S.R.R. & C.V.R. GOVT. DEGREE COLLEGE

(Autonomous)

VIJAYAWADA-520004, KRISHNA DISTRICT

Minutes of the Meeting Board of Studies

Department of Mathematics

Dated: 01-12-2021

SRR & CVR GOVT. DEGREE COLLEGE

(Autonomous)

NAAC accredited with 'B+' Grade

Machavaram. Vijayawada – 520 004, Krishna District.

Ph. No. 0866-2430060 Fax. 0866-2441092

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MINUTES OF THE MEETING OF DEPARTMENT OF MATHEMATICS(BOS)

A meeting on Board of studies of Department of Mathematics held on 01-12-2021in the Department of Mathematics for Ist & IInd Semester of Ist B.Sc, IIIrd & 4th Semester of IInd B.Sc, Vth & VIth Semester of IIIrd B.Sc Syllabus under the chairmanship of K.V. Naga Lakshmi, Head of the Mathematics Department. The following members are present

1. University Nominee :

Prof. K.Jaya Lakshmi,
Head of the Department of Mathematics
Krishna University,
Machilipatnam.

2. Subject Expert :

Sri.P.N.V.Prasada Rao,
HOD of Mathematics,
Social welfare Residential Government Degree College,
Kanchikacherla,
Krishna District.

3. Subject Expert

Dr. Dasari Madhusudhan Rao,
Department of Mathematics,
GDC for Women(A)
Guntur.

4. Chairman : 1/12/2021.

Smt.K.V. Naga Lakshmi,
HOD of Mathematics,
SRR & CVR Govt. Degree College (A),
Vijayawada.

11211

5. Alumni : B. Ratna Kumari

Smt. B. Ratna Kumari,
Sri Sarada College,
Vijayawada.

Agenda:

- **To approve Mathematics Syllabus, Question Paper,Blue Print for IIIrd & IVth Semester of IInd B.Sc per for the academic year 2021-2022 & Ist B.Sc (che)per the academic year 2021-2022**

- **Re-approval for Sem Ist &IInd and Sem-V& VI Mathematics Syllabus,Question Paper,Blue Print of Ist & IInd B.Sc,and Maths for Data Science Sem Iof Ist B.Sc (D.S.Cs) for the academic year 2021-2022.**

- **To divide the syllabus into 5 units.**

- **To approve Model papers, Blue print.**

- **To divide 100 marks into two components.**

- **a) i) External 60 Marks, ii) Internal 40 Marks.**

  b) External 60 Marks further divided into two sections. Section-A consisting - 20 Marks, Section-B consisting – 40 Marks, Max. Time-3 hours is to be approved.

- **To evaluate Internal Assessment as follows :-**
  (a) Internal exams (two) - 10
  (b) Assignments (two) - 10
  (c) Project - 10
  (d) Seminar - 10
  Total = 40

- **To divide the syllabus into FIVE units.**

- **In the Question paper Section-A consisting Questions of weightage 4 marks each. Five questions to be answered i.e. 5×4 = 20 marks and Section-B consisting of questions of weightage 8 marks each, Five questions to be answered 5×8 = 40 Marks is to be approved.**

- **To pass the exam, student must get 40% of 60 (external) and 40% of 40 (internal) and overall 40% combining both internal and external.**

- **To approve the model paper for Sem IIIrd & IVth of II B.Sc and Re approval of Ist & IInd Semester of Ist B.Sc and and Sem-Vth&VIth of IIIrd B.Sc and Maths for Data Science Ist B.Sc (D.S.Cs).**

- **To approve the Syllabus, Blue print and Model Paper for II B.A./B.Com. /B.Sc., III Sem Analytical Skills (Max Marks 50).**
- **To divide the Syllabus into three Units.**
- **The question paper is divided into two sections, Section A consisting 20 Marks, Section B consisting 30 Marks.**
- **The pass mark is 20.**
- **To approve paper setters.**
- **To approve other Academic activities of the Department.**
- **To give permission to the Chairman for any small changes.**

Resolutions:

In BOS meeting the committee has unanimously resolved and approved the following items:-

- **The syllabus for the Mathematics, Question Paper,Blue Print for IIIrd & Ivth Semester of IInd B.Sc, for the academic year 2021-2022 & Ist B.Sc (che) is approved.**
- **Sem Ist& II $^{nd\ of}$and Sem-V &VI Mathematics Syllabus of IInd & IIIrd B.Sc and Maths for Data Science Ist B.Sc (D.S.Cs) for the academic year 2020-2021 is Re-approved.**
- **To divide 100 marks into two components.**
  a) i) External 60 Marks,
  ii) Internal 40 Marks.
  b) External 60 marks further divided into two sections. Section-A consisting 20 marks, Section-B consisting – 40 marks, Max. Time-3 hours is approved.
- **Internal exams(two) - 10**
  Assignments (two) - 10
  Project - 10
  Seminar - 10
  Total = 40 is approved.
- **In the Model paper Section-A consisting Questions of weightage 4 marks each. Five questions to be answered i.e. 5×4 = 20 marks and Section-B consisting of questions of weightage 8 marks each, Five questions to be answered 5×8 = 40 Marks is approved.**
- **To pass the exam student must get 40% of 60 and overall 40% combining both internal and external is approved.**
- **Workload for each paper is 6 hours is approved.**
- **The Syllabus, Blue print and Model Paper for II B.A./B.Com. /B.Sc., III Sem Analytical Skills (Max Marks 50) is approved.**
- **The pass mark 20 is approved.**
- **The panel of paper setter is approved.**
- **The controller of examinations is given empowerment for any changes in selecting paper setter in case if non-availability if examiners as are listed.**

1. Prof. K.Jaya Lakshmi	:	1/4/11
2. Sri.P.N.V.Prasada Rao	:	
3. Dr. Dasari Madhusudhan Rao	:	2
4. Smt. K.V. Naga Lakshmi	:	1/12/21
5. Smt. B. Ratna Kumari	:	B. Ratna Kumari
6. Sri. M. L. Das	:	1/12
6. Dr. MD. Masthan	:	1/12/21
7. Dr. .G. Lalitha	:	
8. Dr. Sk.Sajana	:	01/12/2021
9. Dr.K. Rajinikanth	:	

1.12.2021

PRINCIPAL

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S.R.R. & C.V.R. GOVT. DEGREE COLLEGE

(AUTONOMOUS) NAAC B^+

DEPARTMENT OF MATHEMATICS

STRUCTURE OF NEW C.B.C.S. MODEL CURRICULUM IN MATHEMATICS

SEMESTER-I, II, III & IV

Year	Semester	Paper	Subject	Hours	Credits	IA	EA	Total
I	SEM-I	I	DIFFERENTIAL EQUATIONS	6	5	40	60	100
I	SEM-II	II	THREE DIMENSIONAL ANALYTICAL SOLID GEOMETRY	6	5	40	60	100
II	SEM-III	III	ABSTRACT ALGEBRA	6	5	40	60	100
II	SEM-IV	IV	REAL ANALYSIS	6	5	40	60	100
		V	LINEAR ALGEBRA	6	5	40	60	100

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DEPARTMENT OF MATHEMATICS

Ist B.Sc MATHEMATICS SYLLABUS

SEMESTER-I, PAPER-1

DIFFERENTIAL EQUATIONS

Sl. No.	Title of Unit	Sub Topics	References
1	**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; Change of variables.	**Text Book :** 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 &
2	**UNIT–II (12 Hours)** Orthogonal Trajectories Differential Equations of first order but not of the first degree:	Equations solvable for p; Equations solvable for y; Equations solvable for x; Equations that do not contain x (or y); Equations homogeneous in x and y;Equations of the first degree in x and y – Clairaut's Equation.	
3	**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 of x, 1/f(D) is expressed as partial fractions. P.I. of f(D)y = Q when Q= be^{ax} P.I. of f(D)y = Q when Q is b sin ax or b cos ax.	
4	**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. P.I. of f(D)y = Q when Q= x^m V , where V is a function of x.	HR Anuradha-Universities Press. 4. Differential Equations -Srinivas Vangala & Madhu Rajesh, published by Spectrum University Press.
5	**UNIT– V (12 Hours)** Higher order linear differential equations-III:	Method of variation of parameters; Linear differential Equations with non-constant coefficients; The Cauchy-Euler Equation, Legendre's linear equations, miscellaneous differential equations.	

Bibliography :

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.

Co-Curricular Activities(15 Hours)

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

Bridge Course (15 Hours)

Formation of Differential Equations, Degree and order of an ordinary differential equations, Solving Differential equations, variable and separable methods, Homogeneous differential equations, Non Homogeneous differential equations

COURSE OUTCOMES:

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

1.Solve linear differential equations

2.Convertnonexact homogeneous equations to exact differential equations by using integrating factors.

3.Know the methods of finding solutions of differential equations of the first order but not of the first degree.

4.Solvehigher-order linear differential equations, both homogeneous and non homogeneous, with constant coefficients.

5. Understand the concept and apply appropriate methods for solving differential equations.

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DEPARTMENT OF MATHEMATICS

Ist B.Sc MATHEMATICS

SEMESTER-1, PAPER-1

DIFFERENTIAL EQUATIONS

BLUE PRINT

DURATION : 3 HRS **Total Marks:60**

SECTION-A

Answer any **Five questions.** Each question carries **4 Marks.** **5×4 = 20M**

Question	Topics	No. of Questions	Weight age
1	UNIT-1	1	4
2	UNIT-1	1	4
3	UNIT-2	1	4
4	UNIT-2	1	4
5	UNIT-3	1	4
6	UNIT-3	1	4
7	UNIT-4	1	4
8	UNIT-4	1	4
9	UNIT-5	1	4
10	UNIT-5	1	4

SECTION-B

Answer **ALL** Questions. Each question carries **8 MARKS.** **5×8 = 40M**

QUESTION	Topic	No. of questions	Marks
11.(a) or (b)	UNIT-1	2	8
12.(a) or (b)	UNIT-2	2	8
13.(a) or (b)	UNIT-3	2	8
14.(a) or (b)	UNIT-4	2	8
15.(a) or (b)	UNIT-5	2	8

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DEPARTMENT OF MATHEMATICS

Ist B.Sc MATHEMATICS

SEMESTER –I, PAPER – I

DIFFERENTIAL EQUATIONS

MODEL QUESTION PAPER

Time : 3 hours **Max. Marks: 60**

Section – A

Answer any FIVE questions **(5 x 4 = 20 marks)**

1. Solve $2xy\,dy - (x^2+y^2+1)\,dx = 0$
2. Solve $(1+y^2)dx = (tan^{-1}y - x)dy$
3. Solve $x = y + p^2$
4. Solve $4y^2p^2 + 2xy\,(3x+1)p + 3x^3=0$.
5. Solve $(D^2 - 3D + 2)y = \cos h\, x$.
6. Solve $(D^3+4D)y = \sin 2x$
7. Solve $(D^2 - 4D + 4)\,y = x^3$
8. Solve $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 13y = 8e^{3x}\sin 2x$
9. Solve $[(1+x)^2D^2 + (1+x)D+1]y = 4\cos\log(1+x)$.
10. Solve $\frac{d^2y}{dx^2} + y = cosec\, x$ by the method of variation of parameters

Section - B

Answer ALL questions **(5 x 8 = 40 marks)**

11 (a). Solve $x(1+xy)\,dy + y(1-xy)\,dx = 0$

(OR)

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

12 (a).Solve $(py+x)(px-y) = 2p$

(OR)

(b). Find the orthogonal trajectories of family of curves $r = a(1 - Cos\,\theta)$whose 'a' is a parameters

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

(OR)

(b). Solve $(D^2 - 3D + 2)y = 2x^2$

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

(OR)

(b). Solve $(D^2 + 4)y = x\,\text{Sin}x\,dx$

15. **(a).** Solve $(x^2D^2 - xD + 2)y = x\log x$

(OR)

(b). Solve $\frac{d^2y}{dx^2} + 4y = 4\tan 2x$ by the method of variation of parameters

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DEPARTMENT OF MATHEMATICS

Ist B.Sc MATHEMATICS SYLLABUS

SEMESTER-II, PAPER-2

THREE DIMENSIONAL ANALYTICAL SOLID GEOMETRY

Sl. No.	Title of Unit	Sub Topics	References
1	**UNIT–I (12 Hours)** 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.	**Text Book :** 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
2	**UNIT–II (12 Hours)** 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.	

