UG PROGRAM (4 Years Honors)
CBCS-2020-21

B.A / B.Sc
MATHEMATICS

Syllab s and Model Question Papers

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1. Resolutions of the Board of Studies

Meeting held on:…22-1-2021…..... Time:10 am At: Convention centre,
Adikavi Nannayya university,Rajahmundry

Agenda: Finalising the revised syllabus of UG Mathematics under CBCS frame work with effect from2020-021.

Members present:
1. Dr.D.Chitti Babu, Convenor
2. Dr.D.Ch. Papa Rao, Member
3. Sri G.Sridhar, Member
4. Dr.K.Revathi, Coordinator

Resolutions:
After reviewing the existing titles and contents of classes I,II,III and IV framed by APSCHE, The boardcome out with the following resolutions.

Resolution-1
It is resolved to approve the following changes of courses I,II,III and IV of mathematics as it is given byAPSCHE.

COURSE I:
1. Change of variables topic is deleted in Unit-I.
2. Orthogonal trajectories and equations that do not contain x or y topics are deleted in Unit-II.
3. Linear differential equations with non-constant coefficients is restricted to one Method only i.e. whenpart of C.F. is known.

COURSE II:
1. Simplified form of the equations of two spheres topic is deleted in Unit-IV
2. Limiting points topic is added in Unit IV.

COURSE III:
1. Homomorphism topic is shifted from Unit-III Unit-IV.
2. Cyclic groups topic is deleted in Unit-IV
3. Ideals topic is deleted in Unit-IV

COURSE IV:
1. Bolzano-Weierstrass theorem topic is deleted in Unit-I
2. Absolute convergence and conditional convergence topics are deleted in Unit-II
3. Uniform continuity topic is deleted in Unit-III.
4. Integral as the limit of a sum and mean value theorems topic is changed to first mean value theoremin Unit-V.

COURSE V:
1. Matrices, elementary properties, Inverse matrix, Rank of a matrix are deleted in Unit-IV

Resolution 2.
It is resolved to approve the necessary changes in Blue print and model Courses of Courses I, II, III and
IV. The Course setters should strictly follow the prescribed book and model Courses

UG Program (4 years Honors) Structure (CBCS)
2020-21 A. Y., onwards
BACHLOR OF SCIENCE
(3rd and 4th year detailed design will be followed as per APSCHE GUIDELINES)

Subjects/ Semesters		I		II		III		IV		V		VI			
		H/W	C	H/W	C	H/W	C	H/W	C	H/W	C	H/W	C		
Languages												THIRD PHASE of APPRENTICESHIP Entire 5th / 6th Semester		FIRST and SECOND PHASES (2 spells) of APPRENTICESHIP between 1st and 2nd year and between 2nd and 3rd year (two summer vacations).	
English		4	3	4	3	4	3								
Language (H/T/S)		4	3	4	3	4	3								
Life Skill Courses		2	2	2	2	2+2	2+2								
Skill Development Courses		2	2	2+2	2+2	2	2								
Core Papers															
M-1	C1 to C5	4+2	4+1	4+2	4+1	4+2	4+1	4+2 4+2	4+1 4+1						
M-2	C1 to C5	4+2	4+1	4+2	4+1	4+2	4+1	4+2 4+2	4+1 4+1						
M-3	C1 to C5	4+2	4+1	4+2	4+1	4+2	4+1	4+2 4+2	4+1 4+1						
M-1	SEC (C6,C7)									4+2 4+2	4+1 4+1				
M-2	SEC (C6,C7)									4+2 4+2	4+1 4+1				
M-3	SEC (C6,C7)									4+2 4+2	4+1 4+1				
Hrs/ W (Academic Credits)		30	25	32	27	32	27	36	30	36	30	0	12	4	4
Project Work															
Extension Activities (Non Academic Credits)															
NCC/NSS/Sports/Extra Curricular									2						
Yoga							1		1						
Extra Credits															
Hrs/W (Total Credits)		30	25	32	27	32	28	36	33	36	30	0	12	4	4

M= Major; C= Core; SEC: Skill Enhancement Courses

2. DETAILS OF COURSE TITLES & CREDITS

Marks & Credits distribution: UG-Sciences

Sl. No	Course type	No. of courses	Each course teaching Hrs/wk	Credit for each course	Total credits	Each course evaluation			Total marks
						Conti-Assess	Univ-exam	Total	
1	English	3	4	3	9	25	75	100	300
2	S.Lang	3	4	3	9	25	75	100	300
3	LS	4	2	2	8	0	50	50	200
4	SD	4	2	2	8	0	50	50	200
5	Core/SE -I	5+2	4+2	4+1	35	25	75+50	150	1050
	Core/SE -II	5+2	4+2	4+1	35	25	75+50	150	1050
	Core/SE -III	5+2	4+2	4+1	35	25	75+50	150	1050
6	Summer-Intern	2		4	8		100	200	200
7	Internship/ Apprentice/ on the job training	1		12	12		200	2005	200
		38			**159**				**4550**
8	**Extension Activities (Non Academic Credits)**							25	
	NCC/NSS/Sports/ Extra Curricular			2	2				
	Yoga	2		1	2				
	Extra Credits							2	
	Total	**40**			**142**			5	

Sem	Course No	Course Name	Course Type (T/L/P)	Hrs/Week (Arts/ Commerce &Science	Credits (Arts/Commerce &Science	Max. Marks Count/ Internal/Mid Assessment	Max. Marks (Sem-End)
I	1	Differential Equations	T	5	4	25	75
II	2	Three Dimensional Analytical Solid Geometry	T	5	4	25	75
III	3	Abstract Algebra	T	5	4	25	75
IV	4	Mathematics Real Analysis	T	5	4	25	75
	5	Linear Algebra	T	5	4	25	75
V	6A	Numerical Methods	T	5	4	25	75
	7A	Mathematical Special Functions	T	5	4	25	75
	OR						
	6B	Multiple integrals and Applications of Vector Calculus	T	5	4	25	75
	7B	Integral transforms with Applications	T	5	4	25	75
	OR						
	6C	Partial Differential Equations and Fourier Series	T	5	4	25	75
	7C	Number theory	T	5	4	25	75

Note: *Course type code: T: Theory, L: Lab, P: Problem solving

Note 1: For Semester–V, for the domain subject **MATHEMATICS**, any one of the three pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A & 7A or 6B & 7B or 6C & 7C. The pair shall not be broken (ABC allotment is random, not on any priority basis).

