |x-2|$ is continuous but not derivable of $x=1, 2$.

UNIT-IV

17. State and prove Rolle's Theorem.

OR

18. State and prove Cauchy's Mean value Theorem.

UNIT-V

19. State and prove necessary and sufficient condition for R-integrability.

OR

20. If $f \in R[a, b]$ and m, M are the infimum and supremum of f on $[a, b]$ then prove that

$$m(b-a) \leq \int_a^b f(x)dx \leq M(b-a).$$

R.v. K.  V. Sugum  N. Sridhar  G. Sridhar  R. Ch. Kalyan  K. Kallu  K. S. Adhikari

COURSE 3: ANALYTICAL SOLID GEOMETRY

5hrs/week

Studying solid geometry provides the students with many foundational skills and helps them to build their logical thinking skills, deductive reasoning, analytical reasoning and problem solving skills.

After successful completion of this course, the student will be able to;

1. Will be able to direction cosines and direction ratios.
2. Derive and interpret equations of planes and lines in various forms.
3. Determine co-planarity of lines and solve problems involving shortest distances in 3D space.
4. Knowledge related to concept of cylinder.
5. Analyze sphere-related problems, including tangents, intersections, and circle equations in 3D.

Plane introduction, Distance between parallel planes, System of Planes, Planes bisecting the angles between two Planes.

Joint equation of a pair of planes-Pair of parallel planes.

Equation of a line; Angle between two lines; point of intersection of two lines, length of perpendicular from a given point to a given line, Image of a point in a plane, coplanar Lines

Shortest distance between two lines; the length and equations of the line of shortest distance between two straight lines.

Definition and equation of the sphere; the sphere through four given points; Plane sections of a sphere; Intersection of two spheres.

Equation of a circle: Great circle, small circle; Intersection of a sphere and a line.

Tangent plane, Angle of intersection of two spheres; orthogonal spheres; Radical plane, Coaxial system of spheres; Limiting Points.

Definition of a cylinder, Equation to the cylinder, enveloping cylinder.

Right circular cylinder: Equation of the right circular cylinder.

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Prescribed Text Book :

1. V. Krishna Murthy & Others “A text book of Mathematics for BA/B.Sc Vol 1,
Published by S. Chand & Company, NewDelhi.

Reference Books :

1. Scope as in Analytical Solid Geometry by Shanti Narayan and P.K. Mittal
Published by S. Chand & Company Ltd. Seventeenth Edition.

Sections :- 2.4, 2.5, 2.6, 2.7, 2.8, 3.1 to 3.7, 6.1 to 6.9, 7.1 to 7.4, 7.6 to 7.8.

2. P.K. Jain and Khaleel Ahmed, "A text Book of Analytical Geometry of Three Dimensions", Wiley Eastern Ltd., 1999.

3. Co-ordinate Geometry of two and three dimensions by P. Balasubrahmanyam, K.Y. Subrahmanyam, G.R. Venkataraman published by Tata-MC Gran-Hill Publishers Company Ltd., New Delhi.

4. Telugu Academy Text Book for Solid Geometry.

5. I-B.Sc A text Book of a Mathematics Deepthi Publications.

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ANALYTICAL SOLID GEOMETRY

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- UNIT - II**
13. Find the image of the point (2,-1,3) in the plane $3x-2y+z=9$.
- OR**

13. Find the image of the point (2,-1,3) in the plane $3x-2y+z=9$.

OR

14. Find the length and equation to the line of shortest distance between the lines $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-1}{2}$, $\frac{x-4}{4} = \frac{y-3}{5} = \frac{z-2}{3}$.

15. Find the equation of the sphere through the circle $x^2 + y^2 + z^2 + 2x + 3y + 6 = 0, x - 2y + 4z - 9 = 0$ and the centre of the sphere $x^2 + y^2 + z^2 - 2x + 4y - 6z + 5 = 0$.