3	**UNIT–III** **(12 Hours)** 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;	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.
4	**UNIT–IV** **(12 Hours)** The Sphere and Cone:	Angle of intersection of two spheres; Conditions for two spheres to be orthogonal; Radical plane; Coaxial system of spheres; Simplified from of the equation of two spheres. 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;	
5	**UNIT–V** **(12 Hours)** The 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.	

Bibliography :

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.

Co-Curricular Activities(15 Hours)

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

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.

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DEPARTMENT OF MATHEMATICS

Ist B.Sc MATHEMATICS SYLLABUS

SEMESTER-II, PAPER-2

THREE DIMENSIONAL ANALYTICAL SOLID GEOMETRY

BLUE PRINT

DURATION : 3 HRS **Total Marks:60M**

SECTION-A

Answer any **Five questions.** Each question carries **4 Marks.** **5×4 = 20M**

Question	Topics	No. of Questions	Weight age
1	UNIT-1	1	4
2	UNIT-1	1	4
3	UNIT-2	1	4
4	UNIT-2	1	4
5	UNIT-3	1	4
6	UNIT-3	1	4
7	UNIT-4	1	4
8	UNIT-4	1	4
9	UNIT-5	1	4
10	UNIT-5	1	4

SECTION-B

Answer **ALL** Questions. Each question carries **8 MARKS.** **5×8 = 40M**

QUESTION	Topic	No. of questions	Marks
11.(a) or (b)	UNIT-1	2	8
12.(a) or (b)	UNIT-2	2	8
13.(a) or (b)	UNIT-3	2	8
14.(a) or (b)	UNIT-4	2	8
15.(a) or (b)	UNIT-5	2	8

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DEPARTMENT OF MATHEMATICS

PAPER – II SEMESTER – II

THREE DIMENSIONAL ANALYTICAL SOLID GEOMETRY

MODEL QUESTION PAPER

Time : 3 Hrs. **Max. Marks : 60**

SECTION – A

Answer any Five questions. Each question carries 04 Marks. 5 x 4M = 20 Marks

1.Find the equation of the plane through (4,4,0) and perpendicular to the Planes $x+2y+2z=5$, and $3x+3y+2z-8=0$.

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

3.Find the foot of the perpendicular from (2,-2,3) to the plane $2x-y-2z-9=0$.

4.Find the image of the point (1,3,4) in the plane $2x-y+z+3=0$.

5.Find the equation of spheres passing through the circle $x^2+y^2+z^2=4$, $z=0$ and is intersected by the plane $x+2y+2z=0$ in a circle of radius3.

6.Find the pole of the plane $x-y+5z-3=0$ w .r .t the sphere $x^2+y^2+z^2=9$.

7. . Find the length of the Tangent line from the point (3, 1, -1) to the Sphere $x^2+y^2+z^2-3x+5y+7=0$.

8.Find the vertex of the cone $2x^2+2y^2+7z^2-10yz-10zx+2x+2y+26z-17=0$.

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

10. Find the equation of right circular cone whose vertex is origin, axis as the line $x=t$, $y=2t$, $z=3t$ and whose semi-vertical angle is 60^0

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DEPARTMENT OF MATHEMATICS

IInd B.Sc. MATHEMATICS SYLLABUS

SEMESTER – III, PAPER – 3

ABSTRACT ALGEBRA

60Hrs

UNIT – 1: (10Hrs) 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: (14Hrs) 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.

Co-sets and Lagrange's Theorem:-

Cosets Definition – Properties of Cosets – Index of a subgroups of a finite groups – Lagrange's Theorem.

UNIT-3: (12 Hrs) NORMAL SUBGROUPS & HOMOMORPHISM:-

Definition of normal subgroups-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 – simple group – quotient group – criteria for the existence of a quotient group.

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-4: (14 Hrs) PERMUTATIONS AND CYCLC GROUPS:-

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

Cyclic Groups:-

Definition of cyclic group – elementary properties – classification of cyclic groups.

UNIT-5: (12 Hrs) RINGS:-

Definition of Ring and basic properties, Boolean Rings, divisions of zero nd cancellation laws Rings, Integral Domains, Division Ring and Fields, The Characterises of a Ring The characterises of an Integral Domain, The characteristic of a Field, Sub Rings, Ideals.

Reference Books:

1. Abstract Algebra by J.B. Fraleigh, Published by Narosa Publishing house.

2. 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.

3. **Modern Algebra by M.L. Khanna.**

Suggested Activities:

Seminar/Quiz/Assignments/Project on Group theory and its applications in Graphics and Medical image Analysis.

COURSE OUTCOMES:

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

1. Acquire the basic knowledge and structure of groups, subgroups and cyclic groups.
2. Get the significance of the notation of a normal subgroups.
3. Get the behavior of permutations and operations on them.
4. Study the homomorphisms and isomorphisms with applications.
5. Understand the ring theory concepts with the help of knowledge in group theory and to prove the theorems.
6. Understand the applications of ring theory in various fields.

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DEPARTMENT OF MATHEMATICS

IInd B.Sc MATHEMATICS

SEMESTER-III, PAPER-3

ABSTRACT ALGEBRA

BLUE PRINT

DURATION : 3 HRS **Total Marks:60M**

SECTION-A

Answer any **Five questions.** Each question carries **4 Marks.** **5×4 = 20M**

Question	Topics	No. of Questions	Weight age
1	UNIT-1	1	4
2	UNIT-1	1	4
3	UNIT-2	1	4
4	UNIT-2	1	4
5	UNIT-3	1	4
6	UNIT-3	1	4
7	UNIT-4	1	4
8	UNIT-4	1	4
9	UNIT-5	1	4
10	UNIT-5	1	4

SECTION-B

Answer **ALL** Questions. Each question carries **8 MARKS.** **5×8 = 40M**

QUESTION	Topic	No. of questions	Marks
11.(a) or (b)	UNIT-1	2	8
12.(a) or (b)	UNIT-2	2	8
13.(a) or (b)	UNIT-3	2	8
14.(a) or (b)	UNIT-4	2	8
15.(a) or (b)	UNIT-5	2	8

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(AUTONOMOUS) NAAC B^+

DEPARTMENT OF MATHEMATICS

IInd B.Sc MATHEMATICS

PAPER – III SEMESTER – III

ABSTRACT ALGEBRA

MODEL QUESTION PAPER

Time: 3 Hours **Max.Marks:60**

Section-A

Answer any FIVE Questions **(5x4=20Marks)**

1. In a group, inverse of any element is unique
2. Prove that the set of integers Z is an abelian group for the operation * defined by $a*b=a+b+1 \forall a,b \in z$
3. Show that intersection of two subgroups is also a subgroup
4. If H is any subgroup of a group G, then prove that $H^{-1}=H$
5. Show that every subgroup of an abelian group is normal.
6. Prove that the homomorphic image of a group is a Sub-group.
7. Express the permutation $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 6 & 5 & 4 & 3 & 1 & 2 \end{pmatrix}$ as the product of disjoint cycles.
8. G is a cyclic group of order r and 'a' is a generator of G. Show that a^m is a generator of G if and only if (m,n)=1
9. Prove that every filed is an Integral domain.
10. Prove that the characteristic of a Boolean ring is 2.

Section-B

Answer any ALL Questions **(5x8=40Marks)**

11. (a) If G is a group and $a,b \in G$ then prove that the equations ax=b and ya=b have unique solutions in G

(or)

(b) Prove that the set G or real numbers other than -1 with operation * such that

$a*b=a+b+ab \ \forall \ a, b \in G$ is an abelian group.

12. (a) State and prove langrange's theorem for finite groups

(or)

(b) Let H be a subgroup of a group G and $a,b \in G$ then prove that
(i) $Ha=Hb \Leftrightarrow ab^{-1} \in H$, (ii) $aH=bH \Leftrightarrow a^{-1}b \in H$

13. (a) If H is a subgroup of G and N is normal subgroup of G, then show that

(a) $H \cap N$ is a normal subgroup of H and (b) N is a normal subgroup of HN.

(or)

(b) Prove that every homomorphic image of a group G is isomorphic to some quotient group of G.

14. (a) Let S_n be a symmetric group of n symbols and left A_n be the group of even permutations then show that A_n is a normal is S_n and $O(A_n)=\frac{1}{2}n!$

(or)

(b) Prove that every subgroup of a cyclic group is cyclic

15. (a) Prove that the characteristic of an Integral domain is either zero or prime number.

(or)

(b) Prove that Union of two sub rings is also a sub ring if and only if one is contained another.

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S.R.R. & C.V.R. GOVT. DEGREE COLLEGE

(AUTONOMOUS) NAAC B^+

DEPARTMENT OF MATHEMATICS

IInd B.Sc MATHEMATICS SYLLABUS

SEMESTER – IV, PAPER – 4

REAL ANALYSIS

60Hrs

UNIT – 1: (12Hrs) REAL NUMBERS:-

The algebraic and order properties of R, Absolute value and Real line, Completeness property of R, Application 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.

The Cauchy's criterion, properly divergent sequences, Monotone sequences, Necessary and Sufficient condition for Convergence of Monotone Sequence, Limit Point of Sequence, Subsequences and the Bolzano-weierstrass theorem-Cauchy Sequence –Cauchey's general principal of convergence theorem.

UNIT –II: (12Hrs) INFINTE SERIES:-

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

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

Absolute convergence and conditional convergence, semi convergence.

UNIT –III: (12Hrs) CONTINUITY:-

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

Continuous functions: Continuous functions, Combinations of continuous functions, Continuous Functions on intervals, uniform continuity.

UNIT –IV: (12Hrs) 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 Derivation, Mean value Theorems; Role's Theorem, Lagrange's Theorem, Caouchhy's Mean value Theorem.

UNIT –V: (12Hrs) REMANN INTEGRATION:-

Riemann Integral, Riemann integral functions, Darboux theorem. Necessary and sufficient condition for R – integrability, Properties of integrable functions, Fundamental theorem of integral calculus, integral as the limit of a sum, Mean value Theorems.

Reference Books:

1. Real Analysis by Rabert & Bartely and D.R. Sherbart, published by John Wiley.

2. A Text Book of B.Sc Mathematics by B.V.S.S. Sarma and others. Published by S. Chand & Company Pvt. Ltd., New Delhi.

3. 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.

