VIKRAMA SIMHAPURI UNIVERSITY NELLORE

B.A./ B.SC. MATHEMATICS

UG (CBCS) SEMESTER PATTERN SYLLABUS

I TO VI SEMESTER

VIKRAMA SIMHAPURI UNIVERSITY :: NELLORE.

CBCS B.A./B.Sc. **Mathematics** Course Structure w.e.f. 2015-16 (Revised in April, 2017)

Year	Seme-ster	Paper	Subject	Hrs.	Credits	IA	EA	Total
1	**I**	I	Differential Equations & Differential Equations Problem Solving Sessions	6	5	25	75	100
	II	II	Solid Geometry & Solid Geometry Problem Solving Sessions	6	5	25	75	100
2	**III**	III	Abstract Algebra & Abstract Algebra Problem Solving Sessions	6	5	25	75	100
	IV	IV	Real Analysis & Real Analysis Problem Solving Sessions	6	5	25	75	100
3	**V**	V	Ring Theory & Matrices Problem Solving Sessions	5	5	25	75	100
		VI	Linear Algebra & Linear Algebra Problem Solving Sessions	5	5	25	75	100
	VI	VII	**Electives: (any one)** VII-(A) Vector Calculus VII-(B) Operations Research VII-(C) Number Theory Problem Solving Sessions	5	5	25	75	100
		VIII	**Cluster Electives:**					
			VIII-A-1: Laplace Transforms	5	5	25	75	100
			VIII-A-2: Integral Transforms VIII-A-3: *Project work* or	5	5	25	75	100
			VIII-B-1: Principles of Mechanics VIII-B-2: Fluid Mechanics VIII-B-3: *Project work* or VIII-C-1: Graph Theory VIII-C-2: Applied Graph VIII-C-3: *Project work* or	5	5	25	75	100
			VIII-D-1: Numerical Analysis					
			VIII-D-2: Advanced Numerical Analysis					
			VIII-D-3: *Project work*					

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w.e.f. 2015-16 (Revised in April, 2016)

B.A./B.Sc. FIRST YEAR MATHEMATICS SYLLABUS

SEMESTER –I, PAPER - 1

DIFFERENTIAL EQUATIONS

60 Hrs

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 Excluding Change of Variables.

***UNIT – II (12 Hours),* Orthogonal Trajectories.**

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

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 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 of x.

$\frac{1}{f(D)}$ 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.

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 P.I. of f(D)y = Q when Q= xV

P.I. of f(D)y = Q when Q= x^m V

UNIT –V (12 Hours), Higher order linear differential equations-III :

Method of variation of parameters (without non constant coefficient equations) ; The Cauchy-Euler Equation ; Legender's Equations.

Prescribed Text Book :

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

Reference Books :

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

2. Ordinary and Partial Differential Equations Raisinghania, published by S. Chand & Company, New Delhi.

3. Differential Equations with applications and programs – S. Balachandra Rao & HR Anuradha-universities press.

4. Telugu Academy Text Book for Differential Equations.

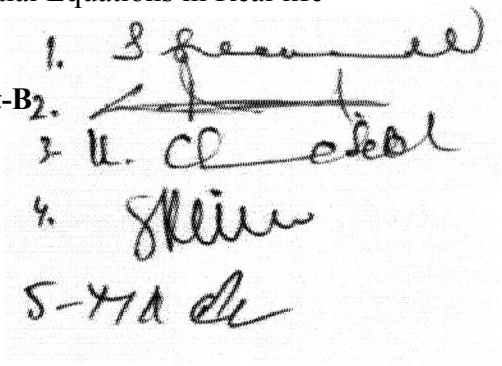
5. I-B.Sc A text Book of a Mathematics Deepthi Publications.

Suggested Activities:

Seminar/ Quiz/ Assignments/ Project on Application of Differential Equations in Real life

Instruction to Paper Setter:

Two questions must be given from each unit in Part-A and Part-B



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(INSTRUCTIONS TO PAPER SETTER)

B.A./B.Sc. MATHEMATICS SEMESTER-I

(DIFFERENTIAL EQUATIONS)

NOTE :- Paper Setter Must select TWO Short Questions and TWO Easy Questions from Each Unit as Follows :-

UNIT	TOPICS	5 MARKS QUESTIONS	10 MARKS QUESTIONS
UNIT - I	Linear Equations	1	-
	Bernoulli's Equations	-	1
	Integrating Factor	1	-
	Exact Equations	-	1
UNIT - II	Orthogonal Trajectories	1	1
	Solvable for x, y, p.	1	1
UNIT - III	General Solution of f(D)y=0	1	-
	f(D)y = Q when Q= be^{ax}	1	1
	f(D)y = Q when Q is b sin ax or b cos ax	-	1
UNIT - IV	f(D)y = Q when Q= bx^k	1	-
	f(D)y = Q when Q= e^{ax} V	1	1
	f(D)y = Q when Q= xV	-	1
UNIT - V	Variation of Parameters (without non constant coefficient equations)	-	1
	Cauchy-Euler Equations	2	-
	Legender's Equations	-	1

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(w.e.f. 2016-17)

B.A./B.Sc. FIRST YEAR MATHEMATICS

SEMESTER-I MODEL QUESTION PAPER-1

(DIFFERENTIAL EQUATIONS)

TIME : 3 Hours *Max.Marks : 75*

PART – A

I. Answer any FIVE Questions : ***5 X 5 = 25M***

1. Solve $\frac{dy}{dx} + 2xy = e^{-x^2}$.

2. Find Integrating factor of $\left(xy^3 + y\right)dx + 2\left(x^2y^2 + x + y^4\right)dy = 0$.

3. Find the Orthogonal trajectories of the family of curves $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ where 'a' is a parameter.

4. Solve $y = 2xP + x^2P^4$.

5. Solve $\left(D^4 + 8D^2 + 16\right)y = 0$.

6. Solve $\left(D^2 - 5D + 6\right)y = e^{4x}$.

7. Solve $\left(D^2 + 4\right)y = x\sin x$.

8. Solve $\left(D^2 - 4D + 4\right)y = x^3$.

9. Solve $\left(x^2D^2 - xD + 1\right)y = \log x$.

10. Find the complementary function $\left(y_c\right)$ of $\left(x^2D^2 - 3xD + 5\right)y = x^2\sin(\log x)$.

PART - B

Answer any FIVE of the following Questions.
Choosing at least ONE Question from Each Section. ***(5 × 10 =50 Marks)***

SECTION - A

UNIT - I

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

12. Solve $x^2ydx-\left(x^3+y^3\right)dy=0$.

UNIT - II

13. Find the orthogonal Trajectories of the families of Curves $r=\frac{2a}{1+\cos\theta}$ when "a" is Parameter.

14. $P^2+2Py\cot x=y^2$.

UNIT - III

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

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

SECTION - B

UNIT - IV

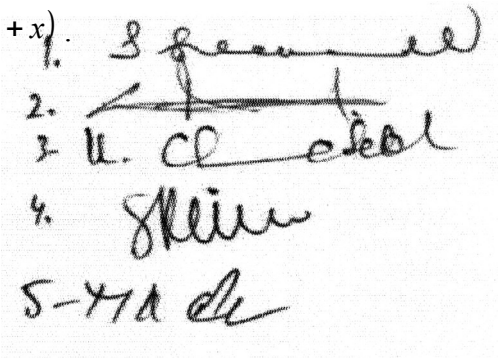
17. Solve $\frac{d^2y}{dx^2}-6\frac{dy}{dx}+13y=8e^{3x}\sin 2x$.

18. Solve $\left(D^2+1\right)y=x^2e^{2x}+x\cos x$.

UNIT - V

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

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



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w.e.f. 2015-16 (Revised in April, 2016)

B.A./B.Sc. FIRST YEAR MATHEMATICS SYLLABUS

SEMESTER – II, PAPER - 2

SOLID GEOMETRY

60 Hrs

UNIT – I (12 hrs) : 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, Distance between parallel planes, System of Planes.

Planes bisecting the angles between two Planes. Pair of Planes.

UNIT – II (12 hrs) : The Line :

Equation of a line; Angle between a line and a plane; The condition for a line to lie in a plane, Image of a point in a plane, Image of point in a line coplanar Lines

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 (10 hrs) : Sphere :

Definition and equation of the sphere; the sphere through four given points; Plane sections of a sphere; Intersection of two spheres; Equation of a circle; great circle, small circle; Intersection of a sphere and a line.

UNIT – IV (10 hrs) : Sphere :

Equation of Tangent plane; Angle of intersection of two spheres; Orthogonal spheres; Coaxial system of spheres; Limiting Points.

UNIT – V (16 hrs) : Cones :

Definitions of a cone; Equation of the cone with a given vertex and guiding curve; Enveloping cone, to Find Vertex of a cone, Reciprocal Cone, Right circular cone, Equation of the Right Circular cone one with a given vertex axis and semi vertical angle the cylinder.

Cylinder :

Definition of a cylinder, Equation to the cylinder, Enveloping cylinder, right circular cylinders equation of the right circular cylinder.

Note : **Concentrate on Problematic parts in all above units.**

Prescribed Text Book :

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

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

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

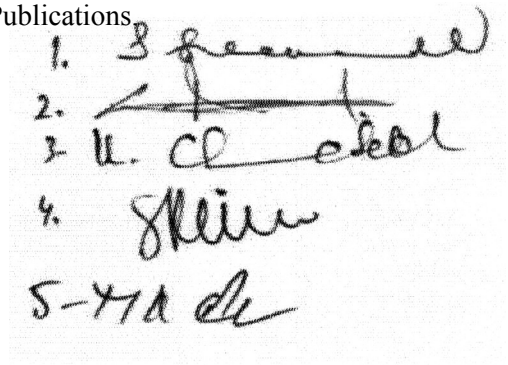
2. P.K. Jain and Khaleel Ahmed, "A text Book of Analytical Geometry of Three Dimensions", Wiley Eastern Ltd., 1999.

3. Co-ordinate Geometry of two and three dimensions by P. Balasubrahmanyam,

K.Y. Subrahmanyam, G.R. Venkataraman published by Tata-MC Gran-Hill Publishers Company Ltd., New Delhi.

