From
Dr. R.V. Krishna Reddy,
Professor & Chairman-BOS (UG), KCDC,
Krishna Chaitanya Degree College (A),
Nellore.

To
The Principal,
Krishna Chaitanya Degree College (A),
Nellore -524003.

Sir,

Sub. : KCDC, Nellore-BOS Mathematics Submission of revised syllabus for B.Sc.(Applied Mathematics) Major (U.G)-Reg.

_ _ _ * * * _ _ _

Under the subject Cited the B.O.S of Mathematics (U.G) had met on 11-11-2025 at 11:30 AM in Online to revise the syllabus for B.Sc. (Applied Mathematics) Major for the Academic Year 2025-2026. I am here with submitting the syllabus for B.Sc. (Applied Mathematics) Major after the discussion of the BOS by online, confirming the Rules and Regulations laid down by the A.P.S.C.H.E. & VSU. The Revised Syllabus along with Model Papers and signatures of B.O.S members, are Enclosed.

Thanking you,

Dr. R.V Krishna Reddy
(Chairman – BoS)

Members:

1 **Prof. V. Sugunamma**,
Dept., of Mathematics,
Sri Venkateswara University, Tirupati

2 **Dr. S. Nanda Kishore,**
Associate Professor,
Dept., of Science & Humanities,
NBKR Institute of Science and Technology, Vidyanagar.

3 **Dr. Dhananjaya Reddy**,
Associate Professor,
Dept., of Mathematics, Govt. Degree College,
Karvetinagaram, Chithoor (Dt.)

4 **Smt. B. Hari Priya Reddy**,
Dept., of Mathematics,
Krishna Chaitanya Degree College, Nellore.

5 **Sri. D.V. Kishore Kumar**,
Dept., of Mathematics,
Krishna Chaitanya Degree College, Nellore.

6 **Sri. S. Ashok Kumar**,
Dept., of Mathematics,
Krishna Chaitanya Degree College, Nellore.

7 **Sri. P. Subba Reddy**,
Vice President,
Brainvire Infotech Pvt. Ltd., Mumbai

8 **Prof. Ch. Kalyani**,
Professor & HOD, Dept. of Mathematics,
Viswam Engineering College, Madanapalli.

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

SEMESTER-I

COURSE 1: DIFFERENTIAL EQUATIONS

Theory **Credits: 4** **5hrs/week**

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.

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, $Q(x) = xV$, 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.

*****

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)	---
	$f(D)y=QwhenQ=be^{ax}$	1(problem)	1(problem)
	$f(D)y=QwhenQ=b\sin ax\, orb\cos ax$	---	1(problem)
UNIT-IV	$f(D)y=QwhenQ=bx^{k}$	1(problem)	---
	$f(D)y=QwhenQ=e^{ax}V$	1(problem)	1(problem)
	$f(D)y=QwhenQ=xV$	---	1(problem)
UNIT-V	Method of variation of parameters	1(problem)	1(problem))
	Legendre's equations	1(problem)	1(problem)

P.V. V.Sugun Ch. Kalyani S. Ashokkumar

Semester – I

COURSE 1: DIFFERENTIAL EQUATIONS

Model Question Paper

Time: 3 Hrs Max Marks: 70

Part - A

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 $\left(e^y+1\right)\cos x\,dx+e^y\sin x\,dy=0$
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 $\left(D^2-5D+6\right)y=e^{4x}$
7. Solve $(D^2-3D+2)y=2x^2$
8. Solve $(D^2-2D)y=e^x\sin x$
9. Solve $\left(D^2+a^2\right)y=\cos ax$ by using method of variation of parameters.
10. Solve $\left[(5+2x)^2D^2-6(5+2x)D+8\right]y=0$.

Part - B

Answer FIVE of the following questions, Choosing ONE question from each unit. 5 X 10 = 50 Marks.

UNIT-I

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

(OR)

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

UNIT-II

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

P.V. V. Sugum Ch. Kalyani S. Ashokkumar

UNIT-III

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

(OR)

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

UNIT-IV

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

(OR)

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

UNIT-IV

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

(OR)

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

P.V. V.Sugum Ch.Kalyani S.Ashokkumar

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 R, Absolute value and Real line, Completeness property of 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'-Alemberts' 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

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-Intigrable 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.

*****

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)

SEMESTER – I

COURSE 2: REAL ANALYSIS

MODEL QUESTION PAPER

Time: 3 Hrs Max Marks: 70

Part - A

Answer any FIVE of the following questions 5 X 4 = 20 Marks

1. Test for convergence $\sum_{n=1}^{\infty}\left(\sqrt{n+1}-\sqrt{n}\right)$.
2. Test for convergence $\sum \frac{n^2(n+1)^2}{n!}$
3. Discuss the continuity of $f(x)=\frac{e^{1/x}}{1+e^{\frac{1}{x}}}$ when $x\neq 0$ and f(0)=0 at the origin.
4. Examine for continuity of a function $f(x)=|x|+|x-1|$ at x=0.
5. If $f(x)=\frac{x}{1+e^{\frac{1}{x}}}$ if $x\neq 0$ and f(x) =0 if x=0 show that f is not derivable at x=0.
6. Prove that $f(x)=x^2\sin\left(\frac{1}{x}\right), x\neq 0$ and f(x)=0 is derivable at the origin.
7. State Lagrange's mean value theorem.
8. Discuss the applicability of Rolle's Theorem $f(x)=x^3-6x^2+11x-6$; $a=1$, $b=3$
9. If $f(x)$ =x^2 on $[0,1]$ and $P=\left\{0,\frac{1}{4},\frac{2}{4},\frac{3}{4},1\right\}$ compute $L(P,f)$ and $U(P,f)$.
10. Prove that a constant function is Remain integrable on [a,b].