Suggested Activities:

Seminar//Quiz/Assignments/Project on Real Analysis and its applications

COURSE OUTCOMES:

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

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

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IInd B.Sc MATHEMATICS

SEMESTER – IV, PAPER – 4

REAL ANALYSIS

BLUE PRINT

DURATION : 3 HRS **Total Marks:60**

SECTION-A

Answer any **Five questions.** Each question carries **4 Marks.** **5×4 = 20M**

Question	Topics	No.of Questions	Weight age
1	UNIT-1	1	4
2	UNIT-1	1	4
3	UNIT-2	1	4
4	UNIT-2	1	4
5	UNIT-3	1	4
6	UNIT-3	1	4
7	UNIT-4	1	4
8	UNIT-4	1	4
9	UNIT-5	1	4
10	UNIT-5	1	4

SECTION-B

Answer **ALL**Questions.Each question carries **8 MARKS.** **5×8 = 40M**

QUESTION	Topic	No. of questions	Marks
11.(a) or (b)	UNIT-1	2	8
12.(a) or (b)	UNIT-2	2	8
13.(a) or (b)	UNIT-3	2	8
14.(a) or (b)	UNIT-4	2	8
15.(a) or (b)	UNIT-5	2	8

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DEPARTMENT OF MATHEMATICS

IInd B.Sc MATHEMATICS

SEMESTER – IV, PAPER – IV

REAL ANALYSIS

MODEL QUESTION PAPER

Time: 3Hrs **Max.Marks:60**

SECTION-A

Answer any FIVE questions **(5x4=20Marks)**

1. Show that every Cauchy sequence is convergent.
2. Prove that the sequence $\{S_n\}$ where $S_n = \frac{1}{n+1} + \frac{1}{n+2} + \ldots\ldots + \frac{1}{n+n}$ is convergent.
3. Test for the convergence of $\sum \frac{1}{2^n+3^n}$
4. Show that the series $\sum(-1)^n\left(\sqrt{n^2+1} - n\right)$ is conditionally convergent
5. If f:[a,b]→R is continuous on [a,b] then prove that f is bounded on [a,b]
6. Discuss the continuity of f defined by $f(x)=\frac{e^{\frac{1}{x}}-1}{e^{\frac{1}{x}}+1}$, $x \neq 0$ and $f(0)=1$ at $x=0$
7. Verify Cauchy's Mean Value Theorem for $f(x)=x^2$, $g(x)=x^3$ in [1,2]
8. Discuss the applicability of Lagrange's mean value theorem for

   $f(x)=x(x-1)(x-2)$ on $[0, \frac{1}{2}]$
9. Prove that the function defined on [0,1] by f(x)=1 when x is rational, f(x)=-1

   when x is irrational, is not integrable.
10. Evaluate $\int_0^{\frac{\Pi}{4}}(sec^4 x - Tan^4 x)dx$

SECTION – B

Answer ALL questions **(5x8=40Marks)**

11. (a) State and Prove Cauchy's first theorem on Limits

(OR)

(b) Show that the sequence $\{S_n\}$ defined by $S_n=1+\frac{1}{1!}+\frac{1}{2!}+\cdots\ldots+\frac{1}{n!}$ is convergent.

12. (a) State and prove Ratio Test

(OR)

(b) State and prove Leibnitz Test

13. (a) Examine the continuity of the function f defined by $f(x)=|x-1|+|x-2|$ at $x=1$ and 2

(OR)

(b) If a function f is continuous on [a,b] then f is uniformly continuous on [a,b]

14 (a) State and prove Rolle's mean value theorem.

(OR)

(b) Show that $f(x)=|x|+|x-1|$ is not derivable at $x=0$ and $x=1$.

15 (a) A bounded function $f:[a,b]\to R$ is Reimann integrable on [a,b] if and only if for each $\in>0$ there exists a partition P of [a,b] such that $U(p,f)-L(p,f)<\in$.

(OR)

(b) State and prove fundamental theorem of Integral Calculus.

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DEPARTMENT OF MATHEMATICS

IInd B.Sc MATHEMATICS SYLLABUS

SEMESTER-4, PAPER-5

LINEAR ALGEBRA

60 Hours

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 Linearly independence and Linearly 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, Algebra of Linear Operators, Range and null space of linear transformation, Rank and Nullity of linear transformations –
Rank – Nullity Theorem.

UNIT –IV (12 Hours)

Matrix :
Matrices, Elementary Properties of Matrices, Inverse Matrices, Rank of Matrix, Linear Equations, Characteristic equations, Characteristic Values & Vectors of a 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, complete 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.

COURSE OUTCOMES:

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

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

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DEPARTMENT OF MATHEMATICS

IInd B.Sc. MATHEMATICS

SEMESTER-4, PAPER-5

LINEAR ALGEBRA

BLUE PRINT

DURATION : 3 HRS **Total Marks:60**

SECTION-A

Answer any **Five questions.** Each question carries **4 Marks.** **5×4 = 20M**

Question	Topics	No.of Questions	Weight age
1	UNIT-1	1	4
2	UNIT-1	1	4
3	UNIT-2	1	4
4	UNIT-2	1	4
5	UNIT-3	1	4
6	UNIT-3	1	4
7	UNIT-4	1	4
8	UNIT-4	1	4
9	UNIT-5	1	4
10	UNIT-5	1	4

SECTION-B

Answer **ALL** Questions. Each question carries **8 MARKS.** **5×8 = 40M**

QUESTION	Topic	No. of questions	Marks
11.(a) or (b)	UNIT-1	2	8
12.(a) or (b)	UNIT-2	2	8
13.(a) or (b)	UNIT-3	2	8
14.(a) or (b)	UNIT-4	2	8
15.(a) or (b)	UNIT-5	2	8

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DEPARTMENT OF MATHEMATICS

IInd B.Sc.MATHEMATICS

SEMESTER-4, PAPER-5

LINEAR ALGEBRA

MODEL QUESTION PAPER

Time: 3 Hrs **Maximum : 60 Marks**

SECTION A – (5 X 4 = 20 Mark)

Answer any FIVE questions.

1. Let p, q, r be the 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 space of* $V_3(F)$.

2. If S is a subset of a vector space V(F) then prove that
   (a) S is a subspace of $V \Leftrightarrow L(S) = S$
   (b) L(L(S) = L(S)

3. If α, β, γ are linearly independent vectors of a vector space V(F), show that $\alpha + \beta, \beta + \gamma, \gamma + a$ are also linearly independent.

4. Show that the set $\{(1,0,0),(1,1,0),(1,1,1)\}$ *is a basis of* $C^3(C)$ hence find the co – ordinates of the vector $(3 + 4i, 6i, 3 + 7i)$ *in* $C^3(C)$.

5. If the mapping $T : V_3(R) \to V_2(R)$ is defined by $T(x, y, z) = (x - y, x + z)$ then
   show that T is a linear transformation.

6. *If* $T : V_3(R) \to V_3(R)$ is a linear transformation defined by
   T(a, b, c) = $(3a, a - b, 2a + b + c)$ *then show that* $(T^2 - I)(T^2 - 3I) = 0$.

7. Find the characteristic roots of the matrix
   $$A = \begin{bmatrix} 2 & 1 & 0 \\ 0 & 2 & 1 \\ 0 & 0 & 2 \end{bmatrix}$$

8 Prove that the characteristic vectors corresponding to distinect characteristic roots of a matrix are linearly independent

9. Find the unit vector orthogonal to $(4, 2, 3)$ *in* R^3.

10. State and prove Triangle inequality

SECTION – B – (5 X 8 = 40 Marks)

Answer the following questions.

UNIT I

11. a) Show that the necessary and sufficient condition for a non empty subset W of a vector space V(F) to be a subspace of V is that

$a, b \in F, \alpha, \beta \in W \Rightarrow a\alpha + b\beta \in W.$

Or

b) If W_1 and W_2 are subspaces of a vector space V(F) then show that $W_1 + W_2$ is a subspace of V(F) and $L(w_1 \cup w_2) = w_1 + w_2$.

12. a) Let W_1 *and* W_2 be two subspaces of R^4 *given by* $W_1 = \{(a,b,c,d)/b - 2c + d = 0\}$ $W_2 = \{(a,b,c,d)/a = db = 2c\}$. Find the basis and dimension of

(i) W_1
(*ii*) W_2
(iii) $W_1 \cap W_2$ *and hence find*
(iv) $\dim(W_1 + W_2)$

Or

b) Let V(F) be a finite dimension vector space and $S = \{\alpha_1, \alpha_2 \ldots . \alpha_3\}$ is L.I. subset of V. Then either S itself a basis of V or S can be extended to form a basis of V.

13. a) State and prove Rank – Nullity theorem.

Or

b) Find the null space, range, rank and nullity of the transformation $T : R^2 \to R^3$ defined by $T(x,y) = (x + y,\ x - y,\ y)$.

14. a) State and prove Cayley – Hamilton theorem.

Or

b) Solve $x + y + z = 6,\ x - y + z = 2,\ 2x - y + 3z = 9$ by matrix inversion method. $x + y + z = 6,\ x - y + z = 2,\ 2x - y + 3z = 9$

15. a) State and prove Cauchy – Schwarz's inequality.

Or

b) Applying Gram – Schmidt orthogonalisation process obtain an orthonormal basis of R^3 *from the basis* $\{(1,0,1),\ (1,0,-1),\ (0,3,4)\}$

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DEPARTMENT OF MATHEMATICS

III[rd] B.Sc MATHEMATICS SYLLABUS

SEMESTER-5, PAPER-5

RING THEORY & VECTOR CALCULUS

60 Hrs

UNIT-1: (12 Hrs) RINGS-I:-

Definition of Ring and basic properties, Boolean Rings, divisions of zero nd cancellation laws Rings, Integral Domains, Division Ring and Fields, The Characterises of a Ring The characterises of an Integral Domain, The characteristic of a Field, Sub Rings, Ideals.

UNIT-2: (12 Hrs) RINGS-II:-

Definition of Homomorphism – Homomorphic Image – Elementary Properties of Homomorphism – Kernal of Homomorphism – Fundamental theorem of Homomorphism – Maximal Ideals - Prime Ideals.

UNIT-3: (12 Hrs) VECTOR DIFFERENTIATION:-

Vector Differentiation, Ordinary derivatives of Vectors, Differentiability, Gradient, Divergence, Curl operators, Formulae Involving these operators. .

UNIT-4: (12 Hrs) VECTOR INTEGRATION:-

Line Integral, Surface Integral, Volume Integral with examples

UNIT-5: (12 Hrs) VECTOR INTEGRATION APPLICATIONS:-

Theorems of Gauss and Stokes, Green's theorem in plane and applications of these theorems.

Reference Books:-

1. Abstract Algebra by J. Fralieh, Published by Narosa Publishing House.
2. Vector Calculus by Santhi Narayana, Published by S. Chand & Company Pvt. Ltd., New Delhi.
3. A Text book of B.Sc., Mathematics by B.V.S.S. Sarma and others, Published by S. Chand & Company Pvt. Ltd., New Delhi.
4. Vector Calculus by R. Guptha, Published by Laxmi Publications.
5. Vector Calculus by P.C. Matthews, Published by Springer Verlag publications.
6. Rings & Linear Algebra by Pundir & Pundir, published by Pragthi Prakashan.