4. Telugu Academy Text Book for Solid Geometry.

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



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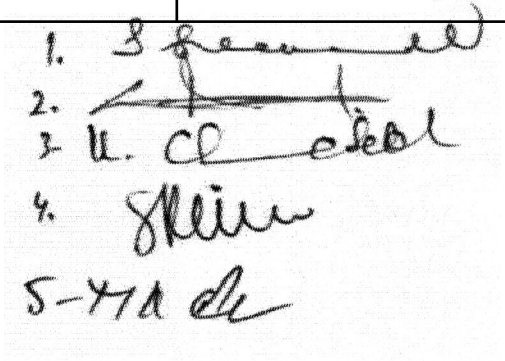
(INSTRUCTIONS TO PAPER SETTER)
B.A./B.Sc. MATHEMATICS SEMESTER-II
(SOLID GEOMETRY)

***NOTE* :- Paper Setter Must select *TWO* Short Questions and *TWO* Easy Questions from Each Unit as Follows :-**

UNIT	TOPICS	5 MARKS QUESTIONS	10 MARKS QUESTIONS
UNIT - I	Planes Introductions	2 (Prb)	-
	System of Planes & Bisecting Planes	-	1(Prb)
	Pair of Planes	-	1(Prb)
UNIT - II	Straight Lines First Part	2 (Prb)	-
	Image & coplaner Lines	-	1(Prb)
	Shortest Distance	-	1(Prb)
UNIT - III	Sphere Introduction	1(Prb)	-
	Plane Section of a Sphere	1(Prb)	1(Prb)
	Great Circle & Small Circle	-	1(Prb)
UNIT - IV	Tangent Plane	1(Prb)	-
	Angle of Intersection of Two Spheres & Orthogonal Spheres	1(Prb)	1(Prb)
	Limiting Points	-	1(Prb)
UNIT - V	Cone	1(Prb)	1(Prb)
	Cylinder	1(Prb)	1(Prb)



VIKRAMA SIMHAPURI UNIVERSITY :: NELLORE

B.A./B.Sc. FIRST YEAR MATHEMATICS

MODEL QUESTION PAPER

SEMESTER-II

SOLID GEOMETRY

Time: 3 Hours Max. Marks : 75

PART-A

Answer any FIVE of the following Questions : (5 x 5= 25 Marks)

1. Find the Equation of the plane through the point (-1,3,2) and perpendicular to the planes $x+2y+2z=5$ and $3x+3y+2z=8$.

2. Find the angles between the planes $x+2y+3z=5,\ 3x+3y+z=9$.

3. Show that the line $\frac{x+1}{-1}=\frac{y+2}{3}=\frac{z+5}{5}$ lies in the plane x+2y-z=0.

4. Find the point of intersection with the plane $3x+4y+5z=5$ and the line $\frac{x+1}{1}=\frac{y+3}{3}=\frac{z-2}{2}$.

5. Find the centre and radius of the sphere $2x^2+2y^2+2z^2-2x+4y+2z+1=0$.

6. Find the equation of the sphere through the circle $x^2+y^2+z^2=9$, $2x+3y+4z=5$ and the point (1,2,3)

7. Find the equation of the tangent plane to the sphere $3x^2+3y^2+3z^2-2x-3y-4z=22=0$ at the point (1,2,3)

8. Show that the spheres are orthogonal $x^2+y^2+z^2+6y+2z+8=0$; $x^2+y^2+z^2+6x+8y+4z+20=0$.

9. Find the equation of the cone which passes through the three co-ordinate axis and the lines $\frac{x}{1}=\frac{y}{-2}=\frac{z}{3}$ and $\frac{x}{2}=\frac{y}{1}=\frac{z}{1}$.

10. Find the equation of the cylinder whose generators are parallel to $\frac{x}{1}=\frac{y}{2}=\frac{z}{3}$ and which Passes through the curve $x^2+y^2=16, z=0$.

PART - B

II. ***Answer any <u>FIVE</u> of the following Questions.***
Choosing at least <u>ONE</u> Question from Each Section. ***(5 × 10 =50 Marks)***

SECTION – A

UNIT - I

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

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

UNIT - II

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

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

UNIT - III

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

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

SECTION – B

UNIT - IV

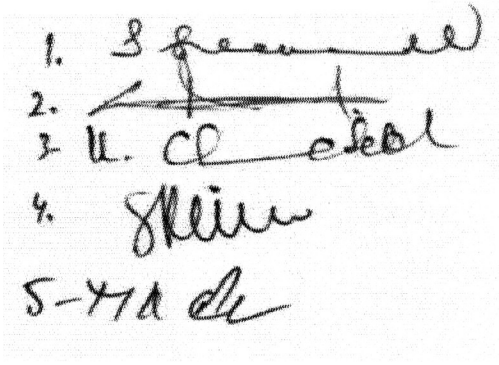
17. Find the equation of the sphere which touches the plane 3x+2y-z+2=0 at (1,-2,1) and cuts orthogonally the sphere $x^2 + y^2 + z^2 - 4x + 6y + 4 = 0$.

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

UNIT - V

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

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



VIKRAMA SIMHAPURI UNIVERSITY::NELLORE

(w.e.f. 2016-17)

B.A./B.Sc. SECOND YEAR MATHEMATICS SYLLABUS

SEMESTER – III, PAPER - 3

ABSTRACT ALGEBRA

60 Hrs

UNIT – 1 : (10 Hrs) 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 : (14 Hrs) 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 Statement and Proof.

UNIT –3 : (12 Hrs) 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 – simple group – quotient group – criteria for the existence of a quotient group.

UNIT – 4 : (10 Hrs) HOMOMORPHISM : -

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

UNIT – 5 : (14 Hrs) PERMUTATIONS AND CYCLIC GROUPS : -

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

Cayley's Theorem and Cyclic Groups :-

Definition of cyclic group – elementary properties.

Prescribed Text Book :

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

Reference Books :

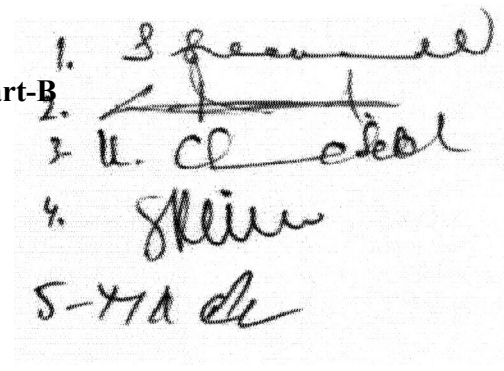
1. Abstract Algebra, by J.B. Fraleigh, Published by Narosa Publishing house.
2. Modern Algebra by M.L. Khanna.
3. Telugu Academy Text Book for Abstract Algebra.
4. I-B.Sc A text Book of a Mathematics Deepthi Publications.

Suggested Activities:

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

Instruction to Paper Setter:

Two questions must be given from each unit in Part-A and Part-B



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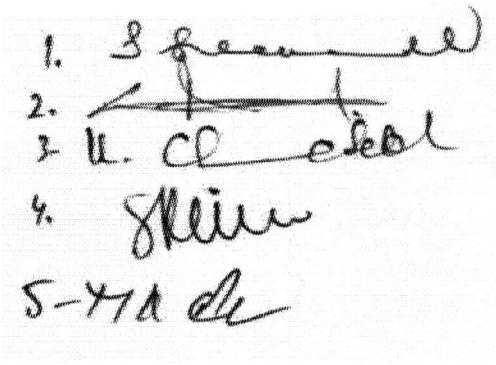
(INSTRUCTIONS TO PAPER SETTER)
B.A./B.Sc. MATHEMATICS SEMESTER-III
(ABSTRACT ALGEBRA)

***NOTE* :- Paper Setter Must select *TWO* Short Questions and *TWO* Easy Questions from Each Unit as Follows :-**

UNIT	TOPICS	5 MARKS QUESTIONS	10 MARKS QUESTIONS
UNIT - I	Group Definition and Elementary Properties	1 (Theorem)	-
	Composition Tables	1(Problem)	-
	Problems	-	2 (Problems)
UNIT - II	Subgroups	1 (Theorem)	2 (Theorems)
	Cosets & Lagrange's Theorem	1 (Theorem)	-
UNIT - III	Normal Subgroups	2 (Theorems)	2 (Theorems)
UNIT - IV	Homomorphism	1(Problem) + 1 (Theorem)	2 (Theorems)
UNIT - V	Permutations	2 (Problems)	1 (Problem)
	Cayley's Theorem & Cyclic Groups	-	1 (Theorem)



VIKRAMA SIMHAPURI UNIVERSITY::NELLORE

(w.e.f. 2016-17)

B.A./B.Sc. SECOND YEAR MATHEMATICS

MODEL QUESTION PAPER

SEMESTER – III

(ABSTRACT ALGEBRA)

Time: 3 Hours *Max. Marks : 75*

PART - A

I. Answer any FIVE of the following Questions : ***(5 X 5= 25 Marks)***

1. Prove that in a group G Inverse of any Element is unique.

2. $G=\{1,2,3,4,5,6\}$ Prepare composition table and prove that G is a finite abelian group of order 6 with respect to X_7.

3. If H is any subgroups of G then prove that $H^{-1}=H$.

4. Prove that any two left cosets of a subgroups are either disjoint or identical.

5. Prove that intersection of any two normal subgroup is again a normal subgroup.

6. Define the following :

(a) Normal subgroups (b) Simple Groups.

7. Prove that the homomorphic image of a group is a group.

8. If for a group G, $F:G\to G$ is given by $f(x)=x^2, x\in G$ is a homomorphism then prove that G is abelian.

9. If $A=\begin{pmatrix}1&2&3\\2&3&1\end{pmatrix}, B=\begin{pmatrix}1&2&3\\3&1&2\end{pmatrix}$ find AB and BA.

10. Find the inverse of the permutation: $\begin{pmatrix}1&2&3&4&5&6\\3&4&5&6&1&2\end{pmatrix}$

PART - B

Answer any FIVE of the following Questions.
Choosing at least ONE Question from Each Section. ***(5 × 10 =50 Marks)***

SECTION - A

UNIT - I

11. Define abelian group. Prove that the set of n^{th} roots of unity under multiplication form a finite abelian group.

12. Show that the set of all positive rational numbers form on abelian group under the composition '0' defined by $aob = \frac{ab}{2}$.

UNIT - II

13. Prove that a non-empty finite subset of a group which is closed under multiplication is a subgroup of G.

14. Prove that the union of two subgroups of a group is a subgroup if f one is contained in the other.

UNIT - III

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

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

SECTION - B

UNIT - IV

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

(i) $f(e) = e^1$ (ii) $f\left(a^{-1}\right) = [f(a)]^{-1}$

Where e , e^1 are then identity elements in G and G^1 respectively.

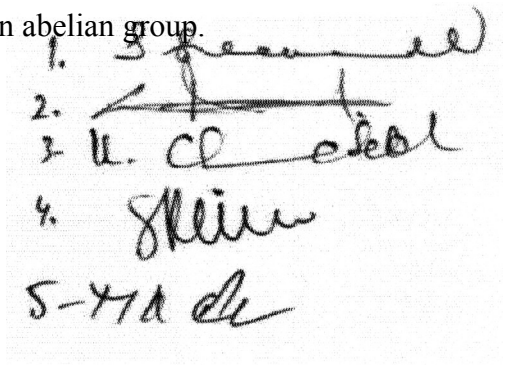
18. State and prove fundamental theorem on Homomorphism of Groups.

UNIT - V

19. Examine the following permutation are even (or) odd

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

20. Define cyclic group. Prove that every cyclic group is an abelian group.



VIKRAMA SIMHAPURI UNIVERSITY::NELLORE

(w.e.f. 2016-17)

B.A./B.Sc. (CBCS) MATHEMATICS SYLLABUS

SECOND YEAR SEMESTER – IV

REAL ANALYSIS

60 Hrs

UNIT – I (12 hrs) : REAL NUMBERS :

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

Real Sequences: Sequences and their limits, Range and Boundedness of Sequences, Limit of a sequence and Convergent sequence, Monotone sequences, Necessary and Sufficient condition for Convergence of Monotone Sequence, Limit and the Bolzano-weierstrass theorem – (Cauchy Sequences – Cauchey's general principle of convergence theorem) No. Question is to be set from this portion.