Part - B

Answer FIVE of the following questions, Choosing ONE question from each unit. 5 X 10 = 50 Marks.

UNIT-I

11. State and prove Root test.

OR

12. State and prove p-test.

UNIT-II

13. Discuss the continuity of $f(x)=\dfrac{x\left(e^{\frac{1}{x}}-e^{\frac{-1}{x}}\right)}{e^{\frac{1}{x}}+e^{\frac{-1}{x}}}$ 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 $f(x)=x\sin\left(\dfrac{1}{x}\right), x\neq 0, f(x)=0$ 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 $m(b-a)\le\int_a^b f(x)dx\le M(b-a)$.

P.V. V.Sugun Ch.Kalyani S.Ashokkumar

SEMESTER-II

COURSE 3: ANALYTICAL SOLID GEOMETRY

Theory **Credits: 4** **5hrs/week**

Course Objective:

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.

Course outcomes:

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

1. Will be able to direction cosines and direction rations.
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.

UNIT – I: The Plane:

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.

UNIT – II: The Line:

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.

UNIT – III: Sphere-I:

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.

UNIT – IV: Sphere -II:

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

UNIT – V: Cylinder:

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

Right circular cylinder: Equation of the right circular cylinder.

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.

*****

BLUE PRINT OF QUESTION PAPER

ANALYTICAL SOLID GEOMETRY

UNIT	TOPICS	4 MARKS QUESTIONS	10 MARKS QUESTIONS
UNIT-I	Parallel Planes	1(problem)	-
	System of planes	1(problem)	1(problem)
	Pair of planes	-	1(problem)
UNIT-II	Coplanar lines	1(problem)	-
	Image, point of intersection	1(problem)	1(problem)
	Shortest distance	-	1(problem)
UNIT-III	Sphere introduction	1(problem)	-
	Plane section of a sphere	1(problem)	1(problem)
	Great circle and small circle	--	1(problem)
UNIT-IV	Angle of intersection of two spheres	1(problem)	--
	orthogonal spheres	1(problem)	1(problem)
	Limiting points		1(problem)
UNIT-V	Equation of a cylinder	1(problem)	-
	Equation of a right circular cylinder	1(problem)	1(problem)
	Enveloping cylinder	-	1(problem)

Semester – II

COURSE 3: ANALYTICAL SOLID GEOMETRY

Model Question Paper

Time: 3 Hrs Max Marks: 70

Part - A

Answer any FIVE of the following questions 5 X 4 = 20 Marks

1. Prove that the distance between parallel planes $2x-2y+z+3=0, 4x-4y+2z+5=0$ $is 1/6$.
2. Find the equation of the plane through the line of intersection of $x-y+3z+5=0, 2x+y-2z+6=0$ and passing through (-3,1,1).
3. Find the point of intersection of the lines $\frac{x-1}{-3}=\frac{y-2}{2}=\frac{z-3}{2}$ and $\frac{x-1}{3}=\frac{y-5}{1}=\frac{z}{-5}$
4. Prove that the line $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x-2}{3}=\frac{y-3}{4}=\frac{z-4}{5}$ are coplanar.
5. Find the centre and radius of the sphere $2x^2+2y^2+2z^2-2x+4y+2z+1=0$
6. Find the Equation of the sphere through the circle $x^2+y^2+z^2=9, 2x+3y+4z=5$ and the point(1,2,3).
7. Show that the spheres are orthogonal $x^2+y^2+z^2+6y+2z+8=0$; $x^2+y^2+z^2+6x+8y+4z+20=0$.
8. Find the equation of the tangent plane to the sphere $x^2+y^2+z^2-2x-4y+2z-3=0$, at $(-1,4,-2)$
9. Find the equation of the cylinder whose generators are parallel to $\frac{x}{1}=\frac{y}{2}=\frac{z}{3}$ which

   Passes through the curve $x^2+y^2=16, z=0$
10. Find the equation to the right circular cylinder whose axis $\frac{x-1}{2}=\frac{y}{3}=\frac{z-3}{1}$ and of radius 2

Part - B

Answer FIVE of the following questions, Choosing ONE question from each unit. 5 X 10 = 50 Marks.

UNIT-I

11. Find the equation of the plane bisecting the angles between the planes $x+2y+2z=19, 4x-3y+12z+3=0$.

OR

P.V. V. Sugum Ch. Kalyani S. Ashokkumar

12. Prove that Equation $2x^2 - 6y^2 - 12z^2 + 18yz + 2zx + xy = 0$ represents a pair of planes and find the angle between them.

UNIT - II

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 $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-1}{2}, \frac{x-4}{4} = \frac{y-3}{5} = \frac{z-2}{3}$.

UNIT - III

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

$x^2 + y^2 + z^2 - 2x + 4y - 6z + 5 = 0$.

OR

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

UNIT - IV

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
$x^2 + y^2 + z^2 - 4x + 6y + 4 = 0$.

OR

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

UNIT - V

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

OR

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

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.

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.

*****

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)

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 $\phi: z_{10} \to z_{20}$ be a homomorphism defined by $\phi(1)=8$ then find "ker f".
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.

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,.) and (G^1,.) be two groups $f:G\to G^1$ 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) $f=\begin{pmatrix}1&2&3&4&5&6&7\\3&2&4&5&6&7&1\end{pmatrix}$ (ii) $g=\begin{pmatrix}1&2&3&4&5&6&7&8\\7&3&1&8&5&6&2&4\end{pmatrix}$.

OR

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