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DEPARTMENT OF MATHEMATICS

IIIrd B.Sc MATHEMATICS

SEMESTER-5, PAPER-5

RING THEORY & VECTOR CALCULUS

BLUE PRINT

DURATION : 3 HRS **Total Marks:60**

SECTION-A

Answer any**Five questions.** Each question carries **4 Marks.** **5×4 = 20M**

Question	Topics	No.of Questions	Weight age
1	UNIT-1	1	4
2	UNIT-1	1	4
3	UNIT-2	1	4
4	UNIT-2	1	4
5	UNIT-3	1	4
6	UNIT-3	1	4
7	UNIT-4	1	4
8	UNIT-4	1	4
9	UNIT-5	1	4
10	UNIT-5	1	4

SECTION-B

Answer **ALL**Questions.Each question carries **8 MARKS.** **5×8 = 40M**

QUESTION	Topic	No. of questions	Marks
11.(a) or (b)	UNIT-1	2	8
12.(a) or (b)	UNIT-2	2	8
13.(a) or (b)	UNIT-3	2	8
14.(a) or (b)	UNIT-4	2	8
15.(a) or (b)	UNIT-5	2	8

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DEPARTMENT OF MATHEMATICS

IIIrd B.Sc MATHEMATICS

SEMESTER – V, PAPER – 5

RING THEORY AND VECTOR CALCULUS

MODEL QUESTION PAPER

Time: 3 Hrs **Maximum : 60 Marks**

SECTION A – (5 X 4 = 20 Mark)

Answer any FIVE questions.

1. Prove that characteristic of a Boolean ring is '2'.
2. If F is a field then show that {0} and F are the only ideals of F.
3. If f is a homomorphism from a ring R into a ring S then prove that ker f is an ideal of R.
4. An ideal A of a commutative ring R with unity is prime ideal iff R/A is an integral domain.
5. If $\bar{r} = a\,cost\,\bar{\imath} + a\sin t\,\bar{\jmath} + at\,tan\theta\,\bar{k}$ *then find*
   (a) $\left(\frac{dr}{dt} \times \frac{d^2r}{dt^2}\right)$ *at* $t = 0$.
   (b) $\left|\frac{dr}{dt} \times \frac{d^2r}{dt^2}\right|$ *and* $\left[\frac{dr}{dt}\ \frac{d^2r}{dt^2}\ \frac{d^3r}{dt^3}\right]$
6. *If* $A = t\bar{\imath} - t^2\bar{\jmath} + (t-1)\bar{k}, B = 2t^2\bar{\imath} + 6t\bar{k}$, *find*
   (a) $\int_0^2 (A\,.\,B)\,dt$
   (b) $\int_0^2 (A \times B)dt$
7. Evaluate $\oint_C \bar{F}.dr$ *where C is the circle* $x^2 + y^2 = 1, z = 0$ *and* $\bar{F} = y\bar{\imath} + z\bar{\jmath} + x\bar{k}$
8. If F=3xy$\bar{\imath}$ - $y^2\bar{\jmath}$, calculate $\int_c F.dr$ where c is the curve $y=2x^2$ is the xy-plane from (0,0) to (1,2)
9. Evaluate $\oint_c (xdy - ydx)$ around the circle C where C is $x^2+y^2 = 1$
10. Prove by stokes theorem curl grad $\emptyset = 0$

SECTION B – (5 X 8 = 40 Marks)
Answer the following questions.

11. a) If $Z(i) = \{a + ib/a, b \in z, i^2 = -1\}$ then show that z(i) is an integral domain w.r.t. addition and multiplication of complex numbers.

Or

b) Show that Z is a principal ideal ring.

12. a) In the ring of integers, determine the maximal ideals.

Or

b) State and prove fundamental theorem of homomorphism of rings.

13. a) (i) Find the directional derivative of $\emptyset = x^2yz + 4xz^2$ *at the point* $(1,-2,-1)$ in the direction of $2\bar{\imath} - \bar{\jmath} - 2\bar{k}$.

(ii) Find *div F and curl F* where $\bar{F} = xy^2\bar{\imath} + 2x^2yz\bar{\jmath} - 3yz^2k$ *at* $(1,-1,1)$.

Or

b) If A, B are two differentiable vector point functions then show that grad (A.B) = $(B.\nabla)A + (A.\nabla)B + B \times (curl\ A) + A \times (curl\ B)$.

14. a) If $F = (x + y^2)\bar{\imath} - 2x\bar{\jmath} + 2yz\bar{k}$, *evaluate* $\int_s F.\ NdS$ where S is the surface of plane $2x + y + 2z = 6$ in the first octant.

Or

b) If $\emptyset = 45x^2y$, *evaluate* $\iiint \emptyset\ dV$ where V is the closed region bounded by the plane $4x + 2y + z = 8,\ x = y = z = 0$.

15. a) State and prove Gauss's divergence theorem.

Or

b) State and prove stokes theorem

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DEPARTMENT OF MATHEMATICS

III[rd] B.Sc MATHEMATICS SYLLABUS

SEMESTER-5, PAPER-6

LINEAR ALGEBRA

60 Hours

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 Linearly independence and Linearly 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, Algebra of Linear Operators, Range and null space of linear transformation, Rank and Nullity of linear transformations –

Rank – Nullity Theorem.

UNIT –IV (12 Hours)

Matrix :

Matrices, Elementary Properties of Matrices, Inverse Matrices, Rank of Matrix, Linear Equations, Characteristic equations, Characteristic Values & Vectors of a 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, complete 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.

COURSE OUTCOMES:

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

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

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III[rd] B.Sc MATHEMATICS

SEMESTER-5, PAPER-6

LINEAR ALGEBRA

BLUE PRINT

DURATION : 3 HRS **Total Marks:60**

SECTION-A

Answer any**Five questions.** Each question carries **4 Marks.** **5×4 = 20M**

Question	Topics	No.of Questions	Weight age
1	UNIT-1	1	4
2	UNIT-1	1	4
3	UNIT-2	1	4
4	UNIT-2	1	4
5	UNIT-3	1	4
6	UNIT-3	1	4
7	UNIT-4	1	4
8	UNIT-4	1	4
9	UNIT-5	1	4
10	UNIT-5	1	4

SECTION-B

Answer **ALL** Questions. Each question carries **8 MARKS.** **5×8 = 40M**

QUESTION	Topic	No. of questions	Marks
11.(a) or (b)	UNIT-1	2	8
12.(a) or (b)	UNIT-2	2	8
13.(a) or (b)	UNIT-3	2	8
14.(a) or (b)	UNIT-4	2	8
15.(a) or (b)	UNIT-5	2	8

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DEPARTMENT OF MATHEMATICS

IIIrd B.Sc MATHEMATICS

SEMESTER – V, PAPER – 6

LINEAR ALGEBRA

MODEL QUESTION PAPER

Time: 3 Hrs **Maximum : 60 Marks**

SECTION A – (5 X 4 = 20 Mark)

Answer any FIVE questions.

1. Let p, q, r be the 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 space of* $V_3(F)$

2. If S is a subset of a vector space V(F) then prove that
   (a) S is a subspace of $V \Leftrightarrow L(S) = S$
   (b) L(L(S) = L(S)

3. If α, β, γ are linearly independent vectors of a vector space V(F), show that $\alpha + \beta, \beta + \gamma, \gamma + a$ are also linearly independent.

4. Show that the set $\{(1,0,0),(1,1,0),(1,1,1)\}$ *is a basis of* $C^3(C)$ hence find the co – ordinates of the vector $(3 + 4i, 6i, 3 + 7i)$ *in* $C^3(C)$.

5. If the mapping $T : V_3(R) \to V_2(R)$ is defined by $T(x,y,z) = (x - y, x + z)$ then
   show that T is a linear transformation.

6. *If* $T : V_3(R) \to V_3(R)$ is a linear transformation defined by
   T(a, b, c) = $(3a, a - b, 2a + b + c)$ *then show that* $(T^2 - I)(T^2 - 3I) = 0$.

7. Find the characteristic roots of the matrix
   $$A = \begin{bmatrix} 2 & 1 & 0 \\ 0 & 2 & 1 \\ 0 & 0 & 2 \end{bmatrix}$$

8 Prove that the characteristic vectors corresponding to distinect characteristic roots of a matrix are linearly independent

9. Find the unit vector orthogonal to $(4, 2, 3)$ *in* R^3.

10. State and prove Triangle inequality

SECTION – B – (5 X 8 = 40 Marks)

Answer the following questions.

UNIT I

11. a) Show that the necessary and sufficient condition for a non empty subset W of a vector space V(F) to be a subspace of V is that
$a, b \in F, \alpha, \beta \in W \Rightarrow a\alpha + b\beta \in W$.

Or

b) If W_1 and W_2 are subspaces of a vector space V(F) then show that $W_1 + W_2$ is a subspace of V(F) and $L(w_1 \cup w_2) = w_1 + w_2$.

12. a) Let W_1 *and* W_2 be two subspaces of R^4 *given by* $W_1 = \{(a,b,c,d)/b - 2c + d = 0\}$ $W_2 = \{(a,b,c,d)/a = db = 2c\}$. Find the basis and dimension of
(i) W_1
(*ii*) W_2
(iii) $W_1 \cap W_2$ *and hence find*
(iv) $\dim(W_1 + W_2)$

Or

b) Let V(F) be a finite dimension vector space and $S = \{\alpha_1, \alpha_2 \ldots . \alpha_3\}$ is L.I. subset of V. Then either S itself a basis of V or S can be extended to form a basis of V.

13. a) State and prove Rank – Nullity theorem.

Or

b) Find the null space, range, rank and nullity of the transformation $T : R^2 \to R^3$ defined by $T(x, y) = (x + y,\ x - y,\ y)$.

14. a) State and prove Cayley – Hamilton theorem.

Or

b) Solve $x + y + z = 6,\ x - y + z = 2,\ 2x - y + 3z = 9$ by matrix inversion method. $x + y + z = 6,\ x - y + z = 2,\ 2x - y + 3z = 9$

15. a) State and prove Cauchy – Schwarz's inequality.

Or

b) Applying Gram – Schmidt orthogonalisation process obtain an orthonormal basis of R^3 *from the basis* $\{(1,0,1),\ (1,0,-1),\ (0,3,4)\}$

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DEPARTMENT OF MATHEMATICS

III[rd] B.Sc. MATHEMATICS

SEMESTER-VI,

ELECTIVES & CLUSTERS

Year	Semester	Paper	Subject	Hours	IA	EA	Total
III	VI	VII	Elective Numerical Analysis	6	40	60	100
		VIII	Cluster Electives:** VIII A1. 1.Integral transform	6	40	60	100
			VIII A2. 2.Advanced Numerical Analysis.	6	40	60	100
			VIII A3. 3.Project	6	40	60	100

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DEPARTMENT OF MATHEMATICS

IIIrd B.Sc. MATHEMATICS SYLLABUS

SEMESTER-VI, PAPER-VII

ELECTIVE: NUMERICAL ANALYSIS

60Marks

UNIT-I: (10hours)

Errors in numerical computations: Errors and their accuracy, Mathematical preliminaries, Errors and their analysis, Absolute, Relative and percentage errors, A general error formula, Error in the approximation of a function.

UNIT-II: (12hours)

Solution of algebraic and transcendental equations: The bisection method, The iteration,The method of false position, Newton Raphson method, Ramanujan's method.

UNIT-III: (12hours) Interpolation-I

Interpolation: Errors in a polynomial interpolation, Finite differences, Forward differences, Backward differences, Central differences, Symbolic relations, Detection of errors by differences tables, Differences of a polynomial.