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

1. P-test
2. Cauchey's n^{th} root test or Root Test.
3. D'-Alemberts' Test or Ratio Test.

UNIT – II (12 hrs) : 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 intervals.

UNIT – III (12 hrs) : DIFFERENTIATION :

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

UNIT – IV (12 hrs) : MEAN VALUE THEORMS :

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

UNIT – V (12 hrs) : RIEMANN INTEGRATION :

Riemann Integral, Riemann integral functions. Necessary and sufficient condition for R–integrability, Properties of Integrable functions, Continuous Functions R-Integral, Monotonic Function R-Intigrable constant function R-Intergrable - Fundamental theorem of integral calculus.

Prescribed Text Book :

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

Reference Books :

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

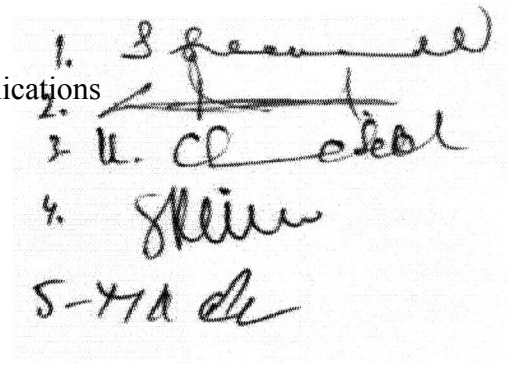
2. Elements of Real Analysis as per UGC Syllabus by Shanthi Narayan and Dr. M.D. Raisingkania Published by S. Chand & Company Pvt. Ltd., New Delhi.

3. Telugu Academy Text Book for Real Analysis.

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

Suggested Activities:

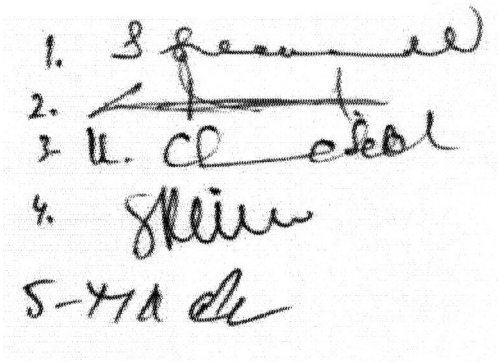
Seminar/ Quiz/ Assignments/ Project on Real Analysis and its applications



BLUE PRINT OF QUESTION PAPER
(INSTRUCTIONS TO PAPER SETTER)
B.A./B.Sc. MATHEMATICS SEMESTER-IV
(REAL ANALYSIS)

***NOTE* :- Paper Setter Must select *TWO* Short Questions and *TWO* Easy Questions from Each Unit as Follows :-**

PAPER	TOPICS	5 MARKS QUESTIONS	10 MARKS QUESTIONS
UNIT – I	Sequence	1 (Prb)	1 (Th)
	Series	1 (Prb)	1 (Th)
UNIT - II	Continuity	2 (Prb)	1(Prb) + 1 (Th)
UNIT - III	Differentiation	2 (Prb)	2 (Prb)
UNIT - IV	Mean Value Theorems	1(Prb) + 1 (Th)	1(Prb) + 1 (Th)
UNIT - V	Riemann Integration	1(Prb) + 1 (Th)	2(Th)



VIKRAMA SIMHAPURI UNIVERSITY::NELLORE

(w.e.f. 2016-17)

B.A./B.Sc. SECOND YEAR MATHEMATICS

SEMESTER – IV

MODEL QUESTION PAPER

(REAL ANALYSIS)

Time: 3 Hours Max. Marks : 75

PART - A

I. Answer any FIVE of the following Questions : (5 X 5= 25 Marks)

1. Test for convergence $\Sigma \frac{1}{n^2+1}$.

2. Prove that the sequence $\{s_n\}$ where $s_n = \frac{1}{n+1} + \frac{1}{n+2} + \ldots + \frac{1}{n+n}$ is convergent.

3. Discuss various types of discontinuity.

4. Examine for continuity of a function $f(x) = |x| + |x-1|$ at x=0.

5. If $f(x) = \frac{x}{1+e^{\frac{1}{x}}}$ if $x \neq 0$ and $f(x) = 0$ if x=0 show that f is not derivable at x = 0.

6. Prove that $f(x) = x^2 \sin\left(\frac{1}{x}\right), x \neq 0$ and $f(0) = 0$ is derivable at the origin.

7. State cauchy's Mean value theorem.

8. Find 'C' of the Lagrange's mean value theorem for $f(x) = (x-1)(x-2)(x-3)$ on $[0,4]$.

9. If $f(x) = x^2$ on $[0,1]$ and $P = \left\{0, \frac{1}{4}, \frac{2}{4}, \frac{3}{4}, 1\right\}$ compute $L(P,f)$ and $U(P,f)$.

10. Prove that a constant function is Reiman integrable on $[a,b]$.

PART - B

II. Answer any FIVE of the following Questions. Choosing at least ONE Question from Each Section. (5 × 10 =50 Marks)

SECTION – A

UNIT - I

11. State and prove Bolzano-weierstrass theorem on sequence.
12. State and prove P-test.

UNIT - II

13. Discuss the continuity of $f(x)=\dfrac{x\left(\dfrac{1}{e^{x}}-e^{-\frac{1}{x}}\right)}{\dfrac{1}{e^{x}}+e^{-\frac{1}{x}}}$ for $x\neq 0$ and $f(0)=0$ at x = 0.
14. If f is continuous on $[a,b]$ and $f(a), f(b)$ having opposite signs then prove that there exist $C\in(a,b)$ ∋ $f(c)=0$.

UNIT - III

15. Show that $f(x)=x\sin\left(\dfrac{1}{x}\right), x\neq 0, f(x)=0$ when x=0 is continuous but not derivable at x=0.
16. Show that $f(x)=\dfrac{x\left(\dfrac{1}{e^{x}}-1\right)}{\dfrac{1}{e^{x}}+1}$ if $x\neq 0$ and $f(0)=0$ is continuous at x=0 but not derivable at x=0.

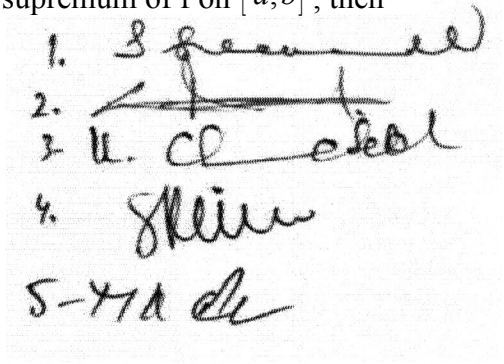
SECTION – B

UNIT - IV

17. State and prove Rolle's theorem.
18. Using Lagrange's theorem show that $x>\log(1+x)>\dfrac{x}{1+x}$ if $f(x)=\log(1+x)$.

UNIT - V

19. If $f:[a,b]\to R$ is monotonic on $[a,b]$ then f is integrable on $[a,b]$.
20. If $f\in R[a,b]$ and m, M are the infimum and supremum of f on $[a,b]$, then $m(b-a)\leq\int_{a}^{b}f(x)\,dx\leq M(b-a)$.



VIKRAMA SIMHAPURI UNIVERSITY::NELLORE

B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS

SEMESTER – V, PAPER- 5

RING THEORY & MATRICES

60 Hrs

UNIT – I (12 hrs) : Rings-I :-

Definition of Ring and basic properties, Boolean Rings, Zero Divisors of Ring - Cancellation laws in a Rings - Integral Domain Division Ring – Fields Examples.

UNIT –II (12 hrs) : Rings-II :-

Characteristic of Ring – Characteristic of an Integral Domain – Characteristic of Field Characteristic of Boo Loan Ring.

Sub Ring Definition – Sub ring test – Union and Intersection of sub rings – Ideal Right and left Ideals – Union and Intersection of Ideals. Excluding Principal prime and maximal Ideals.

UNIT –III (12 hrs) : Rings-III :-

Definition of Homomorphism – Homorphic Image – Elementary Properties of Homomorphism –Kernel of a Homomorphism – Fundamental theorem of Homomorhphism.

UNIT – IV (12 hrs) Matrix-I :-

Rank of a Matrix – Elementary operations – Normal form of a matrix Echecon from of a Matrix - Solutions of Linear Equations System of homogenous Linear equations – System of non Homogenous Linear Equations method of consistency.

UNIT – V (12 hrs) Matrix-II :-

Characteristic Roots, Characteristic Values & Vectors of square Matrix, Cayley – Hamilton Theorem.

Prescribed Text books:

1. Abstract Algebra by J. Fralieh, Published by Narosa Publishing house.
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.

Reference Books :-

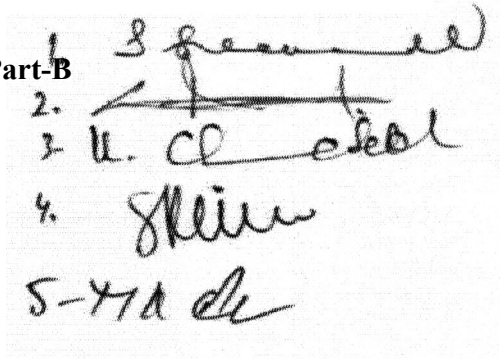
1. Rings and Linear Algebra by Pundir & Pundir, Published by Pragathi Prakashan.
2. Matrices by Shanti Narayana, published by S.Chand Publications.

Suggested Activities:

Seminar/ Quiz/ Assignments/ Project on Ring theory and its applications

Instruction to Paper Setter:

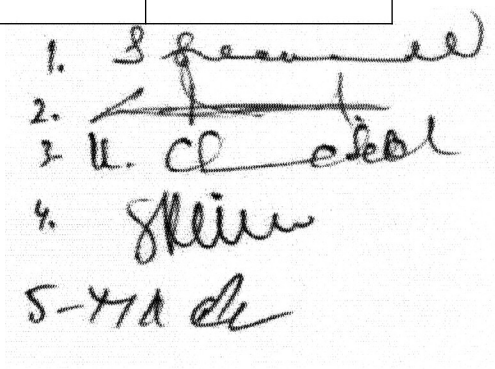
Two questions must be given from each unit in Part-A and Part-B



BLUE PRINT OF QUESTION PAPER
(INSTRUCTIONS TO PAPER SETTER)
B.A./B.Sc. MATHEMATICS SEMESTER-V (PAPER–5)
(RING THEORY AND MATRICES)

NOTE *:- Paper Setter Must select* ***TWO*** *Short Questions and* ***TWO*** *Easy Questions from Each Unit as Follows :-*

PAPER	TOPICS	5 MARKS QUESTIONS	10 MARKS QUESTIONS
UNIT – I	Boolean Rings	1 (Theorem)	
	Special Types of Rings	1 (Theorem)	2 (Theorems)
UNIT - II	Characteristic of a Ring	1 (Theorem)	1 (Theorem)
	Subrings and Ideals	1 (Theorem)	1 (Theorem)
UNIT - III	Homomorphism	2 (Theorems)	2 (Theorems)
UNIT - IV	Rank of a Matrix	1 (Problem)	1 (Problem)
	AX = 0 or AX = B	1 (Problem)	1 (Problem)
UNIT - V	Characteristic Equation	1 (Problem)	
	Eigen Values, Cayley Hamilton Theorem and Characteristic Vectors	1 (Problem)	2 (Problems)



VIKRAMA SIMHAPURI UNIVERSITY :: NELLORE.