Note 2: One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate field skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented. Hence, teachers shall also impart practical training to students on the field skills embedded in the syllabus citing related real field situations.

Note 3: To insert assessment methodology for Internship/ on the Job Training/Apprenticeship under the revised CBCS as per APSCHE Guidelines.

- **First internship (After 1st Year Examinations):** Community Service Project. To inculcate social responsibility and compassionate commitment among the students, the summer vacation in the intervening 1st and 2nd years of study shall be for Community Service Project (the detailed guidelines are enclosed).
- **Credit For Course: 04**

- **Second Internship (After 2nd Year Examinations):** Apprenticeship / Internship / on the job training / In-house Project / Off-site Project. To make the students employable, this shall be undertaken by the students in the intervening summer vacation between the 2nd and 3rd years (the detailed guidelines are enclosed).
- **Credit For Course: 04**

- **Third internship/Project work (6th Semester Period):**
  During the entire 6th Semester, the student shall undergo Apprenticeship / Internship / On

the Job Training. This is to ensure that the students develop hands on technical skills which will be of great help in facing the world of work (the detailed guidelines are enclosed).

- **Credit For Course:12**

a. proposed combination subjects: NIL
b. Student eligibility for joining in the course: NIL
c. Faculty eligibility for teaching the course NIL
d. List of Proposed Skill enhancement courses with syllabus, if any NIL
e. Any newly proposed Skill development/Life skill courses with draft syllabus and requiredresources NIL

f. Required instruments/software/ computers for the course (Lab/Practical course-wise required i.e., fora batch of 15 students)

Sem. No.	Lab/Practical Name	Names of Instruments/Software/ computers required with specifications	Brand Name	Qty Required
1	Lab Name:	-	-	-
2	Lab Name:	--	-	-

g. List of Suitable levels of positions eligible in the Govt/Pvt organizations

Suitable levels of positions for these graduates either in industry/govt organization like., technical assistants/ scientists/ school teachers., clearly define them, with reliable justification

S.No	Position	Company/ Govt organization	Remarks	Additional skills required, if any
-	-	-	-	-
-	-	-	-	-

h. List of Govt. organizations / Pvt companies for employment opportunities or internships or projects

S.No	Company/ Govt organization	Position type	Level of Position			
-	-	-	-	-	-	-
-	-	-	-	-	-	-

i. Any specific instructions to the teacher /Course setters/Exam-Chief Superintendent NIL.

3. Program objectives, outcomes, co-curricular and assessment methods

BSc/BA	MATHEMATICS

1. Aim and objectives of UG program in Subject: MATHEMATICS In this course UG program, student will learn the higher mathematics topics to enable to learn and solve problems in different fields.

2. Learning outcomes of Subject (in consonance with the Bloom's Taxonomy):

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

1. Solving linear differential equations.
2. Understand the concept and apply appropriate methods for solving differential equations.
3. Recommended Skill enhancement courses: (Titles of the courses given below and details of the syllabus for 4 credits (i.e., 2 units for theory and Lab/Practical) for 5 hrs class-cum-lab work NIL
4. Recommended Co-curricular activities:(Co-curricular Activities should not promote copying from text book or from others' work and shall encourage self/independent and group learning)

A. Measurable:

1. Assignments on: different topics of the subject.
2. Student seminars (Individual presentation of Courses) on topics relating to:Mathematics subject.
3. Quiz Programmes on: different units of the course .
4. Individual Field Studies/projects: study projects in different fields
5. Group discussion on: nil
6. Group/Team Projects on: nil

B. General

1. Collection of news reports and maintaining a record of Course-cuttings relating to topics covered in syllabus. Yes
2. Group Discussions on: different areas of the subject
3. Watching TV discussions and preparing summary points recording personal observations etc., under guidance from the Lecturers Yes
4. Any similar activities with imaginative thinking. Nil
5. Recommended Continuous Assessment methods:

   Thorough Assignments and seminars on different areas of the course and problem solving sessions in various unit of the course.

4. Details of course-wise Syllabus

DETAILS OF COURSE-WISE SYLLABUS

B.A/ B.Sc	Semester-I	Credits:4
Course:1	DIFFERENTIAL EQUATIONS	Hrs/Weak:5

Course Outcomes:

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

- Solve linear differential equations
- Convert non exact homogeneous equations to exact differential equations by using integrating factors
- Know the methods of finding solutions of differential equations of the first order but not of the first Degree.
- Solve higher-order linear differential equations, both homogeneous and non homogeneous, with constant coefficients.
- Understand the concept and apply appropriate methods for solving differential equations.

UNIT I: (12 Hours)

Differential Equations of first order and first degree:

Linear Differential Equations; Differential equations reducible to linear form; Exact differential equations; Integrating factors.

UNIT II: (12 Hours)

Differential Equations of first order but not of the first degree:

Equations solvable for p; Equations solvable for y; Equations solvable for x; Equations homogeneous in x and y; Equations of the first degree in x and y – Clairaut's Equation.

UNIT III: (12 Hours)

Higher order linear differential equations-I:

Solution of homogeneous linear differential equations of order n with constant coefficients; Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators. General Solution of f(D)y=0.

General Solution of f(D)y=Q when Q is a function 1/f(D) is expressed as partial fractions of x,

P.I. of f(D)y = Q when Q= be^{ax}

P.I. of f(D)y = Q when Q is bsin ax or b cos ax.

UNIT IV: (12 Hours)

Higher order linear differential equations-II:

Solution of the non-homogeneous linear differential equations with constant coefficients.

P.I. of f(D)y = Q when Q= bx^k

P.I. of f(D)y = Q when Q= e^{ax} V **,** where V is a function of x.

P.I. of f(D)y = Q when Q= xV **,** where V is a function of x.

of f(D)y = Q when Q= x^mV **,** where V is a function of x.

UNIT V: (12 Hours)

Higher order linear differential equations-III :

Method of variation of parameters; Linear differential Equations with non-constant coefficients(Solution when a part of CF is known method only); The Cauchy-Euler Equation, Legendre's linear equations.

Co-Curricular Activities(15 Hours)

Seminar/ Quiz/ Assignments/ Applications of Differential Equations to Real life Problem /Problem Solving.

TEXT BOOK :

1. Differential Equations and Their Applications by Zafar Ahsan, published by Prentice-Hall of India Pvt. Ltd, New Delhi-Second edition.