UNIT-IV: (12hours) Interpolation-II

Newton's formulae for interpolation, Central difference interpolation formulae, Gauss's forward central difference formulae, Gauss's backward central difference formulae, Stirling's central difference formula, Bessel's formula.

UNIT-V: (14hours)) Interpolation-III

Interpolation with unevenly spaced points, Lagrange's formula , Divided differences and their properties, Relation between divided differences and forward differences, Relation between divided differences and backward differences, Relation between divided differences and central differences, Newton's divided difference interpolation formula.

Reference books:

1. Numerical analysis by S.S.Sastry, Published by Prentice Hall of India pvt.Ltd.,New Delhi.(Latest Edition).
2. Numerical analysis by G.Sankar Rao Published by New Age International Publishers,Hyderabad.
3. Finite differences and Numerical analysis by H.C.Saxena Published by S.Chand and company,pvt.Ltd., New Delhi.
4.Numerical methods for scientific and engineering computation by M.K.Jain, S.R.K.Iyengar, R.K.Jain.

Suggested activities: Seminar/Quiz/Assignments.

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DEPARTMENT OF MATHEMATICS

IIIrd B.Sc. MATHEMATICS

SEMESTER-VI, PAPER-VII

ELECTIVE: NUMERICAL ANALYSIS

BLUE PRINT

DURATION : 3 HOURS **TOTAL MARKS : 60**

SECTION – A

Answer any **FIVE** questions. Each question carries 4 Marks

5x4 = 20M

Question	Topics	No. of Questions	Weightage
1	UNIT- I	1	4
2	UNIT-I	1	4
3	UNIT-II	1	4
4	UNIT-II	1	4
5	UNIT-III	1	4
6	UNIT-III	1	4
7	UNIT-IV	1	4
8	UNIT-IV	1	4
9	UNIT-V	1	4
10	UNIT-V	1	4

SECTION – B

Answer any **ALL** questions. Each question carries 8 marks

5x8 = 40M

Question	Topic	No.of questions	Marks
11(a) or (b)	UNIT-I	2	8
12(a) or (b)	UNIT-II	2	8
13(a) or (b)	UNIT-III	2	8
14a) or (b)	UNIT-IV	2	8
15(a) or (b)	UNIT-V	2	8

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DEPARTMENT OF MATHEMATICS

IIIrd B.Sc. MATHEMATICS

SEMESTER-VI, PAPER-VII

ELECTIVE: NUMERICAL ANALYSIS

MODEL QUESTION PAPER

Time: 3Hrs **Max.Marks:60**

SECTION A – (5 X 4 = 20 Marks)
Answer any FIVE of the following questions.

1. If $u = 3x^7 - 6x$, *find the percentage error in* u *at* $x = 1$, *if the error in* x *is* 0.05
$u = 3x^7 - 6x$, అయితే u లతోదోషశాతంను కనుక్కోండి. ఇచ్చట $x = 1, \Delta x = 0.05$.

2. Find the r due of $\sqrt{102} - \sqrt{101}$ విలువను కనుగొనుము.

3. Find a real root of the equation $x^3 + x^2 - 1 = 0$ by iteration method.
$x^3 + x^2 - 1 = 0$ సమీకరణమునకు పునరుక్త పద్ధతిన ఒక వ్యాస్తవమూలంను కనుకొనుమ

4. Using Newton – Raphson method, establish the interative formula $x_{n+1} = \frac{1}{2}\left[x_n + \frac{N}{x_n}\right]$ *to calculate the square root of* N.
N యొక్క వర్గమూలంను గణనం చేయడానికి, న్యూటన్ పద్ధతినుపయోగించి $x_{n+1} = \frac{1}{2}\left[x_n + \frac{N}{x_n}\right]$ అనే పునరుక్త సూత్రమును నిరూపించండి.

5. Construct a forward difference table.
క్రింది దత్తాంశానికి పురోగమన భేద పట్టికను నిర్మించుము.

x :	1	2	3	4	5
y :	2	5	10	20	30

6. Evaluate :
గణించండి.
(a) $\Delta^2 (3e^x)$.
(b) $\Delta^2 (ab^{cx})$

7. From the following table find the value of y at x = 21.
క్రింది పట్టిక నుండి x = 21 అయినప్పుడు y విలువను కనుగొనుము.

x :	20	23	26	29
y :	0.34202	0.3907	0.4384	0.4848

8. Show that $\Delta\nabla = \Delta - \nabla = \delta^2$.
$\Delta\nabla = \Delta - \nabla = \delta^2$ అని చూపుము.

9. Derive Newton's divided difference formula.
న్యూటన్ విభాజిత భేద సూత్రమును రాబట్టండి.

10. Using Lagrange's formula, find f(2) from the following data :
క్రింది దత్తాంశము నుండి లెగ్రాంజ్ సూత్రము ద్వారా f(2) ను కనుగొనుము.

x :	0	1	3	4
$f(x)$:	5	6	50	105

Answer ALL questions each Question curries 8 marks. (5 X 8 = 40 Marks)

UNIT – 1

11(a) If $R = \frac{4x^2y^3}{3^4}$ *and errors* in x, y, z be 0.001 show that the maximum relative error at x = y = z= 1 is 0.009.

$R = \frac{4x^2y^3}{3^4}$ $\Delta x = \Delta y = \Delta z = 0.001$ అయితే $x = y = z = 1$ అయినప్పుడు R లో సాపేక్ష గరిష్ఠ దోషము 0.009 అని చూపుము.

Or

(b) Define absolute, relative, percentage error and derive general error formula.

మారు, సాపేక్ష, శాత దోషములను రాబట్టండి. మరియు సాధారణ దోష సూత్రము రాబట్టండి

UNIT II

12 (a) Find the real root of the equation $x\log_{10}x = 1.2$ by Newton – Raphson method.

న్యూటన్–రాఫ్సన్ పద్ధతిలో $x\log_{10}x = 1.2$ సమీకరణం యొక్క వాస్తవ మూలాలను కొనుక్కొండి.

Or

(b) Find the real root of the equation $x^3 - 6x - 4 = 0$ *by bisection method.*

ద్విధాకర పద్ధతిన $x^3 - 6x - 4 = 0$ సమీకరణానికి ఒక వాస్తవ మూలమును కనుగొనుము.

UNIT III

13 (a) Find the missing term in the following data :

x :	0	1	2	3	4
y :	1	3	9	?	81

పైన తెలిపిన దత్తాంశము నందు లోపించిన పదమును కనుగొనుము.

Or

(b) Prove that

(a) $u_3 = u_2 + \Delta u_1 + \Delta^2 u_0 + \Delta^3 u_0$.

(b) $u_4 = u_3 + \Delta u_1 + \Delta^2 u_1 + \Delta^3 u_1$.

అని నిరూపించండి.

UNIT IV

14 (a) State and prove Gauss forward interpolation formula.

గాస్ పురోగమన సూత్రాన్ని నిర్వచించి నిరూపించండి.

Or

(b) Apply Bessel's formula to obtain y_{25} *given* that $y_{20} = 2854, y_{24} = 3162$ $y_{28} = 3544$, $y_{32} = 3992$.

$y_{20} = 2854$, $y_{24} = 3162$, $y_{28} = 3544$, $y_{32} = 3992$ లకు బెస్సల్ సూత్రంను

UNIT V

15 (a) By means of Newton's divided difference formula, find the value of f(8) and f(15) from the following table :

x :	4	5	7	10	11	13
y :	48	100	294	900	1210	2028

పైన తెలిపిన పట్టిక ద్వారా న్యూటన్ విభాగిత భేద సూత్రం ఉపయోగించి $f(8)$, $f(15)$ లను కనుగొనుము.

Or

(b) Calculate y at $x = 155$ by using Lagrange's interpolation.

x :	150	152	154	156
y :	12.247	12.329	12.410	12.490

పైన తెలిపిన దత్తాంశమునకు లెంగ్రాజి అంతర్వేశనం వుపయోగించి $x = 155$ వద్ద y విలువను కనుక్కోండి.

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DEPARTMENT OF MATHEMATICS

IIIrd B.Sc. MATHEMATICS SYLLABUS

SEMESTER-VI, (CLUSTER), PAPER-VIII-A-1

CLUSTER ELECTIVE-VIII-A-1; INTEGRAL TRANSFORMS

60Hrs

UNIT-I: (12hours) Laplace transforms-I:

Definition of Integral Transform-Laplace transform, Linearity Property, Laplace transform of some Elementary Functions-First Shifting Theorem, Second Shifting Theorem, Change of Scale property- Laplace transform of Derivative of a Function.

UNIT-II: (12hours) Inverse Laplace transform:

Definition of Inverse Laplace transform, Linearity Property , First Shifting Theorem, Second Shifting Theorem, Change of Scale property ,Use of Partial fractions, Examples.

UNIT-III: (12 hours) Applications of Laplace transform Solutions of differential Equations:

Solutions of Ordinary Differential Equations, Solutions of Differential Equations with Constant Coefficients.

UNIT-IV: (12hours) Applications of Laplace transform :

Definition of Fourier Transform- Fourier Sine Transform- Fourier Cosine Transform, Linear Property of Fourier Transform- Change of Scale property for Fourier Transform.

UNIT-V: (12hours) Finite Fourier Transform:

Finite Fourier Sine Transform-Finite Fourier Cosine Transform-Inversion formula for Sine and Cosine Transforms only statements and related problems.

Reference books:

1.Integral Transforms by A.R.Vasistha and Dr.R.K Guptha Published by Krishna.
2.A.Course of Mathematical Analysis by Santhi Narayana and P.K Mittal, Published by S.Chand& Company Pvt.Ltd. New Delhi.
3. Fourier Series and Integral Transforms by Dr.S.Sreenadh, Published by S.Chand& Company Pvt.Ltd. New Delhi.
4. Laplace and Fourier Transforms by Dr.J.K.Goyal and G.P.Guptha by Pragati Prakasan,Meerut.
5. Integral Pvt.Ltd. New Delhi. Transforms by M.V.Raisinghania- H.C.Saxena andH.K.Dass, Published by S.Chand & Company Pvt. Ltd. New Delhi.

Suggested activities: Seminar/Quiz/Assignments.

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DEPARTMENT OF MATHEMATICS

IIIrd B.Sc. MATHEMATICS

SEMESTER-VI, (CLUSTER), PAPER-VIII-A-1

CLUSTER ELECTIVE-VIII-A-1; INTEGRAL TRANSFORMS

BLUE PRINT

DURATION : 3 HOURS **TOTAL MARKS : 60**

SECTION – A

Answer any **FIVE** questions. Each question carries 4 Marks
5x4 = 20M

Question	Topics	No.of Questions	Weightage
1	UNIT- I	1	4
2	UNIT-I	1	4
3	UNIT-II	1	4
4	UNIT-II	1	4
5	UNIT-III	1	4
6	UNIT-III	1	4
7	UNIT-IV	1	4
8	UNIT-IV	1	4
9	UNIT-V	1	4
10	UNIT-V	1	4

SECTION – B

Answer any **ALL** questions. Each question carries 8 marks
5x8 = 40M

Question	Topic	No.of questions	Marks
11(a) or (b)	UNIT-I	2	8
12(a) or (b)	UNIT-II	2	8
13(a) or (b)	UNIT-III	2	8
14a) or (b)	UNIT-IV	2	8

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DEPARTMENT OF MATHEMATICS

IIIrd B.Sc. MATHEMATICS

SEMESTER-VI, (CLUSTER), PAPER-VIII-A-1

CLUSTER ELECTIVE-VIII-A-1; INTEGRAL TRANSFORMS

MODEL QUESTION PAPER

Time: 3Hrs **Max.Marks:60**

Answer any FIVE of the following questions.