B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS

SEMESTER – V, PAPER - 5

MODEL QUESTION PAPER

RING THEORY & MATRICES

Time: 3 Hours ***Max. Marks : 75***

PART - A

I. Answer any FIVE of the following Questions : (5 X 5= 25 Marks)

1. Define Types of rings and give one example for each.

2. If R is a Boolean ring then prove that $a+a=0\ \forall a\in R$.

3. If the characteristic of a ring is 2 and $ab=ba$ then prove that $(a+b)^2=a^2+b^2=(a-b)^2\ \forall a,b\in R$.

4. State and prove "Sub ring test".

5. If $f:R\to R^1$ be a homomorphism of a ring R into a ring R^1 and $0\in R$, $0^1\in R^1$ be the zero elements then prove (1) $f(0)=0^1$ (2) $f(-a)=-f(a)\ \forall a\in R$.

6. Prove that the Homorphic image of a Commutative ring is Commutative.

7. Obtain the rank of the matrix $A=\begin{bmatrix}-1 & 2 & 0\\ 3 & 7 & 1\\ 5 & 9 & 3\end{bmatrix}$.

8. Show that the system $x+2y+3z=0,\ 7x+13y+9z=0,\ 2x+3y+4z=0$ has trial solution only.

9. Find the characteristic equation of the matrix $A=\begin{bmatrix}0 & 1 & 2\\ 1 & 0 & -1\\ 2 & -1 & 0\end{bmatrix}$.

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

PART - B

Answer any FIVE of the following Questions.
Choosing at least ONE Question from Each Section. ***(5 × 10 =50 Marks)***

SECTION - A

UNIT - I

11. Prove that A division ring has no zero divisors.

12. Prove that A finite integral domain is a field.

UNIT - II

13. Prove that characteristic of Booliean Ring is 2.

14. Prove that A field has no proper ideals.

UNIT - III

15. If 'f ' is a homomorphism of a ring 'R' in to the ring $_R1$ then prove that 'f ' is an into isomorphism iff test = $\{0\}$.

16. Prove that every quotient ring of a ring is a homomorphic image of the ring.

SECTION - B

UNIT - IV

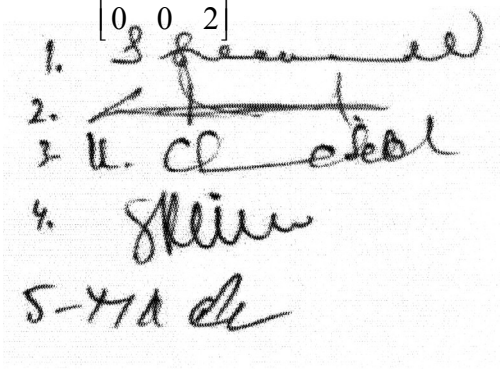
17. Reduce the Matrix $A=\begin{bmatrix}1 & 2 & 3 & 0\\ 2 & 4 & 3 & 2\\ 3 & 2 & 1 & 3\\ 6 & 8 & 7 & 5\end{bmatrix}$ into echelon form and hence find its rank.

18. Show that the equations $x+y+z-3=0,\ 3x-5y+2z-8=0,\ 5x-3y+4z-14=0$ are consistent and solve them.

UNIT - V

19. If $A=\begin{bmatrix}2 & 1 & 2\\ 5 & 3 & 3\\ -1 & 0 & -2\end{bmatrix}$ verfy cayley – Hamilton theorem. Hence find $_A-1$.

20. Find the characteristic roots and vectors to the matrix $A=\begin{bmatrix}2 & 1 & 0\\ 0 & 2 & 1\\ 0 & 0 & 2\end{bmatrix}$.



VIKRAMA SIMHAPURI UNIVERSITY::NELLORE

B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS

SEMESTER – V, PAPER -6

LINEAR ALGEBRA

60 Hrs

UNIT – I (12 hrs) : 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 hrs) : 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 Quotientspace.

UNIT –III (12 hrs) : 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 hrs) : (Inner product space-I) :

Inner product spaces, Euclidean and unitary spaces, Norm or length of a Vector, Schwartz inequality, Triangle in Inequality, Parallelogram law.

UNIT –V (12 hrs) : (Inner product space-II) :

Orthogonal and Orthonormal Vectors, Orthogonal and Orthonormal Sets of Inner product Space, Phythagoras theorem, The Diagonals are perpendicular in a rhombus, orthogonal set of non-zero vectos is linearly independent, orthonormal set of vectors is liner independent, Gram-schmidt Orthogonalisation process, Bessel's Inequality and parseval's Identity.

Reference Books :

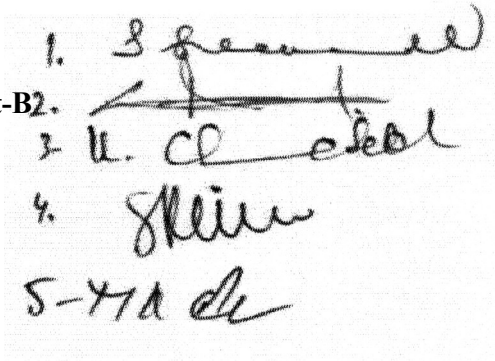
1. Linear Algebra by J.N. Sharma and A.R. Vasista, published by Krishna Prakashan Mandir, Meerut-250002.
2. Linear Algebra by Kenneth Hoffman and Ray Kunze, published by Pearson Education (low priced edition), New Delhi.
3. Linear Algebra by Stephen H. Friedberg et al published by Prentice Hall of India Pvt. Ltd. 4th Edition 2007.

Suggested Activities :

Seminar/ Quiz/ Assignments/ Project on "Applications of Linear algebra Through Computer Sciences"

Instruction to Paper Setter:

Two questions must be given from each unit in Part-A and Part-B



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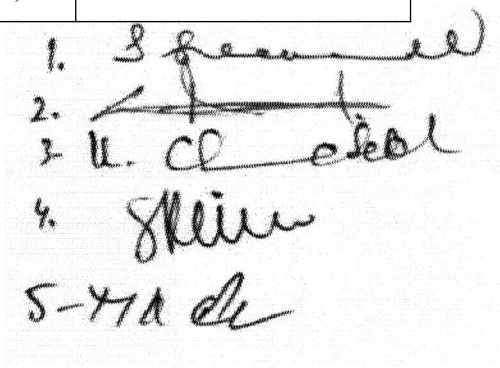
(INSTRUCTIONS TO PAPER SETTER)
B.A./B.Sc. MATHEMATICS SEMESTER-V (PAPER–6)
(LINEAR ALGEBRA)

***NOTE** :- Paper Setter Must select **TWO** Short Questions and **TWO** Easy Questions from Each Unit as Follows :-*

PAPER	TOPICS	5 MARKS QUESTIONS	10 MARKS QUESTIONS
UNIT – I	Subspace	1 (Theorem)	1 (Theorem)
	Linear Combination, Linear dependent and Independent	1 (Problem)	1 (Theorem)
UNIT - II	Basis of a vector Space	1 (Problem) 1 (Theorem)	1 (Theorem) 1 (Problem)
UNIT - III	Linear Transformation	2 (Problems)	
	Range, Null Space, Rank		1 (Theorem) 1 (Problem)
UNIT - IV	Inner Product Space	1 (Problem) 1 (Theorem)	2 (Theorems)
UNIT - V	Orthogonal and Orthonormal Vectors	1 (Problem) 1 (Theorem)	2 (Theorems)



VIKRAMA SIMHAPURI UNIVERSITY :: NELLORE

B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS

SEMESTER – V, PAPER - 6

MODEL QUESTION PAPER

LINEAR ALGEBRA

Time: 3 Hours ***Max. Marks : 75***

PART - A

I. Answer any <u>FIVE</u> of the following Questions : ***(5 X 5= 25 Marks)***

1. Prove that intersection of two subspaces is again a subspace.

2. Show that the system of vector $(1,3,2),(1,-7,-8),(2,1,-1)$ of $V_3(R)$ is Linearly dependent.

3. State and prove "Invariance theorem".

4. Show that the vectors $(1,1,2),(1,2,5),(5,3,4)$ of $R^3(R)$ do not form a basis set of $R^3(R)$.

5. Show that the mapping $T:V_3(R)\to V_2(R)$ is defined by $T:(x,y,z)=(x-y,x-z)$ is a Linear Transformation.

6. $T:V_3(R)\to V_2(R)$ and $H:V_3(R)\to V_2(R)$ be two Linear Transformations $T(x,y,z)=(x-y,y+z)$ and $H(x,y,z)=(2x,y-3)$ Find (i) H+T (ii) aH.

7. State and prove Triangle Inequality.

8. If α,β are two vectors in Euclidean space $V(R)$ such that $\|\alpha\|=\|\beta\|$ prove that $(\alpha+\beta,\alpha-\beta)=0$.

9. In an inner product space prove that $u-v_1,\ u+v$ are orthogonal if $\|u\|=\|v\|$.

10. State and prove Pythagoras Theorem.

PART - B

Answer any FIVE of the following Questions.
Choosing at least ONE Question from Each Section. ***(5 × 10 =50 Marks)***

SECTION - A

UNIT - I

11. If $V(F)$ be a vector space. $\omega \subseteq V$. Prove that the necessary and sufficient conditions for ω to be a subspace of V are

(i) $\alpha \in \omega, \beta \in \omega \Rightarrow \alpha - \beta \in \omega$

(ii) $a \in F, \alpha \in \omega \Rightarrow a\alpha \in \omega$.

12. If show that are the sub sets of a vector space $v(F)$ then prove that $L(S \cup T) = L(S) + L(T)$.

UNIT - II

13. State and prove Basis Existence theorem.

14. ω_1 and ω_2 be two subspaces of R^4.

$\omega_1 = \{(a,b,c,d) : b - 2c + d = 0\}$

$\omega_2 = \{(a,b,c,d) : a = d, b = 2c\}$

Find dim $(\omega_1 + \omega_3)$

UNIT - III

15. Find $T(x,y,z)$ where $T : R^3 \to R$ is defined by $T(1,1,1) = 3$,

$T(0,1,-2) = 1$, $T(0,0,1) = -2$.

16. Define Null space. Prove that Null space $N(T)$ is subspace of $U(F)$ where $T : U \to V$ is a Linear Transformation.

SECTION - B

UNIT - IV

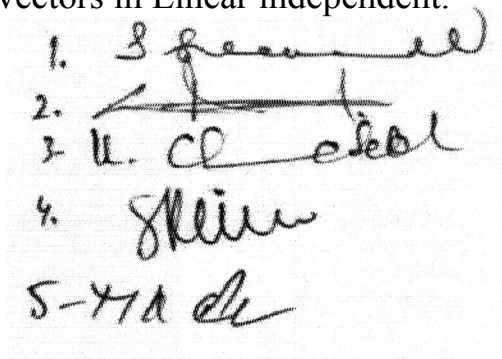
17. State and prove parallelogram Law.