REFERENCE BOOKS :

1. A text book of Mathematics for B.A/B.Sc, Vol 1, by N. Krishna Murthy & others, published by S.Chand & Company, New Delhi.
2. Ordinary and Partial Differential Equations by Dr. M.D,Raisinghania, published by S. Chand & Company, New Delhi.
3. Differential Equations with applications and programs – S. Balachandra Rao & HR Anuradha Universities Press.
4. Differential Equations -Srinivas Vangala & Madhu Rajesh, published by Spectrum University Press.

B.A/ B.Sc	Semester-II	Credits:4
Course:2	THREE DIMENSIONAL ANALYTICAL SOLID GEOMETRY	Hrs/Weak:5

Course Outcomes:

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

1. get the knowledge of planes.
2. basic idea of lines, sphere and cones.
3. understand the properties of planes, lines, spheres and cones.
4. express the problems geometrically and then to get the solution.

UNIT I: (12hrrs)

The Plane: Equation of plane in terms of its intercepts on the axis, Equations of the plane through the given points, Length of the perpendicular from a given point to a given plane, Bisectors of angles between two planes, Combined equation of two planes, Orthogonal projection on a plane.

UNIT II: (12 hrs)

The Line :Equation of a line; Angle between a line and a plane; The condition that a given line may lie in a given plane; The condition that two given lines are coplanar; Number of arbitrary constants in the equations of straight line; Sets of conditions which determine a line; The shortest distance between two lines; The length and equations of the line of shortest distance between two straight lines; Length of the perpendicular from a given point to a given line.

UNIT III: (12 hrs)

The Sphere :Definition and equation of the sphere; Equation of the sphere through four given points; Plane sections of a sphere; Intersection of two spheres; Equation of a circle; Sphere through a given circle;
Intersection of a sphere and a line; Power of a point; Tangent plane; Plane of contact; Polar plane; Pole of a Plane; Conjugate points; Conjugate planes;

UNIT IV: (12 hrs)

The Sphere and Cones : Angle of intersection of two spheres; Conditions for two spheres to be orthogonal; Radical plane; Coaxial system of spheres. Limiting Points.
Definitions of a cone; vertex; guiding curve; generators; Equation of the cone with a given vertex and guiding curve; equations of cones with vertex at origin are homogenous; Condition that the general equation of the second degree should represent a cone;

UNIT V: **(**12 hrs)

Cones :Enveloping cone of a sphere; right circular cone: equation of the right circular cone with a given vertex, axis and semi vertical angle: Condition that a cone may have three mutually perpendicular generators; intersection of a line and a quadric cone; Tangent lines and tangent plane at a point; Condition that a plane may touch a cone; Reciprocal cones; Intersection of two cones with a common vertex.

Co-Curricular Activities 15 Hours)

Seminar/ Quiz/ Assignments/Three dimensional analytical Solid geometry and its applications/ Problem Solving.

TEXT BOOK :

1. Analytical Solid Geometry by Shanti Narayan and P.K. Mittal, published by S. Chand & Company Ltd. 7th Edition.

REFERENCE BOOKS :

1. A text book of Mathematics for BA/B.Sc Vol 1, by V Krishna Murthy & Others, published by S. Chand & Company, New Delhi.
2. A text Book of Analytical Geometry of Three Dimensions, by P.K. Jain and Khaleel Ahmed, published by 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. Solid Geometry by B.Rama Bhupal Reddy, published by Spectrum University Press.

B.A/ B.Sc	Semester-III	Credits:4
Course:3	ABSTRACT ALGEBRA	Hrs/Weak:5

Course Outcomes:

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

- acquire the basic knowledge and structure of groups, subgroups and cyclic groups.
- get the significance of the notation of a normal subgroups.
- get the behavior of permutations and operations on them.
- study the homomorphisms and isomorphisms with applications.
- Understand the ring theory concepts with the help of knowledge in group theory and to prove the theorems.
- Understand the applications of ring theory in various fields.

UNIT I: (12 Hours)

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 II: (12 Hours)

SUBGROUP: 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. **Co-sets and Lagrange's Theorem:** Cosets Definition – properties of Cosets–Index of a subgroups of a finite groups–Lagrange's Theorem.

UNIT III: (12 Hours)

NORMAL SUBGROUPS: Definition of normal subgroup – proper and improper normal subgroup– Hamilton group – criterion for a subgroup to be a normal subgroup – intersection of two normal subgroups – Sub group of index 2 is a normal sub group –quotient group – criteria for the existence of a quotient group.

UNIT IV: (12 Hours)

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.

PERMUTATIONS: Definition of permutation – permutation multiplication – Inverse of a permutation – cyclic permutations – transposition – even and odd permutations – Cayley's theorem.

UNIT V: (12 Hours)

RINGSDefinition of Ring and basic properties, Boolean Rings, divisors of zero and cancellation laws Rings, Integral Domains, Division Ring and Fields, The characteristic of a ring - The characteristic of an Integral Domain, The characteristic of a Field. Sub Rings.

Co-Curricular Activities(15 Hours)

Seminar/ Quiz/ Assignments/ Group theory and its applications / Problem Solving.

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. Rings and Linear Algebra by Pundir & Pundir, published by Pragathi Prakashan.

B.A/ B.Sc	Semester-IV	Credits:4
Course:4	MATHEMATICS REAL ANALYSIS	Hrs/Weak:5

Course Outcomes:

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

- get clear idea about the real numbers and real valued functions.
- obtain the skills of analyzing the concepts and applying appropriate methods for testing convergence of a sequence/ series.
- Test the continuity and differentiability and Riemann integration of a function.
- Know the geometrical interpretation of mean value theorems.

UNIT I: **(12 Hours)**

Introduction of Real Numbers (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. The Cauchy's criterion, properly divergent sequences, Monotone sequences, Necessary and Sufficient condition for Convergence of Monotone Sequence, Limit Point of Sequence, Subsequences , Cauchy Sequences – Cauchy's general principle of convergence theorem.

UNIT II: **(12 Hours)**

INFINITIE SERIES :

Series : Introduction to series, convergence of series. Cauchy's general principle of convergence for series tests for convergence of series, Series of Non-Negative Terms.

1. P-test
2. Cauchy's n^{th} root test or Root Test.
3. D'-Alemberts' Test or Ratio Test.
4. Alternating Series – Leibnitz Test.

UNIT III: **(12 Hours)**

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: Continuous functions, Combinations of continuous functions, Continuous Functions on interval.