16. Find whether the following circle is a great circle or small circle
 $x^2 + y^2 + z^2 - 4x + 6y - 8z + 4 = 0, x + y + z = 3$.

17. Find the equation of the sphere which touches the plane $3x+2y-z+2=0$ at $(1,-2,1)$ and cuts orthogonally the sphere $x^2+y^2+z^2-4x+6y+4=0$.

18. Find limiting points of the co axial system of spheres
 $(x^2 + y^2 + z^2 - 20x + 30y + 40z + 29) + \lambda (2x - 3y - 4z) = 0$.

19. Find the equation of the enveloping cylinder of the sphere $x^2 + y^2 + z^2 = 25$ whose generators are parallel to $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$.

20. Find the equation to the right circular cylinder whose guiding circle $x^2 + y^2 + z^2 = 9, x - y + z = 3$.

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SEMESTER -II

COURSE 4: ABSTRACT ALGEBRA

Theory

Credits:4

5 hrs/week

Course Objective:

The main aim of the course is to introduce the basic concepts of group theory structure and logical thinking in derivations of various properties.

Course outcomes:

After successful completion of this course, the student will be able to;

1. Understand and use the properties of group axioms.
2. Analyze subgroups and cosets, apply Lagrange's Theorem, and understand the structure of a group through its subgroups.
3. Understand and use the properties of cosets and permutations.
4. Understand the concept of homomorphism and isomorphisms, including the fundamental homomorphism theorem and its applications.
5. In over all critical thinking, research and communication from group theory.

UNIT – 1 : GROUPS :-

Binary Operation – Algebraic structure – semi group-monoid – Group definition and elementary properties Finite and Infinite groups – examples –Order of a Group- Composition tables with examples.

UNIT – 2 : SUBGROUPS :-

Complex Definition – Multiplication of two complexes Inverse of a complex-Subgroup definition – examples-criterion for a complex to be a subgroups.

Criterion for the product of two subgroups to be a subgroup-union and Intersection of subgroups.

UNIT –3 : NORMAL SUBGROUPS :-

Cosets Definition – properties of Cosets statements only – Index of a subgroups of a finite groups– Lagrange's Theorem Statement and Proof.

Definition of normal subgroup – proper and improper normal subgroup–Hamilton group – criterion for a subgroup to be a normal subgroup –subgroup of a group is normal if $xhx^{-1}=H$ - normal subgroup iff each left coset is a right coset- intersection of two normal subgroups – every subgroup of an abelian group is normal- A subgroup of a group is a normal subgroup iff product of two right (left) cosets is again a right (left)coset-Sub group of index 2 is a normal sub group.

UNIT – 4 : HOMOMORPHISM :-

Definition of homomorphism – Image of homomorphism elementary properties of homomorphism – Isomorphism –automorphism definitions and elementary properties– kernel of a homomorphism – fundamental theorem on Homomorphism and applications.

P.V. Ravi V. Sugum P. Sridhar G. S. Ravi Ch. Kalpana K. S. Ravi S. Anand

UNIT – 5 : PERMUTATIONS :-

Definition of permutation – permutation multiplication – Inverse of a permutation – cyclic permutations – transposition – even and odd permutations.

Prescribed Text Book :

1. A text book of Mathematics for B.A. / B.Sc. by B.V.S.S. SARMA and others, Published by S.Chand & Company, New Delhi.

Reference Books :

1. Abstract Algebra, by J.B. Fraleigh, Published by Narosa Publishing house.
2. Modern Algebra by M.L. Khanna.
3. Telugu Academy Text Book for Abstract Algebra.
4. I-B.Sc A text Book of a Mathematics Deepthi Publications.