18. If α, β and two vectors in an I.P.S. then prove that α, β are Linear Independent iff $|(\alpha, \beta)| = \|\alpha\| \|\beta\|$.

UNIT - V

19. Prove that in an I.P.S. any orthonormal set of vectors in Linear independent.

20. State and prove Bessel's inequality.



VIKRAMA SIMHAPURI UNIVERSITY::NELLORE

B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS

SEMESTER – VI, PAPER – VII-(A)

VECTOR CALCULUS

60 Hrs

UNIT – I (12 hrs) : Vector Differentiation – I :-

Vector Function of Scalar Variable continuity of a vector function partial differentiation scalar point Faction vector point faction – Gradient of a scalar point Function – Unit normal – Directional Derivative at a Point – Angle between two surfaces.

UNIT – II (12 hrs) : Vector Differentiation – II :-

Vector differential Operator – Scalar Differential Operator – Divergence of a vector – Solenoidal vector – Laplacian operator – curl of a vector – Ir rotational Vector – Vector identities.

UNIT – III (12 hrs) : Vector Integration - I :-

Definition – Integration of a vector – simple problems – smooth curve – Line integral – Tangential Integral – circulation Problems on line Integral. Surface Integral – Flux Problems on Surface Integral.

UNIT – IV(12 hrs) : Vector Integration - II :-

Volume Integrals – Gauss Divergence Theorem statement and proof – Applications of Gauss Divergence theorem.

UNIT – V (12 hrs) : Vector Integration - III :-

Green's Theorem in a plane Statement and proof – Application of Green's Theorem.

Statement and Proof of Stoke Theorem – Application of stoke Theorem.

Prescribed Text books:

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

Reference Books :-

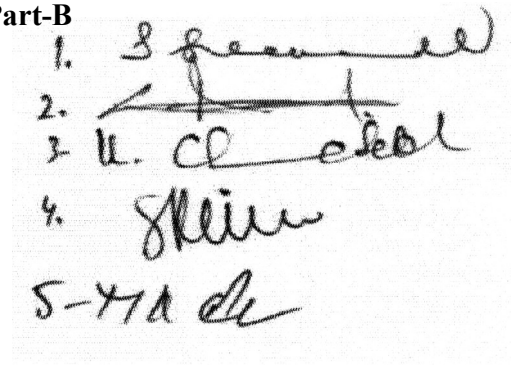
1. Vector Calculus by Santhi Narayana, Published by S. Chand & Company Pvt. Ltd., New Delhi.
2. Vector Calculus by R. Gupta, Published by Laxmi Publications.
3. Vector Calculus by P.C. Matthews, Published by Springer Verlag publicattions.

Suggested Activities:

Seminar/ Quiz/ Assignments/ Project on Vector Calculus and its applications

Instruction to Paper Setter:

Two questions must be given from each unit in Part-A and Part-B



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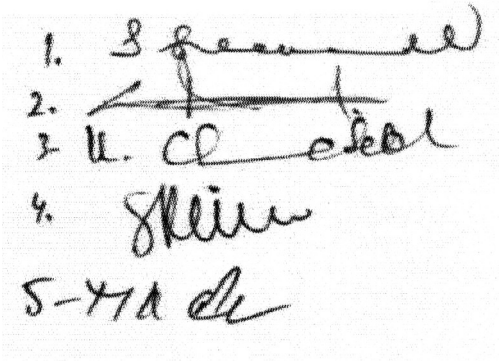
(INSTRUCTIONS TO PAPER SETTER)
B.A./B.Sc. MATHEMATICS
(SEMESTER-VI) PAPER–VII-(A)
VECTOR CALCULUS

NOTE* :- *Paper Setter Must select TWO Short Questions and TWO Easy Questions from Each Unit as Follows :-

UNIT	TOPICS	5 MARKS QUESTIONS	10 MARKS QUESTIONS
UNIT - I	Introductions Gradient	2 (Problems)	-
	Unit Normal, Directional Derivates Angle Between two Surfaces	-	2 (Problems)
UNIT - II	Degree of a vector Curl, Solenoidal, Ir rotational	2 (Problems)	
	Laplace operator Vector identities	-	1(Problem)+ 1(Theorem)
UNIT - III	Integration of a Vector	2 (Problems)	
	Line Integral	-	1(Problem)
	Surface Integral	-	1(Problem)
UNIT - IV	Volume Integral Gauss Divergence	2 (Problems)	-
	Gauss Divergence Theorem	-	1 (Theorem) 1 (Problem)
UNIT - V	Green's Theorem + Stoke Theorem	1 (Theorem) 1 (Problem)	1 (Theorem) 1 (Problem)



VIKRAMA SIMHAPURI UNIVERSITY :: NELLORE.

B.A./B.Sc. THIRD YEAR MATHEMATICS

SEMESTER – VI, PAPER – VII-(A)

VECTOR CALCULUS

MODEL QUESTION PAPER

TIME : 3 Hours ***Max.Marks : 75***

PART – A

I. Answer any FIVE Questions : ***5 X 5 = 25M***

1. Prove that $\nabla\left(\frac{1}{r}\right) = \frac{-\vec{r}}{\hat{} 3}$.

2. Find grad f at $(1,1,-2)$ when $f = x^3 + y^3 + 3xyz$.

3. If $\vec{f} = xy^2 i + 2x^2 yzj + 3yz^2 k$ find curl $\vec{f}$ at (1,-1,1).

4. Define solenoidal vector show that $3y^4 3^2 i + 4x^3 z^3 j + 3x^2 y^2 k$ is solenoidal.

5. If $\vec{F}(t) = \left(t - t^2\right) i + 2t^3 j - 3\bar{k}$ find $\int_1^2 \vec{F}(t)\, dt$.

6. If $\bar{A} = ti - t^2 j + (t-1)\bar{k}$

$\bar{B} = 2t^2 i + 6t\bar{k}$

$\int_0^2 \left(\bar{A} \times \bar{B}\right) dt$.

7. By Divergence theorem evaluate $\int_s \vec{F}.\vec{n}\, ds$ where $\vec{F} = 4xyi + y3j - xz\bar{k}$ when sin the surface x=0, x=1, y=0, y-1, z=0, z=1.

8. Applying Gauss theorem to prove $\int_s N\phi ds = \int_v \nabla\phi dr$.

9. State and prove Green's theorem.

10. Evaluate by stoke theorem $\int_s \vec{F}.d\bar{r}$ when $\vec{F} = yzi + 3xj + xyk$ and C is the curve $x^2 + y^2 = 1, z = y^2$.

PART - B

Answer any FIVE of the following Questions.
Choosing at least ONE Question from Each Section. ***(5 × 10 =50 Marks)***

SECTION - A

UNIT - I

11. If $a = x + y + z, b = x^2 + y^2 + z^2, c = xy + yz + 3x$ prove that $[\nabla a, \nabla b, \nabla c] = 0$.

12. Find the Directional derivative of $f = xy + yz + zx$ in the direction of the vector $i + 2j + 2k$ at $(1,2,0)$.

UNIT - II

13. Prove that $div(\bar{A} \times \bar{B}) = \bar{B}\ curl\bar{A} - \bar{A}\ curl\bar{B}$.

14. Prove that $\nabla^2\left(\frac{x}{r^3}\right) = 0$.

UNIT - III

15. If $\vec{F} = 3xyi - y^2 j$ evaluate $\int_c \hat{F}, d\bar{r}$ when C is the curve $y = 2x^2$ in xy plane from $(0,0)$ to $(1,2)$.

16. If $\vec{F} = 2yi - 3j + x^2 k$ and S is the surface $y^2 = 8x$ in the front octant bounded by the planes $y = 4$ and $z = 6$. Evaluate $\int_s \vec{F}.\vec{n}\, ds$.

SECTION - B

UNIT - IV

17. State and prove Gauss's Divergence theorem.

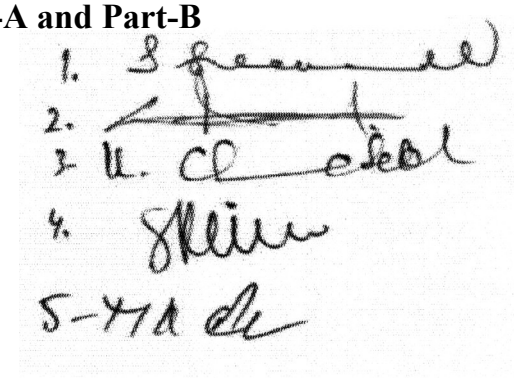
18. If $\vec{F} = (2x^2 - 3z)i - 2xyj - 4x\bar{x}$ then evaluate $\int_v dir\vec{F}dr$ when V is the closed region bounded by the planer x = 0, y = 0, z = 0 and $2x + 2y + z = 4$.

UNIT - V

19. Evaluate by Green's Theorem.
$\int_c (3x^2 - 8y^2)dx(4y - 6xy)\,dy$ when C is the boundary defiled by $x = 0, y = 0, x + y = 1$.

20. State and prove stock's Theorem.

Instruction to Paper Setter:
Two questions must be given from each unit in Part-A and Part-B



VIKRAMA SIMHAPURI UNIVERSITY::NELLORE

B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS

SEMESTER – VI, PAPER – VII-(B)

ELECTIVE–VII-(B); OPERATIONS RESEARCH

60 Hrs

UNIT-I ***(12 hrs)*****:**

Introduction to Operations Research, Definition of OR, Applications of OR, Limitations of OR, Linear programming problem (LPP), Introduction, Mathematical formulation of the LPP, Applications and Limitation of LPP.

UNIT-II ***(12 hrs)*****:**

Linear Programming Problem – Solution of LPP Using Graphical Method and Simplex Method (≤inequality only).

UNIT-III ***(12 hrs)*****:**

Transportation problem: Mathematical formulation, IBFS of transportation problem using north-west corner rule, least-cost rule and Vogel's approximation method, Simple problems.

UNIT-IV ***(12 hrs)*****:**

Assignment problem, definition, mathematical formulation of assignment problem, solution of assignment problem using Hungarian algorithm, unbalanced assignment problem, simple problems, Difference between Assignment and transportation Problem.

UNIT-V ***(12 hrs)*****:**

Introduction – Definition – Terminology and Notations Principal Assumptions,
Problems with n Jobs through Two Machines
Problems with n Jobs through Three Machines

Prescribed Text Book:

Operations Research (2nd Edition) by S.Kalavathi, Vikas Publications Towers Pvt. Ltd.