UNIT IV: **(12 Hours)**

DIFFERENTIATION AND MEAN VALUE THEOREMS: The derivability of a function, on an interval, at a point, Derivability and continuity of a function, Graphical meaning of the Derivative, Mean value Theorems; Rolle's Theorem, Lagrange's Theorem, Cauchy's Mean value Theorem

UNIT V: **(12 Hours)**

RIEMANN INTEGRATION : Riemann Integral, Riemann integral functions, Darboux theorem. Necessary and sufficient condition for R – integrability, Properties of integrable functions, Fundamental theorem of integral calculus, First mean value Theorem.

Co-Curricular Activities(15 Hours)

Seminar/ Quiz/ Assignments/ Real Analysis and its applications / Problem Solving.

TEXT BOOK:

1. Introduction to Real Analysis by Robert G.Bartle and Donlad R. Sherbert, published by John Wiley.

REFERENCE BOOKS:

1. A Text Book of B.Sc Mathematics by B.V.S.S. Sarma and others, published by S. Chand & Company Pvt. Ltd., New Delhi.
2. Elements of Real Analysis as per UGC Syllabus by Shanthi Narayan and Dr. M.D. Raisinghania, published by S. Chand & Company Pvt. Ltd., New Delhi.

B.A/ B.Sc	Semester-IV	Credits:4
Course:5	LINEAR ALGEBRA	Hrs/Weak:5

Course Outcomes:

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

- understand the concepts of vector spaces, subspaces, basises, dimension and their properties.
- understand the concepts of linear transformations and their properties
- apply Cayley- Hamilton theorem to problems for finding the inverse of a matrix and higher powers of matrices without using routine methods
- Learn the properties of inner product spaces and determine orthogonality in inner product spaces.

UNIT I: (12 Hours)

Vector Spaces-I: Vector Spaces, General properties of vector spaces, n-dimensional Vectors, addition and scalar multiplication of Vectors, internal and external composition, Null space, Vector subspaces, Algebra of subspaces, Linear Sum of two subspaces, linear combination of Vectors, Linear span Linear independence and Linear dependence of Vectors.

UNIT II: (12 Hours)

Vector Spaces-II: Basis of Vector space, Finite dimensional Vector spaces, basis extension, co-ordinates, Dimension of a Vector space, Dimension of a subspace, Quotient space and Dimension of Quotient space.

UNIT III: (12 Hours)

Linear Transformations: Linear transformations, linear operators, Properties of L.T, sum and product of LTs, Range and null space of linear transformation, Rank and Nullity of linear transformations – Rank – Nullity Theorem.

UNIT IV: (12 Hours)

Matrix : Linear Equations, Characteristic equations, Characteristic Values & Vectors of square matrix, Cayley – Hamilton Theorem.

UNIT V: (12 Hours)

Inner product space : Inner product spaces, Euclidean and unitary spaces, Norm or length of a Vector, Schwartz inequality, Triangle Inequality, Parallelogram law, Orthogonality, Orthonormal set, Gram– Schmidt orthogonalisation process. Bessel's inequality and Parseval's Identity.

Co-Curricular Activities (15 Hours)

Seminar/ Quiz/ Assignments/ Linear algebra and its applications / Problem Solving.

TEXT BOOK:

1. Linear Algebra by J.N. Sharma and A.R. Vasista, published by Krishna Prakashan Mandir,Meerut- 250002.

REFERENCE BOOKS:

2. Matrices by Shanti Narayana, published by S.Chand Publications.
3. Linear Algebra by Kenneth Hoffman and Ray Kunze, published by Pearson Education (low priced edition), New Delhi.
4. Linear Algebra by Stephen H. Friedberg et. al. published by Prentice Hall of India Pvt. Ltd. 4th Edition, 2007.

BLUE PRINT FOR QUESTION PAPER PATTERN

COURSE-I, DIFFERENTIAL EQUATIONS

Unit	TOPIC	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Differential Equations of 1^{st} order and 1^{st} Degree	2	2	30
II	Differential Equations of 1^{st} order but not of 1^{st} degree	1	2	25
III	Higher Order Linear Differential Equations (with constant coefficients) – I	2	2	30
IV	Higher Order Linear Differential Equations (with constant coefficients) – II	2	2	30
V	Higher Order Linear Differential Equations (with non constant coefficients)	1	2	25
TOTAL		8	1	140

S.A.Q. = Short answer questions (5 marks)

E.Q. = Essay questions (10 marks)

Short answer questions : 5 X 5 M = 25 M

Essay questions : 5 X 10 M = 50 M

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Total Marks = 75 M

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MODEL QUESTION PAPER (Sem-End)
B.A./B.Sc. DEGREE EXAMINATIONS

Semester - I

Course-1: DIFFERENTIAL EQUATIONS

Time: 3Hrs **Max.Marks:75M**

SECTION - A

Answer any FIVE questions. **5 X 5 M=25 M**

1. Solve $\left(1+e^{x/y}\right)dx+\ e^{x/y}\left(1-\frac{x}{y}\right)dy=0$
2. Solve $\left(y-e^{sin^{-1}x}\right)\frac{dx}{dy}+\sqrt{1-x^2}=0$
3. Solve sin px cos y = cos px siny + p.
4. Solve $[D^2-(a+b)D+ab]y=0$
5. Solve $(D^2-3D+2)=\cosh x$
6. Solve $(D^2-4D+3)y=\sin 3x\cos 2x.$
7. Solve $\frac{d^2y}{dx^2}-6\frac{dy}{dx}+13\ y=8\ e^{3x}\sin 2x.$
8. Solve $x^2y''-2x(1+x)y'+2(1+x)y=x^3$

SECTION - B

Answer ALL the questions. **5 X 10 M = 50 M**

9. (a) Solve $\frac{dy}{dx}+y=y^2\log x.$

(Or)

(b) Solve $\left(y+\frac{y^3}{3}+\frac{x^2}{2}\right)dx+\frac{1}{4}(x+xy^2)dy=0$

10. (a) Solve $p^2+2pycotx=y^2.$

(Or)

(b) Solve $y+Px=\ P^2x^4$

11. (a) Solve$(D^3+D^2-D-1)y=\cos 2x.11$

(OR)

(b) Solve $(D^2-3D+2)y=\sin e^{-x}.$

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

(Or)

(b) Solve $\frac{d^2y}{dx^2}+3\frac{dy}{dx}+2y=xe^x\sin x$

13. (a) Solve $(D^2-2D)\ y=e^x\sin x$ by the method of variation of parameters.