1. Evaluate $L(t \sin 3t \cos 2t)$ ను సాధించుము.

2. Find $L(e^{-2t} Sin\ 3t)$ ను కనుగొనుము.

3. Define integral transforms, Laplace transforms of a function.
సమాకలన, లెప్లాస్ పరివర్తన ప్రమేయమును నిర్వచింపుము.

4. Find the inverse Laplace transform of $L^{-1}\left\{\frac{p^2}{(p+2)^3}\right\}$.
విలోమ లెప్లాస్ పరివర్తనను కనుగొనుము.

5. If $L[F(t)] = f(p)$ then prove that $L^{-1}[f(a)] = \frac{1}{a}F\left[\frac{t}{a}\right]$
$L[F(t)] = f(p)$, అయితే $L^{-1}[f(a)] = \frac{1}{a}F\left[\frac{t}{a}\right]$ ను నిరూపించుము.

6. Solve $(D^2 + 4D + 3)y = e^{-t}$ given y = 1, $\frac{dy}{dt} = 1$ at $t = 0$.
$t = 0$ వద్ద, ఇచ్చిన ప్రకారం $\frac{dy}{dt} = 1, y = 1$ అయితే
$(D^2 + 4D + 3)y = e^{-t}$ ను సాధించుము.

7. Solve $ty'' + y' + 4ty = 0$ if $y(0) = 3, y'(0) = 0$.
$y(0) = 3, y'(0) = 0$ అయితే $ty'' + y' + 4ty = 0$ ను సాధించుము.

8. Define the Fourier sine transform and Fourier cosine transform of a function.
ఫోరియర్ సైన్ మరియు కాసైన్ పరివర్తన ప్రమేయమును నిర్వచింపుము.

9. Find the Fourier sine and Fourier cosine transforms of $f(x) = x$.
$f(x) = x$ కు సైన్ మరియు కాసైన్ పరివర్తనను కనుగొనుము.

10. Find fourier sinc transform of $f(x) = \frac{1}{x}$
$f(x) = \frac{1}{x}$ యొక్క ఫోరియర్ సైన్ పరివర్తనను కనుగొనుము.

SECTION – B (5 X 8 = 40 Marks)

Answer ALL questions each question carry 8 marks.

11(a). State and prove first shifting theorem for Laplace transformation.
లెప్లాస్ పరివర్తన మొదటి సిద్ధాంతమును ప్రవచించి నిరూపించుము.

Or

(b) *Find* : $L\left\{\frac{1-\cos t}{t^2}\right\}$.
$L\left\{\frac{1-\cos t}{t^2}\right\}$ ను కనుగొనుము.

12(a). State and prove change of scale property of inverse Laplace transformations.
లప్లాస్ పరివర్తనలో స్కేల్ మార్పు ధర్మాన్ని ప్రవచించి నిరూపణ చేయండి.

Or

(b) Find the inverse Laplace transforms of $\left[\frac{4P+5}{(P-1)^2(P+2)}\right]$.
$\left[\frac{4P+5}{(P-1)^2(P+2)}\right]$ యొక్క విలోమ లప్లాస్ పరివర్తనను కనుగొనుము.

13(a). Solve $(D^2-D-2)y = 20\sin 2t,\ y=-1, Dy=2$ *when* $t=0$.
$t=0$ వద్ద $y=-1, Dy=2$,అయితే $(D^2-D-2)y = 20\sin 2t$ ను సాధించుము.

Or

(b). Solve $(D^2+1)y = sint\ sin2t, t>0$ *if* $y=1, Dy=0$ *when* $t=0$.
$t=0$ వద్ద $y=-1, Dy=2$, $(D^2-D-2)y = 20\sin 2t$ ను సాధించుము.

14(a). Find the Fourier transform of f(x) defined by
f(x) నిర్వచింపబడిన ఫోరియర్ పరివర్తనను కనుగొనుము.

$$f(x)=\begin{cases}1, |x|<a\\ 0, |x|>a\end{cases}$$ and hence evaluate మరియు

(a) $\int_{-\infty p}^{\infty} \frac{\sin pa\cos px}{} dp$ *and* మరియు

(b) $\int_0^{\infty} \frac{\sin p}{p}\ dp.$ ను సాధించుము.

Or

(b). Find Fourier sine transforms of $\frac{e^{-ax}}{x}$ *and deduce*
that $\int_0^{\infty} \frac{e^{-ax}-e^{-bx}}{x}\sin pxdx = tan^{-1}\frac{p}{a} - tan^{-1}\frac{p}{b}.$

$\frac{e^{-ax}}{x}$కు ఫోరియర్ సైన్ పరివర్తనను కనుగొనుము మరియు
$\int_0^{\infty} \frac{e^{-ax}-e^{-bx}}{x}\sin pxdx = tan^{-1}\frac{p}{a} - tan^{-1}\frac{p}{b}$.ను రాబట్టుము.

15(a). Find the finite Fourier sine and Fourier consin transform of f(x) if
$f(x)=\begin{cases}1 & 0<x<\pi/2\\ -1\pi/2 & <x<\pi\end{cases}$
$f(x)=\begin{cases}1 & 0<x<\pi/2\\ -1\pi/2 & <x<\pi\end{cases}$ అయితే పరిమిత ఫోరియర్ సైన్ మరియు కోసైన్ పరివర్తనను కనుగొనుము.

Or

(b) Find the finite sine transform of f(x), if $f(x) = coskx$.
$f(x) = coskx$ అయితే f(x) యొక్క పరిమిత సైన్ పరివర్తనను కనుగొనుము.

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DEPARTMENT OF MATHEMATICS

III[rd] B.Sc. MATHEMATICS SYLLABUS

SEMESTER-VI, (CLUSTER), PAPER-VIII-A-2

CLUSTER ELECTIVE-VIII-A-2; ADVANCED NUMERICAL ANALYSIS

60Hrs

UNIT-I: (10hours)

Curve Fitting: Least Squares curve fitting procedures, fitting a straight line, Nonlinear curve fitting, curve fitting by a sum of exponentials.

UNIT-II: (12hours)

Numerical Differentiation: Derivatives using Newton's forward difference formula, Newton's Backward difference formula, Derivatives using central difference formula, Stirling's interpolation formula ,Newton's divided difference formula. Newton's divided difference formula.

UNIT-III: (12 hours)

Numerical Integration: General quadrature formula on errors, Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule,Weddl's rule and Boole's rule.

UNIT-IV: (14hours)

Solutions of Simultaneous Linear Systems of Equations: Solution of linear systems-Direct methods; Matrix inversion method, Gaussian Elimination methods, Gauss-Jordan method, Method of factorization, Iterative methods; Jacobi's method, Gauss-Seidal methods.

UNIT-V: (12hours)

Numerical Solution of Ordinary Differential Equations: Introduction, Solution by Taylor's series, Picard's method of successive approximations, Euler's method, Modified Euler's method, Runge-Kutta methods.

Reference books:

1. Numerical analysis by S.S.Sastry, Published by Prentice Hall of India Pvt.Ltd., New Delhi.(Latest Edition).
2. Numerical analysis by G.Sankar Rao Published by New Age International Publishers,Hyderabad.
3. Finite differences and Numerical analysis by H.C.Saxena Published by S.Chand and company, Pvt.Ltd., New Delhi.
4.Numerical methods for scientific and engineering computation by M.K.Jain, S.R.K.Iyengar, R.K.Jain.

Suggested activities: Seminar/Quiz/Assignments.

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DEPARTMENT OF MATHEMATICS

III[rd] B.Sc. MATHEMATICS

SEMESTER-VI (CLUSTER), PAPER-VIII(A)-2

CLUSTER ELECTIVE-VIII(A)-2.ADVANCED NUMERICAL ANALYSIS

BLUE PRINT

DURATION : 3 HOURS **TOTAL MARKS : 60**

SECTION – A

Answer any **FIVE** questions. Each question carries 4 Marks

5x4 = 20M

Question	Topics	No.of Questions	Weightage
1	UNIT- I	1	4
2	UNIT-I	1	4
3	UNIT-II	1	4
4	UNIT-II	1	4
5	UNIT-III	1	4
6	UNIT-III	1	4
7	UNIT-IV	1	4
8	UNIT-IV	1	4
9	UNIT-V	1	4
10	UNIT-V	1	4

SECTION – B

Answer any **ALL** questions. Each question carries 8 marks

5x8 = 40M

Question	Topic	No.of questions	Marks
11(a) or (b)	UNIT-I	2	8
12(a) or (b)	UNIT-II	2	8
13(a) or (b)	UNIT-III	2	8
14a) or (b)	UNIT-IV	2	8
15(a) or (b)	UNIT-V	2	8

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DEPARTMENT OF MATHEMATICS

IIIrd B.Sc. MATHEMATICS

SEMESTER-VI (CLUSTER), PAPER-VIII(A)-2

CLUSTER ELECTIVE-VIII(A)-2.ADVANCED NUMERICAL ANALYSIS

MODEL QUESTION PAPER

Time: 3Hrs **Max.Marks:60**

SECTION A – (5 X 4 = 20 Marks)

Answer any FIVE of the following questions.

1. By the method of least squares, fit a straight line to the following data :

x :	1	2	3	4	5
y :	14	27	40	55	68

పై దత్తాంశానికి కనిష్ఠ వర్గాల పద్ధతిల సరళ రేఖను సంధానించండి.

2. Fit a parabola to the data given below :

క్రింది దత్తాంశమునకు ఒక పరావలయంను సంధించండి :

x :	1	2	3	4	5
y :	10	12	8	10	14

3. Using the following table, compute $\frac{dy}{dx}$ at $x = 1$:

క్రింది పట్టికనుపయోగించి $x = 1$వద్ద $\frac{dy}{dx}$ ను కనుక్కోండి.

x :	1	2	3	4	5	6
y :	1	8	27	64	125	216

4. Find $f'(1.5)$ from the following table.

క్రింది ఇవ్వబడిన దత్తాంశము నుండి $f'(1.5)$ ను కనుగొనుము.

x :	1.5	2.0	2.5	3.0	3.5	4.0
y :	3.375	7.000	13.625	24.000	38.875	59.000

5. Evaluate $\int_0^1 x^3\ dx$ $with$ 5 $sub-intervals$ by $trapezoidal$ $rule.$

ట్రెపిజాయిడల్ సూత్రమునుపయోగించి 5 అంతరాలతో $\int_0^1 x^3\ dx$ విలువను కనుక్కోండి.

6. By Simpson's rule, evaluate $\int_1^2 \sqrt{1-\frac{1}{x}}\ dx$ $with$ 5 $ordinates.$

సింప్సన్ సూత్రము ద్వారా 5 సమాన దూరంలో గల బిందువులలో $\int_1^2 \sqrt{1-\frac{1}{x}}\ dx$ విలువను కనుక్కోండి.

7. Solve the equations $x+y+z=9, 2x+5y+7z=52, 2x+y-z=0$ by Cramer's rule.

$x+y+z=9, 2x+5y+7z=52, 2x+y-z=0$ సమీకరణములను క్రామర్ సూత్రము ద్వారా సాధించండి.