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BLUE PRINT OF QUESTION PAPER

ABSTRACT ALGEBRA

UNITS	TOPICS	4 MARKS QUESTIONS	10 MARKS QUESTIONS
UNIT-1	Problems on finite and infinite groups	1(Problem) +1(theorem)	2(Problems)
UNIT-2	Subgroups	2 (theorems)	2(theorems)
UNIT-3	Cosets and Lagrange's theorem	1(theorem)	---
	Normal Subgroups	1(theorem)	2(theorems)
UNIT-4	Homomorphism	1(Problem) +1(theorem)	2(theorems)
UNIT-5	Permutations	2(problems)	2(problems)

R.v. K ~~to~~ V. Sugum ~~to~~ Nitish ~~to~~ G. ~~to~~ R. ~~to~~ Ch. Kalyan ~~to~~ J. K. ~~to~~ K. ~~to~~ S. Adhikari

SEMESTER – II
COURSE 4: ABSTRACT ALGEBRA
Model Question Paper

Time: 3 Hrs

Max Marks: 70

Part - A

Answer any FIVE of the following questions

5 X 4 = 20 Marks

1. $G = \{1, 2, 3, 4, 5, 6\}$ Prepare composition table and prove that G is finite Abelian group of order 6 with respect to X_7 .
2. Prove that in a group G , inverse of an element is unique.
3. If H is any subgroup of G then prove that $H^{-1} = H$
4. Prove that intersection of two sub group is again a subgroup.
5. State and prove Lagrange's theorem.
6. Prove that Intersection of any two normal subgroups is again a normal Subgroup.
7. Prove that Homomorphic image of a group is a group.
8. If $\phi: z_{10} \rightarrow z_{20}$ be a homomorphism defined by $\phi(1) = 8$ then find "ker ϕ ".
9. If $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 2 & 3 \\ 3 & 1 & 2 \end{pmatrix}$ calculate AB, BA
10. Find the inverse of the permutation: $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 3 & 4 & 5 & 6 & 1 & 2 \end{pmatrix}$

Part - B

Answer FIVE of the following questions, Choosing ONE question from each unit.

5 X 10 = 50 Marks.

UNIT-I

11. Prove that the set of n^{th} roots of unity under multiplication form a finite abelian group.
- OR**
12. Show that set of all positive rational numbers form on abelian group under the composition 'o' defined by $aob = \frac{ab}{2}$.

UNIT-II

13. Prove that non-empty finite set of a group which is closed under multiplication is a sub group of G .
- OR**
14. Prove that the union of two subgroups of a group is a subgroup iff one is contained in the other.

P.V. Ravi V. Sugun Prasad Gururaj B.R. Ch. Kalpana Kaddu Kavi S. Anubhava

UNIT-III

15. Prove that a subgroup H of a group G is a normal sub group of G iff each left coset of H in G is a right coset of H in G .

OR

16. If G is group and H is a subgroup of index 2 in G then prove that H is a normal subgroup of G .

UNIT-IV

17. $(G, \cdot)$ and $(G^1, \cdot)$ be two groups $f : G \rightarrow G^1$ is an homomorphism then prove

(i) $f(e) = e^1$ (ii) $f(a^1) = [f(a)]^{-1}$ where e, e^1 are then identity elements in G and G^1 respectively.

OR

18. State and prove fundamental theorem on homomorphism of groups.

UNIT-V

19. Examine the following permutation are even or odd

$$(i) \quad f = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 3 & 2 & 4 & 5 & 6 & 7 & 1 \end{pmatrix} \quad (ii) \quad g = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 7 & 3 & 1 & 8 & 5 & 6 & 2 & 4 \end{pmatrix}$$

OR

20. Find the regular Permutation group isomorphic to the multiplicative group $\{1, \omega, \omega^2\}$.

R.v. K $\rightarrow$ V. Sugum $\rightarrow$ Prasanna $\rightarrow$ dhruv $\rightarrow$ R.R $\rightarrow$ Ch. Kalga $\rightarrow$ Hadda $\rightarrow$ Kiriy $\rightarrow$ S. Adhikari