(Or)

(b) Solve $3x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+y=x$

BLUE PRINT FOR QUESTION PAPER PATTERN

COURSE-II, THREE DIMENSIONAL ANALYTICAL SOLID GEOMETRY

Unit	TOPIC	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	The Plane	2	2	30
II	The Right Line	2	2	30
III	The Sphere	2	2	30
IV	The Sphere & The Cone	1	2	25
V	The Cone	1	2	25
Total		8	10	140

S.A.Q. = Short answer questions (5 marks)

E.Q. = Essay questions (10 marks)

Short answer questions : 5 X 5 M = 25 M

Essay questions : 5 X 10 M = 50 M

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Total Marks = 75 M

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MODEL QUESTION PAPER (Sem-End)
B.A./B.Sc. DEGREE EXAMINATIONS

Semester - II

Course-2: THREE DIMENSIONAL ANALYTICAL SOLID GEOMETRY

Time: 3Hrs **Max.Marks:75M**

SECTION - A

Answer any FIVE questions. **5 X 5 M=25 M**

1. Find the equation of the plane through the point (-1,3,2) and perpendicular to the planesx+2y+2z=5 and 3x+3y+2z=8.
2. Find the bisecting plane of the acute angle between the planes 3x-2y-6z+2=0,-2x+y-2z-2=0.
3. Find the image of the point (2,-1,3) in the plane 3x-2y+z =9.
4. Show that the lines $2x + y - 4 = 0 = y + 2z$ and $3z - 4 = 0$, $2x + 5z - 8 = 0$ are coplanar.
5. A variable plane passes through a fixed point (a, b, c). It meets the axes in A, B, C. Show that thecentre of the sphere OABC lies on $ax^{-1}+by^{-1}+cz^{-1}=2$.
6. Show that the plane 2x-2y+z+12=0 touches the sphere $x^2+y^2+z^2-2x-4y+2z-3=0$ and find the pointof contact.
7. Find the equation to the cone which passes through the three coordinate axes and the lines $\frac{x}{1}=\frac{y}{-2}=\frac{z}{3}$ *and* $\frac{x}{2}=\frac{y}{1}=\frac{z}{1}$
8. Find the equation of the enveloping cone of the sphere $x^2 + y^2 + z^2 + 2x - 2y = 2$ withits vertex at (1, 1, 1).

SECTION - B

Answer ALL the questions. **5 X 10 M = 50 M**

9. (a) A plane meets the coordinate axes in A, B, C. If the centroid of ABc (a,b,c), show that theEquation of the plane is $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=3$.

(OR)

(b) A variable plane is at a constant distance p from the origin and meets the axes in A,B,C. Show thatThe locus of the centroid of the tetrahedron OABC is $x^{-2}+y^{-2}+z^{-2}=16p^{-2}$.

10. (a) Find the shortest distance between the lines $\frac{x-3}{3}=\frac{y-8}{-1}=\frac{z-3}{1}$; $\frac{x+3}{-3}=\frac{y+7}{2}=\frac{z-6}{4}$.

(OR)

(b) Prove that the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$; $\frac{x-2}{3}=\frac{y-3}{4}=\frac{z-4}{5}$ are coplanar. Also find their point ofintersection and the plane containing the lines.

11. (a) Show that the two circles $x^2+y^2+z^2-y+2z=0$, $x-y+z=2$; $x^2+y^2+z^2+x-3y+z-5=0$, $2x-y+4z-1=0$lie on the same sphere and find its equation.

(OR)

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

12. (a) Find the limiting points of the coaxial system of spheres $x^2+y^2+z^2-8x+2y-2z+32=0$, $x^2+y^2+z^2-7x+z+23=0$.

(OR)

(b) Find the equation to the cone with vertex is the origin and whose base curve is $x^2+y^2+z^2+2ux+d=0$.

13 (a) Prove that the equation $\sqrt{fx}\pm\sqrt{gy}\pm\sqrt{hz}=0$ represents a cone that touches the coordinatePlanes and find its reciprocal cone.

(OR)

(b) Find the equation of the sphere $x^2+y^2+z^2-2x+4y-1=0$ having its generators parallel to the line $x=y=z$.

BLUE PRINT FOR QUESTION PAPER PATTERN

COURSE-III, ABSTRACT ALGEBRA

Unit	**TOPIC**	**S.A.Q**(including choice)	**E.Q**(including choice)	**Total Marks**
I	Groups	2	2	30
II	Subgroups, Cosets & Lagrange's theorem	1	2	25
III	Normal Subgroups	1	2	25
IV	Homomorphism and Permutations	2	2	30
V	Rings	2	2	30
Total		8	10	140

S.A.Q. = Short answer questions (5 marks)

E.Q. = Essay questions (10 marks)

Short answer questions : 5 X 5 M = 25 M

Essay questions : 5 X 10 M = 50 M

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Total Marks = 75 M

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MODEL QUESTION PAPER (Sem-End)
B.A./B.Sc. DEGREE EXAMINATIONS

Semester - III

Course-3: ABSTRACT ALGEBRA

Time: 3Hrs **Max.Marks:75M**

SECTION – A

Answer any FIVE questions. **5 X 5 M=25 M**

1. Show that the set G=$\{x/x = 2^a 3^b \text{ and } a,b \in Z\}$ is a group under multiplication
2. Define order of an element. In a group G, prove that if $a \in G$ then $O(a) = O(a)^{-1}$.
3. If H and K are two subgroups of a group G, then prove that HK is a subgroup ⇔ HK=KH
4. If G is a group and H is a subgroup of index 2 in G then prove that H is a normal subgroup.
5. Examine whether the following permutations are even or odd

i) $\begin{pmatrix}1&2&3&4&5&6&7&8&9\\6&1&4&3&2&5&7&8&9\end{pmatrix}$ ii) $\begin{pmatrix}1&2&3&4&5&6&7\\3&2&4&5&6&7&1\end{pmatrix}$

6. If f is a homomorphism of a group G into a group G', then prove that the kernel of f is a normal of G.
7. Prove that the characteristic of an integral domain is either prime or zero.
8. Define a Boolean Ring and Prove that the Characteristic of a Boolean Ring is 2.

SECTION - B

Answer ALL the questions. **5 X 10 M = 50 M**

9. a) Show that the set of n^{th} roots of unity forms an abelian group under multiplication.