8. Solve the system of equations $5x + 2y + z = 12, x + 4y + 2z = 15,$ $x + 2y + 5z = 20$ by Gauss - Jordan Method.
$5x + 2y + z = 12, x + 4y + 2z = 15, x + 2y + 5z = 20$ సమీకరణాలను గాస్-జార్డన్ పద్ధతినుపయోగించి సాధించండి.

9. Solve the differential equation $\frac{dy}{dx} = x + y, with\ y(0) = 1, x \in [0,1]$ by Taylor series expansion to obtain y for $x = 0.1$.
$\frac{dy}{dx} = x + y, y(0) = 1, x \in [0,1]$ అను అవకలన సమీకరణమును టేలర్స్ సిరీస్ పద్ధతి ద్వారా సాధించి $x = 0.1$ దగ్గర y విలువను పొందండి.

10. Solve $\frac{dy}{dx} = y^2 - x^2$ with $y_{(0)} = 1$ by using Elder's method.
యూలర్ పద్ధతినుపయోగించి $y_{(0)} = 1$తో $\frac{dy}{dx} = y^2 - x^2$ ను సాధించుము.

SECTION – B (5 X 8 = 40 MARKS)

Answer ALL questions, each question carries 8 Marks.

11(a). Fit a curve of the form $y = ab^x$ to the following data :
క్రింది దత్తాంశమునకు $y = ab^x$ వక్రమును కనుగొనుము.

x :	1	2	3	4	5	6	7	8
y :	1.0	1.2	1.8	2.5	3.6	4.7	6.6	9.1

Or

(b). Find a parabolic curve to the following data :
క్రింది దత్తాంశమునకు పరావలయ వక్రమును కనుక్కోండి.

x :	1	2	3	4	5
y :	1090	1220	1390	1625	1915

12(a). From the following table, find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.05$.
క్రింది పట్టిక నుండి $x = 1.05$ వద్ద $\frac{dy}{dx}$ మరియు $\frac{d^2y}{dx^2}$ విలువలను కనుక్కోండి.

x :	1.00	1.05	1.10	1.15	1.20	1.25	1.30
y :	1.00000	1.02470	1.04881	1.07238	1.09544	1.11803	1.14017

Or

(b). From the following table, find the value of $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 2.03$.
క్రింది పట్టిక నుండి $x = 2.03$ వద్ద $\frac{dy}{dx}$ మరియు $\frac{d^2y}{dx^2}$ విలువలను కనుక్కోండి.

x :	1.96	1.98	2.00	2.02	2.04
y :	0.7825	0.7739	0.7651	0.7563	0.7473

13(a). Let $y = f(x)$ be a function which assumes the values $y_0, y_1, y_2 \cdots . y_n$ corresponding to the values $x_0 = a,\ x_1 = a + h, \ldots, x_n = a + nh = b$ so that $b - a = nh$ and n is a multiple if 6.

Then show that $\int_a^b y dx = \frac{3h}{10}[y_0 + 5y_1 + y_2 + 6y_3 + y_4 + 5y_5 + 2y_6 + 5y_7 + y_8 + \cdots . + y_n]$

$y = f(x)$ ఒక ప్రమేయము, $x_0 = a,\ x_1 = a + h, \ldots, x_n = a + nh = b$ విలువలకు అనురూపంగా y విలువలు $y_0, y_1, y_2 \cdots . y_n$ మరియు $b - a = nh$, n అనేది 6 యొక్క గుణకము అయితే $\int_a^b y dx = \frac{3h}{10}[y_0 + 5y_1 + y_2 + 6y_3 + y_4 + 5y_5 + 2y_6 + 5y_7 + y_8 + \cdots . + y_n]$ అని చూపండి.

Or

(b). Use Simpson's formula with n=4 to estimate $\int_0^1 \frac{1}{1+x^2} dx$ and hence find the approximate value of π.

సింప్సన్ సూత్రమునుపయోగించి n=4 తో $\int_0^1 \frac{1}{1+x^2} dx$ను అంచనా వేయండి మరియు π విలువను కనుక్కోండి.

14(a). Solve $x_1 - 2x_2 + 3x_3 = 2, 3x_1 - x_2 + 4x_3 = 4, 2x_1 + x_2 - 2x_3 = 5$ by matrix inversion method. $x_1 - 2x_2 + 3x_3 = 2, 3x_1 - x_2 + 4x_3 = 4,$ $2x_1 + x_2 - 2x_3 = 5$ సమీకరణములను మాత్రిక విలోమ పద్ధతిలో సాధించండి.

Or

(b). Solve the equations $2x_1 + x_2 + x_3 = 2,\ x_1 + 3x_2 + 2x_3 = 2,$ $3x_1 + x_2 + 2x_3 = 2$ by LU decomposition method.

$2x_1 + x_2 + x_3 = 2,\ x_1 + 3x_2 + 2x_3 = 2,\quad 3x_1 + x_2 + 2x_3 = 2$ సమీకరణములను పద్ధతి ద్వారా సాధించండి.

15(a). Find an approximate value of y for $x = 0.1$ *if* $\frac{dy}{dx} = x + y$ *and* $y = 1$ *at* $x = 0$ using Picards method.

$\frac{dy}{dx} = x + y$ మరియు $x = 0$ వద్ద $y = 1$ అయినప్పుడు, ఫికార్డు పద్ధతిన $x = 0.1$ వద్ద y యొక్క ఉజ్జాయింపు విలువను కనుక్కోండి.

Or

(b). Given the differential equation $\frac{dy}{dx} = \frac{x^2}{y^2+1}$ with the initial condition y =0 when x =0, use Picard's to obtain y for $x = 0.25, 0.5$ and 1.0 correct to three decimal places.

అవకలన సమీకరణము $\frac{dy}{dx} = \frac{x^2}{y^2+1}$ మరియు $x = 0, y = 0$ ప్రాథమిక నిబంధనతో $x = 0.25, 0.5$ మరియు 1.0ల వద్ద ఫికార్డు పద్ధతిలో y విలువలను కనుక్కోండి. 3 దశాంశ స్థానములకు సవరించండి.

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DEPARTMENT OF MATHEMATICS

IIIrd B.Sc. MATHEMATICS

SEMESTER-VI, PAPER-VIII-A-3

CLUSTER ELECTIVE-VIII(A)-3.PROJECT

BLUE PRINT

DURATION : 3 HOURS **TOTAL MARKS : 60**

Project Work done by the Students From cluster subjects only

Evaluation of project work

Total Marks -100

Internal Marks-40

1. Internal exams (two)	- 10
2. Assignments (two)	- 10
3. Group discussion	- 10
4. Seminar	- 10

External Marks-60

1. Project report	- 20M
2. Seminar	- 20M
3. Examination	- 20M

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DEPARTMENT OF MATHEMATICS

Ist B.Sc. MATHEMATICS SYLLABUS

SEMESTER-I, PAPER-I

MATHS FOR DATA SCIENCE

UNIT – 1

Matrices and basic operation, Square matrix, Determinates properties of Determinates, Singular and Non – Singular matrix, Examples, Inverse matrix, Rank of a matrix.

UNIT -2

Eigen values and Eigen vectors, Characteristics polynomial, Cayley – Hamilton theorem, Interpretation of Eigen values and Eigen vectors.

UNIT – 3

Linear systems, Definition, Solving Linear system, Homogeneous and Non-Homogeneous equations, Linear programming-simplex method, Graphical method .

UNIT – 4

Limits and Continuity, Real valued functions, Boundedness of a function, Limit of a function, some extension of the limits concept, Infinite limits, Limits at infinity.

Continuous function – Continuity at a point, Combination of continuous function, Continuous function on intervals, uniform continuity.

UNIT – 5

Differentiation and Mean value theorem – The derivability of a function on 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.

REFERENCE BOOKS

1) Matrices by Shanti Narayana, Published by S. Chand publications.

2) A Text book of B.Sc Mathematics by B.V.S.S. Sarma and others, Published by S. Chand and company Pvt. Ltd, New Delhi.

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DEPARTMENT OF MATHEMATICS

Ist B.Sc. MATHEMATICS

SEMESTER-I, PAPER-I

MATHS FOR DATA SCIENCE

BLUE PRINT

DURATION : 3 HOURS **TOTAL MARKS : 60**

SECTION – A

Answer any **FIVE** questions. Each question carries 4 Marks

5x4 = 20M

Question	Topics	No.of Questions	Weightage
1	UNIT- I	1	4
2	UNIT-I	1	4
3	UNIT-II	1	4
4	UNIT-II	1	4
5	UNIT-III	1	4
6	UNIT-III	1	4
7	UNIT-IV	1	4
8	UNIT-IV	1	4
9	UNIT-V	1	4
10	UNIT-V	1	4

SECTION – B

Answer any **ALL** questions. Each question carries 8 marks

5x8 = 40M

Question	Topic	No.of questions	Marks
11(a) or (b)	UNIT-I	2	8
12(a) or (b)	UNIT-II	2	8
13(a) or (b)	UNIT-III	2	8
14a) or (b)	UNIT-IV	2	8
15(a) or (b)	UNIT-V	2	8

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DEPARTMENT OF MATHEMATICS

Ist B.Sc. MATHEMATICS

SEMESTER-I, PAPER-I

MATHS FOR DATA SCIENCE

MODEL QUESTION PAPER

Time: 3 Hrs **Maximum : 60 Marks**

SECTION A – (5 X 4 = 20 Mark)
Answer any FIVE questions.

1. If A =. $\begin{bmatrix}1 & 2 & 2\\ 2 & 1 & 2\\ 2 & 2 & 1\end{bmatrix}$ Then show that $A^2-4A-5I=0$.

2. Find the Rank of the Matrix $\begin{bmatrix}-1 & 2 & 0\\ 3 & 7 & 1\\ 5 & 9 & 3\end{bmatrix}$

3. Find the Eigen values of $\begin{bmatrix}5 & 4\\ 1 & 2\end{bmatrix}$

4. Verify the Matrix A = $\begin{bmatrix}1 & -1\\ 1 & 0\end{bmatrix}$ satisfies its characteristic equation.

5. Show that the system of equations $2x + 3y = 1,\ x + y = 0,$ $6x + 5y = 1$ are inconsistent

6. Solve the equation $2x - y + 3z = 8, -x + 2y + z = 4,\ 3x + y - 4z = 0.$

7. If a function f is continuous on [a, b] then show that, f is bounded on [a,b].

8. Let 'a' be a limit point of an aggregate A & f: A $\rightarrow$R. If $\lim_{x\to a} f(x)$ exists then show that it is unique.

9. Verify Cauchy's Mean value theorem for $f\ (x) = x^2, g(x) = x^3$ in [1,2].

10. Show that $f\ (x) = |x| + |x-1|$ is not derivable at $x = 0$.

SECTION – B – (5 X 8 = 40 Marks)
Answer the following questions.

11. a) Show that det of $\begin{bmatrix} a & b & c \\ a^2 & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{bmatrix}$ = (a-b) (b-c) (c-a).

OR

b)Find the inverse of the Matrix A= $\begin{bmatrix} 1 & 2 & 1 \\ 3 & 2 & 3 \\ 1 & 1 & 2 \end{bmatrix}$ by using Elementary Transformations

12. a) State and prove Caley Hamilton Theorem.