Scope:

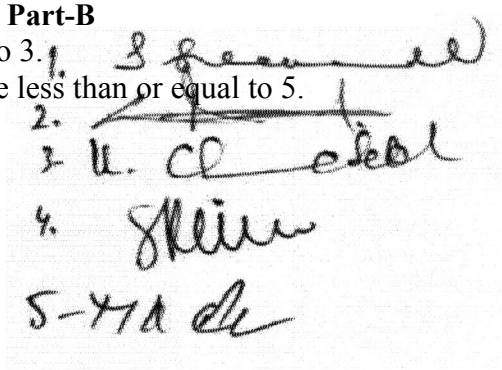
UNIT-I: 1.1, 1.2, 1.3, 1.5, 1.6, 1.7
UNIT-II: 2.1, 2.2, 2.2.1, 2.2.2, 3.1, 3.1.1, 4.1, 4.2, 4.3
UNIT-III: 8.1, 8.2, 8.3, 8.4.1, 8.4.2, 8.4.3
UNIT-IV: 9.1, 9.2, 9.2.1, 9.2.2, 9.3, 9.4
UNIT-V: 12.1, 12.2, 12.2.1, 12.2.2, 12.3, 12.4

Reference books:

1. Operations Research by Kanthiswaroop, P.K.Gupta, Manmohan by Sultan Chand & Sons
2. Operations Research by SD. Sharma, Published by Kedhar Nath ram Nath – Meerut.

INSTRUCTIONS TO PAPER SETTER:-

1. **Two questions must be given from each unit in Part-A and Part-B**
2. Number of constraints in LPP should be less than or equal to 3.
3. The order of transportation and assignment matrix should be less than or equal to 5.



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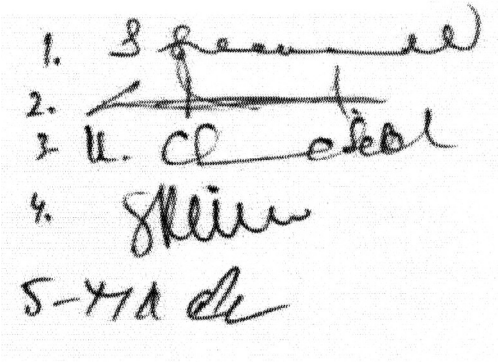
(INSTRUCTIONS TO PAPER SETTER)
B.A./B.Sc. MATHEMATICS
SEMESTER – VI, PAPER – VII-(B)
ELECTIVE–VII-(B); OPERATIONS RESEARCH

***NOTE* :- Paper Setter Must select *TWO* Short Questions and *TWO* Easy Questions from Each Unit as Follows :-**

UNIT	TOPICS	5 MARKS QUESTIONS	10 MARKS QUESTIONS
UNIT - I	Introduction of OR	1(Theory)	1(Theory)
	LPP	1(Theory)	1 (Problem)
UNIT - II	Simplex Graphical Method	1(Theory) 1(Problem)	2(Problems)
UNIT - III	Transportation	1(Theory) 1(Problem)	2(Problems)
UNIT - IV	Assignment problem	1(Theory) 1(Problem)	2(Problems)
UNIT - V	sequencing Jobs	1(Theory) 1(Problem)	2(Problems)



VIKRAMA SIMHAPURI UNIVERSITY :: NELLORE.

B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS

SEMESTER – VI, PAPER – VII-(B)

ELECTIVE–VII-(B); OPERATIONS RESEARCH

MODEL QUESTION PAPER

TIME : 3 Hours ***Max.Marks : 75***

PART – A

I. Answer any FIVE Questions : ***5 X 5 = 25M***

1. Explain the origin and development of operation research.

2. Explain the procedure to formulate a linear programming problem.

3. Explain the Simplex method to solve a linear programming problem.

4. Solve the following LPP by using graphical method

$\max z = 8x_1 + 5x_2$

Subject to : $2x_1 + x_2 \le 500$

$x_1 \le 150$

$x_2 \le 250$

$x_1, x_2 \ge 0$

5. Explain the mathematical formulation of transportation problem.

6. Determine an initial basic feasible solution to the following transportation problem using North west corner rule.

	D_1	D_2	D_3	D_4	Supply
O_1	6	4	1	5	14
O_2	8	9	2	7	16
O_3	4	3	6	2	5
Demand	6	10	15	4	

7. Explain the difference between transportation and assignment problem.

8. Solve the following Assignment problem which Minimize the Total Cost.

	A	B	C	D
1	10	25	15	20
2	15	30	5	15
3	35	20	12	24
4	17	25	24	20

9. Explain the assumptions involved in sequencing problem.

10. There are five jobs each of which must go through the two machines A and B in the order A,B processing times are given below.

JOB	**1**	**2**	**3**	**4**	**5**
Machine-A	5	1	9	3	10
Machine-B	2	6	7	8	4

Determine a sequence for the five jobs that will minimize the total elapsed time.

PART - B

Answer any <u>FIVE</u> of the following Questions.
Choosing at least <u>ONE</u> Question from Each Section. ***(5 X 10 = 50Marks)***

SECTION - A

UNIT - I

11. Explain advantages and limitations of operations research.

12. A paper mill produces two grades of paper namely x and y owing to raw material restrictions it cannot produce more than 400 tons of grade x and 300 tons of grade y in a week. There are 160 production hours in a week. It requires 0.2 and 0.4 hours to produce a ton of products x and y respectively with corresponding profits of Rs. 200/- and Rs. 500/- per ton. Formulate the above as an LPP to maximize profit.

UNIT - II

13. Solve the LPP by using graphical method

objective function : $\max z = 3x_1 + 4x_2$

Subject to : $4x_1 + 2x_2 \leq 80$

$2x_1 + 5x_2 \leq 180$

$x_1 \geq 0,\ x_2 \geq 0$

14. Use simplex method to solve the LPP.

objective function : $\max z = 3x_1 + 2x_2$

Subject to : $x_1 + x_2 \leq 4$

$x_1 - x_2 \leq 2$

$x_1, x_2 \geq 0$

UNIT - III

15. Use vogel's approximation method to obtain an initial basic feasible solution of the transportation problem.

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	

16. Find the initial basic feasible solution for the following data using least cost method.

	A	B	C	Available
1	2	7	4	5
2	3	3	1	8
3	5	4	7	7
4	1	6	2	14
Demand	7	9	18	

SECTION - B

UNIT - IV

17. A department head has four tasks to be performed and three subordinates, the subordinates differ in efficiency the estimates of the time, each subordinate would take to perform is given below in the matrix. How should he allocate the tasks one to each man, so as to minimize the total Men - Hours?

	MEN		
Task	***1***	***2***	***3***
I	9	26	15
II	13	27	6
III	35	20	15
IV	18	30	20

18. Solve the following assignment problem in order to minimize the total cost. The matrix given below gives the assignment cost when different operators are assigned to various machines.

	I	*II*	*III*	*IV*	*V*
A	30	25	33	35	36
B	23	29	38	23	26
C	30	27	22	22	22
D	25	31	29	27	32
E	27	29	30	24	32

UNIT - V

19. In a factory, there are Six Jobs to perform, each of which should go through two machines A and B, in the order A, B. The processing time (in hours) for the Jobs are given below. You are required to determine the sequence for performing the Jobs that would minimize the total elapsed time T, what is the value of T?

JOB	J_1	J_2	J_3	J_4	J_5	J_6
Machine-A	1	3	8	5	6	3
Machine-B	5	6	3	2	2	10

20. We have five jobs each of which must go through the machines A,B and C in the order A,B,C. Determine the sequence that will minimize the total elapsed time.

JOB	***1***	***2***	***3***	***4***	***5***
Machine-A	5	7	6	9	5
Machine-B	2	1	4	5	3
Machine-C	3	7	5	6	7

Instruction to Paper Setter :

Two questions must be given from each unit in Part-A and Part-B

VIKRAMA SIMHAPURI UNIVERSITY::NELLORE

B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS

SEMESTER – VI, PAPER – VII-(C)

ELECTIVE– VII-(C) : NUMBER THEORY

60 Hrs

UNIT-I (12 hours)

Divisibility – Greatest Common Divisor – Euclidean Algorithm – The Fundamental Theorem of Arithmetic

UNIT-II (12 hours)

Congruences – Special Divisibility Tests - Chinese Remainder Theorem- Fermat"s Little Theorem – Wilson"s Theorem – Residue Classes and Reduced Residue Classes – Solutions of Congruences

UNIT-III (12 hours)

Number Theory from an Algebraic Viewpoint – Multiplicative Groups, Rings and Fields

UNIT-IV (12 hours)

Quadratic Residues - Quadratic Reciprocity – The Jacobi Symbol

UNIT-V (12 hours)

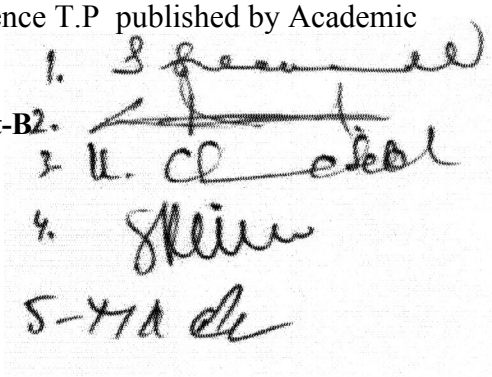
Greatest Integer Function – Arithmetic Functions – The Moebius Inversion Formula

Reference Books:

1. "Introduction to the Theory of Numbers" by Niven, Zuckerman & Montgomery (John Wiley & Sons)
2. "Elementary Number Theory" by David M. Burton.
3. Elementary Number Theory, by David, M. Burton published by 2nd Edition (UBS Publishers).
4. Introduction to Theory of Numbers, by Davenport H., Higher Arithmetic published by 5th Edition (John Wiley & Sons) Niven,Zuckerman & Montgomery.(Camb, Univ, Press)
5. Number Theory by Hardy & Wright published by Oxford Univ, Press.
6. Elements of the Theory of Numbers by Dence, J. B & Dence T.P published by Academic Press.

Instruction to Paper Setter:

Two questions must be given from each unit in Part-A and Part-B



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B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS

SEMESTER – VI, PAPER – VIII-A-1

Cluster Elective –VIII-A-1; LAPLACE TRANSFORMS

60 Hrs

UNIT – 1 (12 hrs) Laplace Transform I : -

Definition of - Integral Transform – Laplace Transform Linearity, Property, Piecewise continuous Functions, Existence of Laplace Transform, Functions of Exponential order, and of Class A. Linear property, First Shifting Theorem.

UNIT – 2 (12 hrs) Laplace Transform II : -

Second Shifting Theorem, Change of Scale Property, Laplace Transform of the derivative of f(t), Initial Value theorem and Final Value theorem.

UNIT – 3 (12 hrs) Laplace Transform III : -

Laplace Transform of Integrals – Multiplication by t, Multiplication by t^n – Division by t.

UNIT –4 (12 hrs) Inverse Laplace Transform I : -

Definition of Inverse Laplace Transform. Linearity, Property, First Shifting Theorem, Second Shifting Theorem, Change of Scale property, use of partial fractions, Examples.

UNIT –5 (12 hrs) Inverse Laplace Transform II : -

Inverse Laplace transforms of Derivatives–Inverse Laplace Transforms of Integrals – Multiplication by Powers of „P'– Division by powers of „P'– Convolution Definition – Convolution Theorem – proof and Applications – Heaviside's Expansion theorem and its Applications.

Prescribed Text Books :-

Integral Transforms by A.R. Vasistha and Dr. R.K. Gupta Published by Krishna Prakashan Media Pvt. Ltd. Meerut.