(Or)

b) In a group G, for $a, b \in G$, O(a)=5, b ≠ e and $aba^{-1} = b^2$. Find O(b).

10. a) The Union of two subgroups is also a subgroup □ one is contained in the other.

(Or)

b) State and prove Langrage's theorem.

11. a) Prove that a subgroup H of a group G is a normal subgroup of G iff the product of two right cosets of H in G is again a right coset of H in G.

(Or)

b) Define Normal Subgroup. Prove that a subgroup H of a group G is normal iff $xHx^{-1} = H \; \forall \; x \in G$.

12. a) State and prove fundamental theorem of homomorphisms of groups.

(Or)

b) Let S_n be the symmetric group on n symbols and let A_n be the group of even permutations. Then show that A_n is normal in S_n and $O(A_n) = \frac{1}{2}(n!)$

13. a) Prove that every finite integral domain is a field.

(Or)

b) Let S be a non empty sub set of a ring R. Then prove that S is a sub ring of R if and only if a-b ∈ S and ab ∈ S for all a, b ∈ S.

BLUE PRINT FOR QUESTION PAPER PATTERN

COURSE-IV, REAL ANALYSIS

Unit	TOPIC	**S.A.Q**(including choice)	**E.Q**(including choice)	Total Marks
I	Real Sequence	1	2	25
II	Infinite Series	2	2	30
III	Limits and Continuity	1	2	25
IV	Differentiation and Mean Value Theorem	2	2	30
V	Riemann Integration	2	2	30
	TOTAL	8	10	140

S.A.Q. = Short answer questions (5 marks)

E.Q. = Essay questions (10 marks)

Short answer questions : 5 X 5 M = 25 M

Essay questions : 5 X 10 M = 50 M

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Total Marks = 75 M

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MODEL QUESTION PAPER (Sem-End)

B.A./B.Sc. DEGREE EXAMINATIONS

Course-4: REAL ANALYSIS

Time: 3Hrs **Max.Marks:75M**

SECTION - A

Answer any FIVE questions. **5 X 5 M=25 M**

1. Prove that every convergent sequence is bounded.
2. Examine the convergence of $\frac{1}{1.2} - \frac{1}{3.4} + \frac{1}{5.6} - \frac{1}{7.8} + \cdots$
3. Test the convergence of the series $\sum_{n=1}^{\infty}(\sqrt[3]{n^3+1} - n)$.
4. Examine for continuity of the function *f* defined by $f(x) = |x| + |x-1|$ at x=0 and 1.
5. Show that $f(x) = x\sin\frac{1}{x},\ x \neq 0; f(x) = 0, x = 0$ is continuous but not derivable at x=0.
6. Verify Rolle's theorem for the function f(x) = $x^3 - 6x^2 + 11x - 6$ on $[1,3]$.
7. If $f(x) = x^2\ \forall\ x \in [0,1]$ and $p = \{0, \frac{1}{4}, \frac{2}{4}, \frac{3}{4}, 1\}$ then find L(p, f) and U(p, f).
8. Prove that if $f: [a,b] \to R$ is continuous on [a, b] then f is R- integrable on [a, b].

SECTION –B

Answer ALL the questions. **5 X 10 M = 50 M**

9. (a)If $s_n = 1 + \frac{1}{2!} + \frac{1}{3!} + \cdots + \frac{1}{n!}$ then show that $\{s_n\}$ converges.

(OR)

(b) State and prove Cauchy's general principle of convergence.

10. (a) State and Prove Cauchy's nth root test.

(OR)

(b) Test the convergence of $\sum \frac{x^n}{x^n + a^n}$ ($x > 0, a > 0$)

11. (a) Let f: R→ R be such that

$$f(x) = \frac{\sin(a+1)x + \sin x}{x} \text{ for } x < 0$$

$$= c \text{ for } x = 0$$

$$= \frac{(x+bx^2)^{1/2} - x^{1/2}}{bx^{3/2}} \text{ for } x > 0$$

Determine the values of a, b, c for which the function f is continuous at x=0.

(OR)

(b) If f: [a, b] → R is continuous on [a, b] then prove that f is bounded on [a, b]

12. (a) Using Lagrange's theorem, show that $x > \log(1+x) > \frac{x}{(1+x)} \forall\, x > 0$.

(OR)

(b) State and prove Cauchy's mean value theorem...

13. (a) State and prove Riemman's necessary and sufficient condition for R- integrability.

(OR)

(b) Prove that $\frac{\pi^3}{24} \leq \int_0^{\pi} \frac{x^2}{5+3\cos x}\,dx \leq \frac{\pi^3}{6}$

BLUE PRINT FOR QUESTION PAPER PATTERN

COURSE-V, LINEAR ALGEBRA

Unit	TOPIC	S.A.Q (including choice)	E.Q (including choice)	Marks Allotted
I	Vector spaces - I	2	2	30
II	Vector spaces - II	1	2	25
III	Linear Transformation	2	2	30
IV	Matrices	1	2	25
V	Inner product spaces	2	2	30
Total		8	10	140

S.A.Q. = Short answer questions (5 marks)

E.Q. = Essay questions (10 marks)

Short answer questions : 5 X 5 M = 25 M

Essay questions : 5 X 10 M = 50 M

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Total Marks = 75 M

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MODEL QUESTION PAPER (Sem-End)

B.A./B.Sc. DEGREE EXAMINATIONS

Semester -IV

Course-5: LINEAR ALGEBRA

Time: 3Hrs **Max.Marks:75M**

SECTION - A

Answer any FIVE questions. **5 X 5M=25 M**

1. Let p, q, r be fixed elements of a field F. Show that the set W of all triads (x, y, z) of elements of F, such that px+qy+rz=0 is a vector subspace of $V_3(R)$.
2. Define linearly independent &linearly dependent vectors in a vector space. If α, β, γ are linearly independent vectors of V(R) then show that $\alpha+\beta, \beta+\gamma, \gamma+\alpha$ are also linearly independent.
3. Prove that every set of $(n+1)$ or more vectors in an n dimensional vector space is linearly dependent.
4. The mapping T : V3(R) V3(R) is defined by T(x,y,z) = (x-y,x-z). Show that T is a linear ransformation.
5. Let $T: R^3 \to R^2$ and $H: R^3 \to R^2$ be defined by T (x, y, z)= (3x, y+z) and H (x, y, z)= (2x-z, y). Compute i) T+H ii) 4T-5H iii) TH iv) HT.
6. If the matrix A is non-singular, show that the eigen values of A^{-1} are the reciprocals of the eigen values of A.
7. State and prove parallelogram law in an inner product space V(F).
8. Prove that the set S = $\left\{\left(\frac{1}{3},\frac{-2}{3},\frac{-2}{3}\right),\left(\frac{2}{3},\frac{-1}{3},\frac{2}{3}\right),\left(\frac{2}{3},\frac{2}{3},\frac{-1}{3}\right)\right\}$ is an orthonormal set in the inner product space $R^3(R)$ with the standard inner product.