OR

b) Prove that the Matrix A, A^1 have same Eigen values. Give an example

13. a) State and prove System of equations $x + 2y + z = 3$, $3x + y + 2z = 1$, $2x + 2y + 3z = 2$, $x + y + z = -1$, is consistent and solve them

OR

b) For what values of λ, the equations $x + y + z = 1$, $x + 2y + 4z = \lambda$, $x + 4y + 10z = \lambda^2$ have solution? Solve them completely in each case.

14. a) State and prove Sandwich theorem for Limits.

OR

b) If f is continuous on [a, b] then it is uniformly continuous on [a, b]

15 a) State and prove Lagrange's Mean value theorem.

OR

b) State and prove Cauchy's Mean value theorem.

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S.R.R & C.V.R. GOVT. DEGREE COLLEGE (AUTONOMOUS)
VIJAYAWADA
Department of Mathematics
II year Degree Examinations - III Semester
ANALYTICAL SKILLS
(w.e.f. 2020-2021 Admitted Batch)

Course Objective: Intended to inculcate quantitative analytical skills and reasoning as an inherentability in students.

Course Outcomes:

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

- Understand the basic concepts of arithmetic ability, quantitative ability, logical reasoning,business computations and data interpretation and obtain the associated skills.
- Acquire competency in the use of verbal reasoning.
- Apply the skills and competencies acquired in the related areas
- Solve problems pertaining to quantitative ability, logical reasoning and verbal abilityinside and outside the campus.

UNIT – 1 (10 Hrs)

Arithmetic ability: Algebraic operations BODMAS, Fractions, Divisibility rules, LCM& GCD (HCF).

Verbal Reasoning: Number Series, Coding & Decoding, Blood relationship, Clocks, Calendars.

UNIT – 2: (10 Hrs)

Quantitative aptitude: Averages, Ratio and proportion, Problems on ages, Time-distance–speed.

Business computations: Percentages, Profit & loss, Partnership, simple compound interest.

UNIT – 3: (07 Hrs)

Data Interpretation: Tabulation, Bar Graphs, Pie Charts, line Graphs, Venn diagrams.

Recommended Co-Curricular Activities (03 Hrs)

Surprise tests / Viva-Voice / Problem solving/Group discussion.

Text Book:

Quantitative Aptitude for Competitive Examination by R.S. Agrawal, S.Chand Publications.

Reference Books:

1. Analytical skills by Showick Thorpe, published by S. Chand And Company Limited, Ramnagar,New Delhi-110055.
2. Quantitative Aptitude and Reasoning by R V Praveen, PHI publishers.
3. Quantitative Aptitude for Competitive Examination by Abhijit Guha, Tata Mc Graw HillPublication

1/12/2021.

1/12/21

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BLUE PRINT FOR QUESTION PAPER PATTERN

Unit	TOPIC	S.A.Q	E.Q
I	Arithmetic ability &Verbal reasoning	3	2
II	Quantitative aptitude & Business computations	3	2
III	Data interpretation	2	2

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

E.Q. = Essay questions (10marks)

Short answer questions : 4 X 5 = 20M

Essay questions : 3X 10 = 30M

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Total Marks = 50

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01/12/2021

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MODEL QUESTION PAPER FORMAT

Time: 1½hrs (90Minutes). Max. Marks: 50

SECTION-A (4x5M=20Marks)

Answer any **four** questions. Each answer carries **5 marks** (At least 1 question should be given from each Unit)

1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

SECTION B (3x10M=30Marks)

Answer any **three** questions. Each answer carries **10 marks** (At least 1 question should be given from each Unit)

9.	
10.	
11	
12	
13	
14	

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S.R.R & C.V.R. Govt. Degree College (Autonomous), Vijayawada
II year Degree Examinations - III Semester
Analytical Skills
(Model Paper w.e.f. 2020-21)

Time: 1½hrs (90Minutes) **Total Marks: 50M**

SECTION –A

Answer any 4 questions. Each question carries 5 marks **4×5 = 20M**

1). (i) Simplify $18-[5-\{6+2(7-\overline{8-5})\}]$.
(ii) What is the lowest common multiple of 12, 36 and 20?
2). Explain divisibility rule.
3). i) 1,9,25,49,?,121
ii) 6,17,39,72,?
iii). 6,11,21,36,56,?
iv). In a certain code 'MISSIONS' is written as 'MSIISNOS'. How is 'ONLINE' written in that code?
v). In a certain code 'RAJANI' is written as 'IZQZMR'. How is 'KANTH' written in that code?
4). Divide Rs.1162 among A,B,C in the ratio 35:28:20.
5). The average of 5 numbers is 15 and the average of first three numbers is 10 and the average of last three numbers is 20. Then find the middle number?
6). One-fourth of two-fifth of 30% of a number is 15. What is 20% of that number?
7). Prasad sold his work tools for Rs.1850 and earned a profit of 25% . At what price did prasad buy the work tools?
8). Explain types of Venn diagrams.

Section-B

Answer any <u>Three</u> questions. Each question carries 10 marks. (3×10 = 30 M)

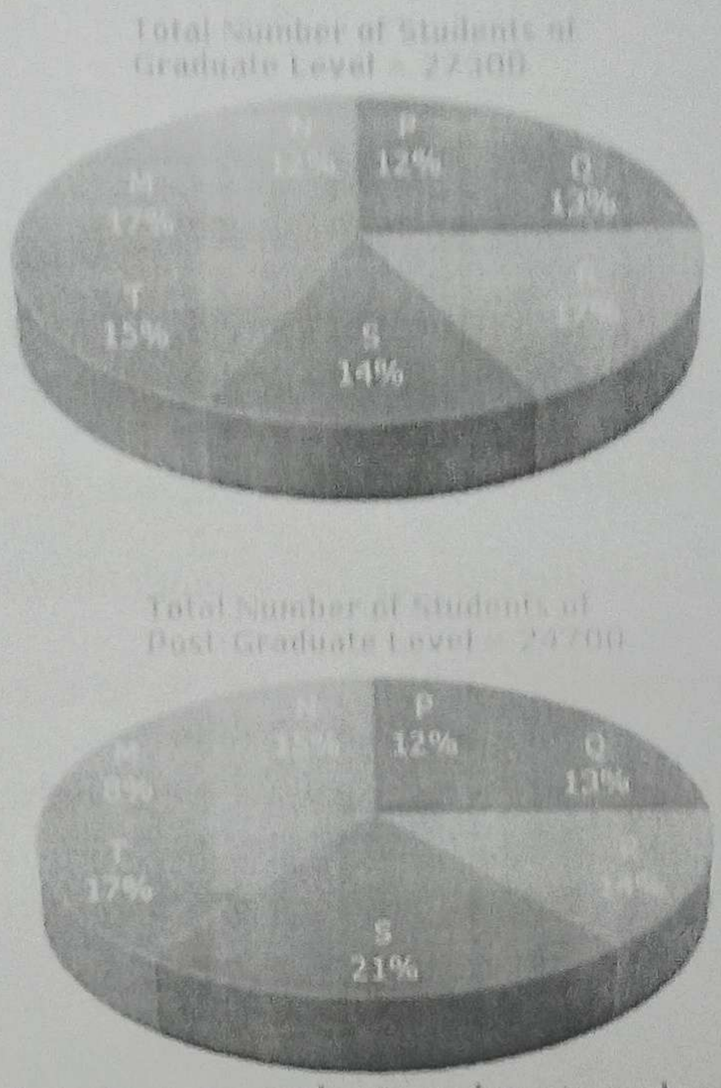
9). i) Explain BODMAS rule.
(ii) LCM of two numbers is 120 and their HCF is 10. What is the sum of those two numbers?
10. i). A is B's sister. C is B's mother. D is C's father. E is D's mother. Then, how is A related to D?
ii). Pointing out to a lady, a girl said. "She is the daughter-in-law of the grandmother of my father's only son." How is the lady related to the girl ?
iii). At what angle the hands of a clock are inclined at 15 minutes past 5?
iv). At what time between 2 and 3 o'clock will the hands of a clock be together?
v). What was the day on 15th august 1947?
11). i) Explain Ratio and proportion

ii). Rohit was 4 times as old his son 8 years ago. After 8 years, Rohit will be twice as old as his son. What are their present ages?

12). i) Explain profit, loss formulae.

ii) In a partnership business, A has invested 2000 for 5months, while B has invested Rs.3500 for a certain period. If out of the total annual profit of Rs.1440, B's share has been Rs.840. For how many months has he kept his investment in the business?

13). The following pie-charts show the distribution of students of graduate and post-graduate levelsin seven different institutes in a town.



Distribution of students at graduate and post-graduate levels in seven institutes

i). What is the total number of graduate and post-graduate level students is institute R?

ii). What is the ratio between the number of students studying at post- graduate and graduate levels respectively from institute S?

iii). How many students of institutes of M and S are studying at graduate level?

iv). What is the ratio between the number of students studying at post-graduate level from institutes S and the number of students studying at graduate level from institute Q?

v).Total number of students studying at post-graduate level from institutes N and P is?

14). Study the following table carefully answer the questions percentage of marks obtained by 6 students in 6 different subjects.

Sub/student	History (out of 50)	Geography (out of 50)	Maths(out 150)	Science(out 100)	English (out of 75)	Hindi (out of 75)
Amit	76	85	69	73	64	88
Bharat	84	80	85	78	73	92
Umesh	82	67	92	87	69	76
Nikhil	73	72	78	69	58	83
Pratiksha	68	79	64	91	66	65
Ritesh	79	87	88	93	82	72

i). What is the approximately the integral % of marks obtained by umesh in all the subjects?

ii).What is the avg % of marks obtained by all the students in hindi ?

iii). What are the average marks of all the students in Mathematics?

iv). What are the average marks obtained by all the students in geography?

v).What are the total marks obtained by pratiksha in all the subjects taken together?

1/12/2021.

1/12/21

01/12/2021

01/12/2021

DEPARTMENT OF MATHEMATICS

BOS MEETIONG APPROVED THE FOLLOWING LSIT OF PAPER SETTERS FOR AUTONOMOUS

S.NO	NAME OF THE LECTURER	DESIGNANTION	COLLEGE
1	Dr.A. Ananta Lakshmi	Lecturer in Mathematics	P.R. Govt. College, Kakinada
2	Dr.P. Subhashini	Lecturer in Mathematics	P.R. Govt. College, Kakinada
3	S. Padmaja	Lecturer in Mathematics	G.D.C, Pitapuram
4	Dr.B. Chitti Babu	Lecturer in Mathematics	GDC, Pentapadu, JP.Gudem,W.G Dt.
5	Dr.Ch. Srinivasa Rao	Lecturer in Mathematics	GDC,Mandapet
6	Ch.S. Haranadh	Lecturer in Mathematics	GDC, Adkiveedu,W.G.Dt.
7	P. Hari Krishna	Lecturer in Mathematics	GDC, Eluru
8	G.V. Bhaskar	Lecturer in Mathematics	GDC for Women, Guntur
9	M. Maha Lakshmi Naidu	Lecturer in Mathematics	GDC(A), Tuni
10	A. Surya Narayana	Lecturer in Mathematics	GDC(A), Rajahmundry
11	BVN. Srirama Murthy	Lecturer in Mathematics	GDC(A), Rajahmundry
12	I. Lakshmi Gayatri	Lecturer in Mathematics	GDC(A), Rajahmundry
13	S. Jaganmohan Rao	Lecturer in Mathematics	GDC, Jaggampea, E.G.Dt.
14	V. Chitti Babu	Lecturer in Mathematics	GDC, Ramachandrapuram.

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