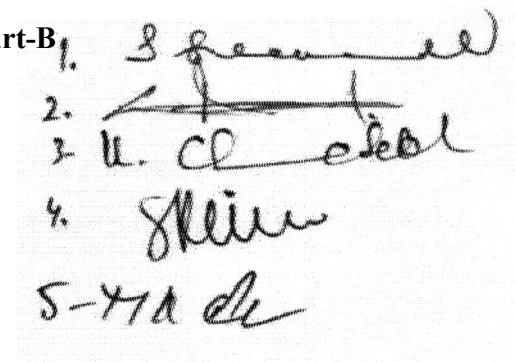
Reference Books :-

1. Laplace Transforms by A.R. Vasistha and Dr. R.K. Gupta Published by Krishna Prakashan Media Pvt. Ltd. Meerut.
2. Fourier Series and Integral Transforms by Dr. S. Sreenadh Published by S.Chand and Co., Pvt. Ltd., New Delhi.
3. Laplace and Fourier Transforms by Dr. J.K. Goyal and K.P. Gupta, Published by Pragathi Prakashan, Meerut.
4. Integral Transforms by M.D. Raising hania, - H.C. Saxsena and H.K. Dass Published by S. Chand and Co., Pvt.Ltd., New Delhi.

Suggested Activities: Seminar/ Quiz/ Assignments

Instruction to Paper Setter:

Two questions must be given from each unit in Part-A and Part-B



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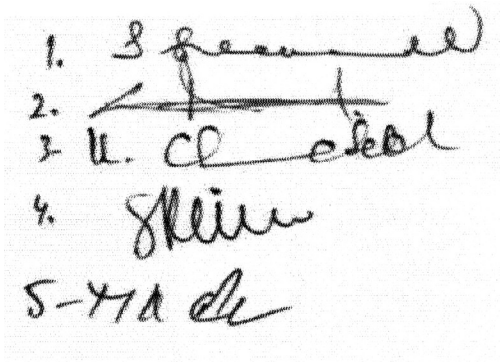
B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS

SEMESTER – VI, PAPER – VIII-A-1

Cluster Elective –VIII-A-1; LAPLACE TRANSFORMS

NOTE :- Paper Setter Must select TWO Short Questions and TWO Easy Questions from Each Unit as Follows :-

PAPER	5 MARKS QUESTIONS	10 MARKS QUESTIONS
UNIT – I	2 (Problems)	1 (Theorem) & 1 (Problem)
UNIT – II	1 (Theorem) & 1 (Problem)	1 (Theorem) & 1 (Problem)
UNIT – III	2 (Problems)	1 (Theorem) & 1 (Problem)
UNIT – IV	1 (Theorem) & 1 (Problem)	1 (Theorem) & 1 (Problem)
UNIT – V	2 (Problems)	1 (Theorem) & 1 (Problem)



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B.A./B.Sc. THIRD YEAR MATHEMATICS

SEMESTER – VI, PAPER – VIII-A-1

Cluster Elective –VIII-A-1; LAPLACE TRANSFORMS

MODEL QUESTION PAPER

TIME : 3 Hours ***Max.Marks : 75***

PART – A

I. Answer any FIVE Questions : ***5 X 5 = 25M***

1. Find $L\left\{ e^{-t}(3\sinh 2t - 5\cosh 2t)\right\}$.

2. Find $L\left\{ F(t)\right\}$ Where $F(t) = \begin{cases} 0, & 0 < t < 1 \\ t, & 1 < t < 2 \\ 0, & t > 2 \end{cases}$

3. State and prove second shifting theorem in Laplace Transforms.

4. Applying change of scale property, find $L\left\{ \cos 5t\right\}$.

5. Find $L\left\{ t(3\sin 2t - 2\cos 2t)\right\}$.

6. Show that $\int_0^{\alpha} t\, e^{-2t}\cos t\, dt = \frac{3}{25}$.

7. State and prove first shifting Theorem in Inverse Laplace Transforms.

8. $L^{-1}\left\{\frac{3P-2}{P^2-4P+20}\right\}$.

9. Find $L^{-1}\left\{\log\frac{P+3}{P+2}\right\}$.

10. Find $L^{-1}\left\{\frac{1}{P(P+1)^3}\right\}$.

PART - B

Answer any FIVE of the following Questions.
Choosing at least ONE Question from Each Section. ***(5 × 10 =50 Marks)***

SECTION - A

UNIT - I

11. Define Laplace Transforms. State and prove linear property of Laplace Transforms.

12. Find $L\{\sin at\}$ and $L\{\cos at\}$ and hence obtain $L\{\sin^2 at\}$.

UNIT - II

13. State and prove initial value theorem.

14. Find $L\{F(t)\}$ where $F(t)=\begin{cases}\cos\left(t-\frac{2}{3}\pi\right) & ,t>\frac{2\pi}{3}\\ 0 & ,t<\frac{2\pi}{3}\end{cases}$

UNIT - III

15. If $L\{F(t)\}=f(p)$ then prove that $L\left\{\int_0^t F(x)\,dx\right\}=\frac{1}{p}L\{F(t)\}$.

16. Prove that $L\left\{\frac{\sin t}{t}\right\}=\text{Tan}^{-1}\frac{1}{P}$ and hence find $L\left\{\frac{\sin at}{t}\right\}$.

SECTION - B

UNIT - IV

17. State and prove change of scale property in Inverse Laplace Transforms.

18. Prove that $L^{-1}\left\{\frac{P}{(P^2-2P+2)(P^2+2P+2)}\right\}=\frac{1}{2}\sin t\sinh t$.

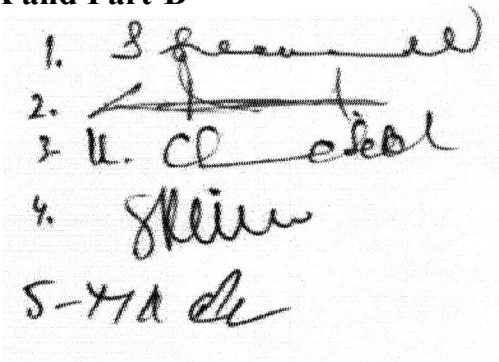
UNIT - V

19. State and prove Heaviside's expansion theorem.

20. Use Convolution theorem to find $L^{-1}\left\{\frac{1}{P\sqrt{P+1}}\right\}$.

Instruction to Paper Setter:

Two questions must be given from each unit in Part-A and Part-B



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B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS,

SEMESTER – VI, CLUSTER – A, PAPER – VIII-A-2

Cluster Elective- VIII-A-2: INTEGRAL TRANSFORMS

60 Hrs

UNIT – 1 (12 hrs) Application of Laplace Transform to solutions of Differential Equations : -

Solutions of ordinary Differential Equati6ons.

Solutions of Differential Equations with constants co-efficient Solutions of Differential Equations with Variable co-efficient

UNIT – 2 (12 hrs) Application of Laplace Transform : -

Solutions of partial Differential Equations.

UNIT – 3 (12 hrs) Application of Laplace Transforms to Integral Equations : -

Definitions : Integral Equations-Abel's, Integral Equation-Integral Equation of Convolution Type, Integro Differential Equations. Application of L.T. to Integral Equations.

UNIT –4 (12 hrs) Fourier Transforms-I : -

Definition of Fourier Transform – Fourier's in Transform – Fourier cosine Transform – Linear Property of Fourier Transform – Change of Scale Property for Fourier Transform – sine Transform and cosine transform shifting property – modulation theorem.

UNIT – 5 (12 hrs) Fourier Transform-II : -

Convolution Definition – Convolution Theorem for Fourier transform – parseval's Indentify – Relationship between Fourier and Laplace transforms – problems related to Integral Equations.

Prescribed Text Books :-

Integral Transforms by A.R. Vasistha and Dr. R.K. Gupta Published by Krishna Prakashan Media Pvt. Ltd. Meerut.

Reference Books :-

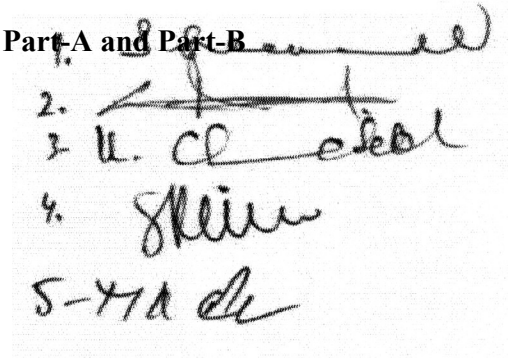
1. Laplace Transforms by A.R. Vasistha and Dr. R.K. Gupta Published by Krishna Prakashan Media Pvt. Ltd. Meerut.
2. Fourier Series and Integral Transforms by Dr. S. Sreenadh Published by S.Chand and Co., Pvt. Ltd., New Delhi.
3. Laplace and Fourier Transforms by Dr. J.K. Goyal and K.P. Gupta, Published by Pragathi Prakashan, Meerut.
4. Integral Transforms by M.D. Raising hania, - H.C. Saxsena and H.K. Dass Published by S. Chand and Co., Pvt.Ltd., New Delhi.

Suggested Activities:

Seminar/ Quiz/ Assignments

Instruction to Paper Setter:

Two questions must be given from each unit in Part-A and Part-B



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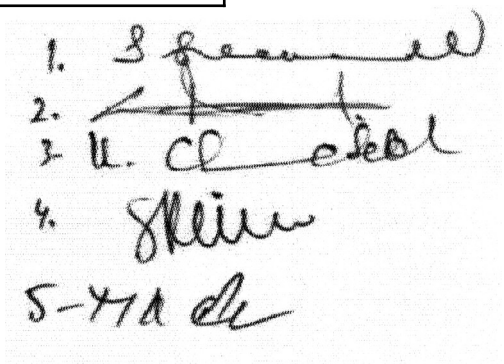
SEMESTER – VI, CLUSTER – A, PAPER – VIII-A-2
Cluster Elective- VIII-A-2: INTEGRAL TRANSFORMS

NOTE *:- Paper Setter Must select* ***TWO*** *Short Questions and* ***TWO*** *Easy Questions from Each Unit as Follows :-*

PAPER	5 MARKS QUESTIONS	10 MARKS QUESTIONS
UNIT – I	2 (Problems)	2 (Problems)
UNIT – II	2 (Problems)	2 (Problems)
UNIT – III	2 (Problems)	2 (Problems)
UNIT – IV	1 (Theorem) & 1 (Problem)	1 (Theorem) & 1 (Problem)
UNIT – V	1 (Theorem) & 1 (Problem)	2 (Theorems)



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B.A./B.Sc. THIRD YEAR MATHEMATICS

SEMESTER – VI, CLUSTER – A, PAPER – VIII-A-2

Cluster Elective- VIII-A-2: INTEGRAL TRANSFORMS

MODEL QUESTION PAPER

TIME : 3 Hours ***Max.Marks : 75***

PART – A

I. Answer any FIVE Questions : ***5 X 5 = 25M***

1. Solve $\frac{d^2y}{dx^2} + y = 0$.

2. $\left(D^2 + 2D + 1\right)y = 3te^{-t}$ find $L\{y\}$.

3. If $y(x,t)$ is a function of x and t prove that $L\left\{\frac{\partial y}{\partial t}\right\} = p\bar{y}(x,p) - y(x,0)$.