SECTION - B

Answer ALL the questions. **5 X 10 M = 50 M**

9. (a) Define vector space. Let V (F) be a vector space. Let W be a non empty sub set of V. Prove that the Necessary and sufficient condition for W to be a subspace of V is $a, b \in F$ and $\alpha, \beta \epsilon V \Rightarrow a\alpha + b\beta \epsilon W$

(OR)

(b) Prove that the four vectors (1,0,0), (0,1,0), (0,0,1) and (1,1,1) of $V_3(C)$ form linearly dependent set, but any three of them are linearly independent.

10. (a) Define dimension of a finite dimensional vector space. If W is a subspace of a finite Dimensional vector space V (F) then prove that W is finite dimensional and dim W $\leq n$.

(OR)

(b) If W be a subspace of a finite dimensional vector space V(F) then Prove that

. $\dim {}^{V}/_{W} = \dim V - \dim W$

11. (a) Find T (x, y, z) where $T: R^3 \rightarrow R$ is defined by T (1, 1, 1) =3, T (0, 1, -2) =1,T (0, 01) = -2

(OR)

(b) State and prove Rank Nullity theorem.

12. (a) Find the eigen values and the corresponding eigen vectors of the matrix A= $\begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{pmatrix}$

(OR)

(b) State and prove Cayley-Hamilton theorem.

13. (a) State and prove Schwarz's inequality in an Inner product space V(F).

(OR)

(b) Given $\{(2,1,3),(1,2,3),(1,1,1)\}$ is a basis of R^3(R).Construct an orthonormal basis using Gram-Schmidorthogonalisation process.

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SEMESTER- II: ANALYTICAL SOLID GEOMETRY
MATHEMATICS PRACTICALS
(W.E.F 2022 ADMITTED BATCH)

GUIDELINES

1.EVALUATION PROCESS

No. of Students per Batch	No. of hours per week	Max. Marks	Credits
30	2	50	1

2. DIVISION OF MARKS

Test	Record	Viva-voce	Total
30 Marks	10 Marks	10 Marks	50 marks

NOTE: Practical should be evaluated by both Internal and External examiners.
Remuneration will be given as per university norms.

1. BLUE PRINT FOR TEST

Time: 3 hours Max. Marks: 30

Question Paper contains two sections A and B.
Answer any FIVE Questions choosing at least TWO from each section.
Each question carries 6 Marks. **5 X 6 = 30 marks**

UNIT	No. of questions	
	Section-A	Section-B
I	2	----
II	2	----
III	1	1
IV	----	2
V	----	2

NOTE : 3 hours duration time includes record verification and Viva- Voce.

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SEMESTER- II: ANALYTICAL SOLID GEOMETRY

QUESTION BANK FOR PRACTICALS
(W.E.F 2022 ADMITTED BATCH)

UNIT-I (PLANES)

1) **Find the bisecting plane of the acute angle between the planes**

   $3x - 2y + 6z + 2 = 0, -2x + y - 2z - 2 = 0$

2) **Find the equation of the plane passing through the point $(2, 3, -1)$and is perpendicular to the line passing through the points $(3, 4, -1)$ and $(2, -1, -5)$.**

3) **Find the equation of the plane through $(4, 4, 0)$ and perpendicular to the planes**

   $x + 2y + 2z = 5$ **and** $3x + 3y + 2z - 8 = 0$.

4) **A variable plane is at a constant distance p from the origin and meets the axes in A, B, C. Show that the locus of thecentroid of the tetrahedron OABC is** $x^{-2} + y^{-2} + z^{-2} = 16\, p^{-2}$.

5) **A variable plane is at a constant distance 3p from the origin and meets the axes in A, B, C. Show that the locus of the centroid of the** Δ**ABC is** $x^{-2} + y^{-2} + z^{-2} = p^{-2}$.

6) **A variable plane moves so that the sum of the reciprocals of its intercepts on the coordinate axes is a constant. Show that it Passes through a fixed point.**

7) **Find the equation to the plane through the line of intersection of** $x - 2y - z + 3 = 0, -3x - 5y + 2z + 1 = 0$ **and perpendicular to** yz **plane.**

8) **Find the equations of the planes passing through the intersection of the planes** $x + 2y + 3z - 4 = 0$,
   $2x + y - z + 5 = 0$ **and perpendicular to the plane** $5x + 3y + 6z + 8 = 0$.

9) **Show that the equation** $x^2 + 4y^2 + 9z^2 - 12yz - 6zx + 4xy + 5x + 10y - 15z + 6 = 0$ **represents a pair of parallel planes and find the distance between them.**

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

UNIT-II (STRAIGHT LINES)

1) Find the image of the lines $\frac{x-1}{9}=\frac{y-2}{1}=\frac{z+3}{-3}$ in the plane $3x-3y+10z-26=0$.

2) Prove that the lines $\frac{x+1}{1}=\frac{y+1}{2}=\frac{z+1}{3}$ and $x+2y+3z-8=0, 2x+3y+4z-11=0$ are intersecting and find the point of their intersection. Find the equation to the plane containing them.

3) Prove that the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x-2}{3}=\frac{y-3}{4}=\frac{z-4}{5}$ are coplanar and find the equation to the plane containing the lines.

4). Find the equation of the straight line passing through the point $(1,0,-1)$and interesting the lines $4x-y-13=0=3y-4z-1;\quad y-2z+2=0=x-5$.

5) Fimd length and equation of SD between the lines $\frac{x-3}{3}=\frac{y-8}{-1}=\frac{z-3}{1}$ and $\frac{x+3}{-3}=\frac{y+7}{2}=\frac{z-6}{4}$ also find the equations and points in which the Shortest Distance meets the given lines.

6) Fimd length and equation of SD between the lines $\frac{x-3}{1}=\frac{y-5}{-2}=\frac{z-7}{1}$ and $\frac{x+1}{7}=\frac{y+1}{-6}=\frac{z+1}{1}$ also find the equations and points in which the Shortest Distance meets the given lines.

7) Prove that the lines $\frac{x+1}{1}=\frac{y+1}{2}=\frac{z+1}{3}$; $x+2y+3z-8=0=2x+3y+4z-11$ are coplanar and find their point of intersection. Find also the equation to the plane containing them.

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

9) Find the shortest distance between the $z-$axis and the line $a_1x+b_1y+c_1z+d_1=0=a_2x+b_2y+c_2z+d_2$.

10) Find the length and equation of the line of S. D. between the lines $3x-y+5z=0=x+y-z$, $6x+8y+3z-10=0=x-2y+2z-3$

UNIT-III (SPHERES)

1) Find the equation to the sphere through $O=(0,0,0)$ and making intercepts a, b, c on the coordinate axes.

2) A sphere of constant radius k passes through the origin and intersects the axes in A, B, C.

3) Prove that centroid of the ΔABC lies on the sphere $9(x^2+y^2+z^2)=4k^2$.

4) **Show that the four points $(-8,5,2),(-5,2,2),(-7,6,6),(-4,3,6)$ are concyclic.**

5) **Find the equations of the spheres passing through the circle $x^2+y^2=4, z=0$ and is interacted by the plane $x+2y+2z=0$ in a circle of radius 3.**

6) **Find the centre and the radius of the circle $x^2+y^2+z^2-2y-4z=11, x+2y+2z=15$**

7) **S.T the two circles $x^2+y^2+z^2-y+2z=0, x-y+z=2$ & $x^2+y^2+z^2+x-3y+z-5=0$, $2x-y+4z-1=0$ lie on the same sphere and find its equation.**

8) **S.T the plane $2x-2y+z+12=0$ touches the sphere $x^2+y^2+z^2-2x-4y+2z-3=0$ and find the point of contact.**

9) **Find the equation of the sphere which touches the sphere $x^2+y^2+z^2-x+3y+2z-3=0$ at $(1,1,-1)$ and passing through the origin.**

10) **Show that the spheres $x^2+y^2+z^2-2x-4y-6z-50=0, x^2+y^2+z^2-10x+2y+18z+82=0$ touch externally at the point $\left(\frac{45}{13},\frac{2}{13},,\frac{-57}{13}\right)$.**

UNIT-IV (SPHERE & CONES)

1) **Find the equation of the sphere for which the circle $x^2+y^2+z^2+7y-2z+2=0, 2x+3y+4z=8$ is a great circle.**

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

3) **Find the limiting points of the coaxal system defined by spheres $x^2+y^2+z^2+4x-2y+2z+6=0$ and $x^2+y^2+z^2+2x-4y-2z+6=0$.**

4) **Find the limiting points of the coaxal system of spheres $x^2+y^2+z^2-20x+30y-40z+29+\lambda(2x-3y+4z)=0$, where $\lambda \in R$.**

5) **Find the limiting points of the coaxal system of spheres of which two members are $x^2+y^2+z^2+3x-3y+6=0$, $x^2+y^2+z^2-6y-6z+6=0$.**

6) **Find the equation to the cone which passes through the three coordinate axes and the lines $\frac{x}{1}=\frac{y}{-2}=\frac{z}{3}$ and $\frac{x}{2}=\frac{y}{1}=\frac{z}{1}$.**

7) **Find the equation of the cone whose vertex is $(1,2,3)$ and base $y^2=4ax, z=0$.**

8) **Find the equation of the cone whose vertex is (1,1,1) and whose guiding curve is $x^2+y^2=4, z=2$.**

9) **Find the vertex of the Cone $2x^2+2y^2+3z^2-10yz-10zx+2x+2y+26z-17=0$.**

10) **Find the equation of the cone with vertex (5,4,3) and base curve $3x^2+2y^2=6, y+z=0$ as base.**

UNIT -V (CONES)

1) Find the angle between the lines of intersection of the plane $x - 3y + z = 0$ and the cone $x^2 - 5y^2 + z^2 = 0$.

2) Find the enveloping cone of the sphere $x^2 + y^2 + z^2 + 2x - 2y = 2$ with its vertex at $(1, 1, 1)$.

3) Find the equation to the right circular cone whose vertex is $P(2, -3, 5)$, axis PQ which makes equal angles with the axes and which passes through $A(1, -2, 3)$.

4) Find the equation of the right circular cone whose vertex is $(3, 2, 1)$, axis line $\frac{x-3}{4} = \frac{y-2}{1} = \frac{z-1}{3}$ and semi vertical angle 30^0.

5) Show that the semi-vertical angle of a right circular cone having three mutually perpendicular generators is $\tan^{-1}(\sqrt{2})$

6) Show that the two lines of intersection of the plane $ax + by + cz = 0$ with the cone $yz + zx + xy = 0$ will be perpendicular if $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 0$.

7) Prove that the angle between the lines of intersection of the plane $x + y + z = 0$ with the cone $ayz + bzx + cxy = 0$ is $\frac{\pi}{3}$ if $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 0$.

8) If the line $\frac{x}{1} = \frac{y}{2} = \frac{z}{1}$ represents one of the mutually perpendicular generators of the cone $11yz + 6zx - 14xy = 0$, find the equations of the other two.

9) Find the equations of the tangent planes to the cone $9x^2 - 4y^2 + 16z^2 = 0$ which contains the line $\frac{x}{32} = \frac{y}{72} = \frac{z}{27}$.

10) Show that the the general equation to a cone which touches the three coordinate planes is

$\sqrt{ax} \pm \sqrt{by} \pm \sqrt{cz} = 0$.

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SEMESTER- II: ANALYTICAL SOLID GEOMETRY

MATHEMATICS PRACTICAL EXAMINATIONS, AUG 2023.

(W.E.F 2022 ADMITTED BATCH)

MODEL PAPER

Time: 3 hours Max. Marks: 30

Question Paper contains two sections A and B. Answer any FIVE Questions choosing at least TWO from each sections A and B. Each question carries 6 Marks. **5 X 6 = 30 marks**

SECTION-A

FIVE QUESTIONS

SECTION-B

FIVE QUESTIONS

NOTE: The above problems are only suggested, problems can bechosen from the ANALYTICAL SOLID GEOMETRY according to the convenience and creativity of the Staff and Student.

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