4. Solve $\frac{\partial^2 y}{\partial x^2} - \frac{\partial^2 y}{\partial t^2} = xt$ when $y = 0 = \frac{\partial y}{\partial t}$ at $t = 0$ and $y(0,t) = 0$.

5. Define Abel's Integral Equation give One Example.

6. Solve $\int_0^t F(\mu)F(t-\mu)\,d\mu = 16\sin 4t$.

7. State and prove Linear property of Fourier Transform.

8. Find Fourier sine transform of $f(x)$

$$f(x) = \begin{cases} 1, & 0 \le x < 1 \\ 0, & x > 1 \end{cases}.$$

9. State and prove Rayleigh's theorem.

10. Solve the Integral Equation $\int_0^{\alpha} f(x)\cos\lambda x\,dx = e^{-\lambda}$.

PART - B

Answer any FIVE of the following Questions.
Choosing at least ONE Question from Each Section. ***(5 × 10 =50 Marks)***

SECTION - A

UNIT - I

11. Solve $\left(D^2 - D - 2\right)y = 20\sin 2t$ if $y = -1,\ Dy = 2$ at $t = 0$.

12. Solve $y^{11} - ty^1 + y = 1$ if $y(0) = 1,\ y^1(0) = 2$.

UNIT - II

13. Solve $\frac{\partial y}{\partial t} = 3\frac{\partial^2 y}{\partial x^2}$ when $y\left(\frac{\pi}{2}, t\right) = 0,\ \left(\frac{\partial y}{\partial x}\right)_{x=0} = 0$ and $y(x,0) = 30\cos 5x$.

14. Solve $\frac{\partial y}{\partial x} - \frac{\partial y}{\partial t} = 1 - e^{-t}, 0 < x < 1, t > 0$ and $y(x,0) = x$.

UNIT - III

15. Solve the integral equation $\int_0^t \frac{F(\mu)}{(t-\mu)^{\frac{1}{3}}} d\mu = t(1+t)$.

16. Solve $2F(t) = 2 - t + \int_0^t F(t-\mu)F(\mu)$.

SECTION - B

UNIT - IV

17. State and prove change of scale property for Fourier cosine Transform.

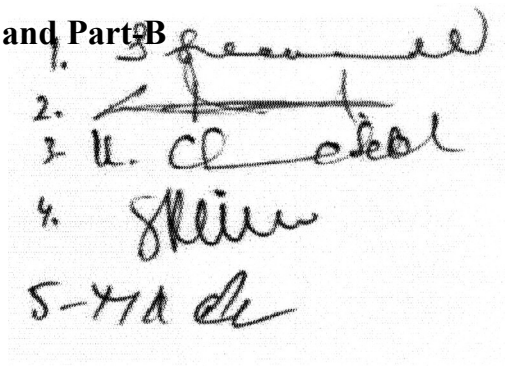
18. Find the Fourier Transform of $F(x) = \begin{cases} 1 - x^2, & |x| \le 1 \\ 0, & |x| \ge 1 \end{cases}$.

UNIT - V

19. State and prove Fatling theorem for Fourier Transform.

20. Derive the Relationship between Fourier and Laplace Transforms.

Instruction to Paper Setter:
Two questions must be given from each unit in Part-A and Part-B



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B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS

SEMESTER – VI, CLUSTER-B, PAPER – VIII-B-1

Cluster Elective – VIII-B-1 : PRINCIPLES OF MECHANICS

60 Hrs

Unit – I : (10 hours)

D' Alembert's Principle and Lagrange's Equations : some definitions – Lagrange's equations for a Holonomic system – Lagrange's Equations of motion for conservative, nonholonomic system.

Unit – II: (10 hours)

Variational Principle and Lagrange's Equations: Variatonal Principle – Hamilton's Principle – Derivation of Hamilton's Principle from Lagrange's Equations – Derivation of Lagrange's Equations from Hamilton's Principle – Extension of Hamilton's Principle – Hamilton's Principle for Non-conservative, Non-holonomic system – Generalised Force in Dynamic System – Hamilton's Principle for Conservative, Non-holonomic system – Lagrange's Equations for Non-conservative, Holonomic system - Cyclic or Ignorable Coordinates.

Unit –III: (15 hours)

Conservation Theorem, Conservation of Linear Momentum in Lagrangian Formulation – Conservation of angular Momentum – conservation of Energy in Lagrangian formulation.

Unit – IV: (15 hours)

Hamilton's Equations of Motion: Derivation of Hamilton's Equations of motion – Routh's procedure – equations of motion – Derivation of Hamilton's equations from Hamilton's Principle – Principle of Least Action – Distinction between Hamilton's Principle and Principle of Least Action.

Unit – V: (10 hours)

Canonical Transformation: Canonical coordinates and canonical transformations – The necessary and sufficient condition for a transformation to be canonical – examples of canonical transformations – properties of canonical transformation – Lagrange's bracket is canonical invariant – poisson's bracket is canonical invariant - poisson's bracket is invariant under canonical transformation – Hamilton's Equations of motion in poisson's bracket – Jacobi's identity for poisson's brackets.

Reference Text Books :

1. Classical Mechanics by C.R.Mondal Published by Prentice Hall of India, New Delhi.

2. A Text Book of Fluid Dynamics by F. Charlton Published by CBS Publications, New Delhi.

3. Classical Mechanics by Herbert Goldstein, published by Narosa Publications, New Delhi.

4. Fluid Mechanics by T. Allen and I.L. Ditsworth Published by (McGraw Hill, 1972)

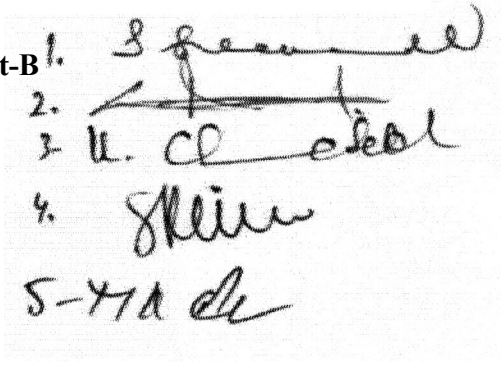
5. Fundamentals of Mechanics of fluids by I.G. Currie Published by (CRC, 2002)

6. Fluid Mechanics : An Introduction to the theory, by Chia-shun Yeh Published by (McGraw Hill, 1974)

7. Introduction to Fluid Mechanics by R.W Fox, A.T Mc Donald and P.J. Pritchard Published by (John Wiley and Sons Pvt. Ltd., 2003)

Instruction to Paper Setter:

Two questions must be given from each unit in Part-A and Part-B



VIKRAMA SIMHAPURI UNIVERSITY::NELLORE

B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS

SEMESTER – VI, CLUSTER-B, PAPER – VIII-B-2

Cluster Elective–VIII-B-2 : FLUID MECHANICS

60 Hrs

Unit – I : (10 hours)

Kinematics of Fluids in Motion

Real fluids and Ideal fluids – Velocity of a Fluid at a point – Streamlines and pthlines – steady and Unsteady flows – the velocity potential – The Vorticity vector – Local and Particle Rates of Change – The equation of Continuity – Acceleration of a fluid – Conditions at a rigid boundary – General Analysis of fluid motion.

Unit – II : (10 hours)

Equations of motion of a fluid- Pressure at a point in fluid at rest – Pressure at a point in a moving fluid – Conditions at a boundary of two inviscid immiscible fluids – Euler's equations of motion – Bernoulli's equation – Worked examples.

Unit – III : (10 hours)

Discussion of the case of steady motion under conservative body forces - Some flows involving axial symmetry – Some special two-dimensional flows – Impulsive motion – Some further aspects of vortex motion.

Unit – IV : (15 hours)

Some Two – dimensional Flows, Meaning of two-dimensional flow – Use of Cylindrical polar coordinates – The stream function – The complex potential for two-dimensional, Irrotational, Incompressible flow – Uniform Stream – The Milne-Thomson Circle theorem – the theorem of Blasius.

Unit – V : (15 hours)

Viscous flow, Stress components in a real fluid – Relations between Cartesian components of stress – Translational motion of fluid element – The rate of strain quadric and principal stresses – Some further properties of the rate of strain quadric – Stress analysis in fluid motion – Relations between stress and rate of strain – the coefficient of viscosity and laminar flow - The Navier-Stokes equations of motion of a viscous fluid.

Reference Text Books :

1. A Text Book of Fluid Dynamics by F. Charlton Published by CBS Publications, New Delhi.

2. Classical Mechanics by Herbert Goldstein, published by Narosa Publications, New Delhi.

3. Fluid Mechanics by T. Allen and I.L. Ditsworth published by (McGraw Hill, 1972)

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5. Fluid Mechanics, An Introduction to the theory by Chia-shun Yeh published by (McGraw Hill, 1974)

6. Fluids Mechanics by F.M White published by (McGraw Hill, 2003)

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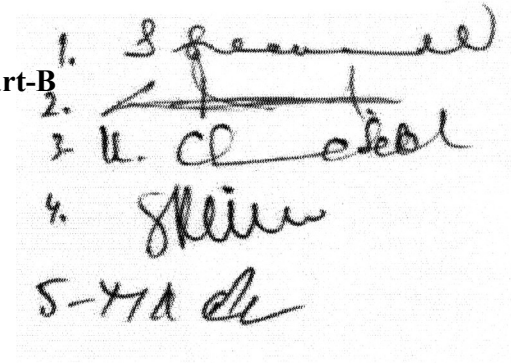

VIKRAMA SIMHAPURI UNIVERSITY::NELLORE

B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS

SEMESTER – VI, CLUSTER-C, PAPER – VIII-C-1 Cluster Elective–VIII-C-1: GRAPH THEORY

60 Hrs

UNIT – I (12 hrs) Graphs and Sub Graphs :

Graphs , Simple graph, graph isomorphism, the incidence and adjacency matrices, sub graphs, vertex degree, Hand shaking theorem, paths and connection, cycles.

UNIT – II (12 hrs)

Applications, the shortest path problem, Sperner"s lemma.

Trees :

Trees, cut edges and Bonds, cut vertices, Cayley"s formula.

UNIT – III (12 hrs) :

Applications of Trees - the connector problem.

Connectivity

Connectivity, Blocks and Applications, construction of reliable communication Networks,

UNIT – IV (12 hrs):

Euler tours and Hamilton cycles

Euler tours, Euler Trail, Hamilton path, Hamilton cycles , dodecahedron graph, Petersen graph, hamiltonian graph, closure of a graph.

UNIT – V (12 hrs)

Applications of Eulerian graphs, the Chinese postman problem, Fleury"s algorithm - the travelling salesman problem.

Reference Books :

1. Graph theory with Applications by J.A. Bondy and U.S.R. Murthy published by Mac. Millan Press

2. Introduction to Graph theory by S. Arumugham and S. Ramachandran, published by scitech Publications, Chennai-17.

3. A Text Book of Discrete Mathamatics by Dr. Swapan Kumar Sankar, published by S.Chand & Co. Publishers, New Delhi.

4. Graph theory and combinations by H.S. Govinda Rao published by Galgotia Publications.

Instruction to Paper Setter:

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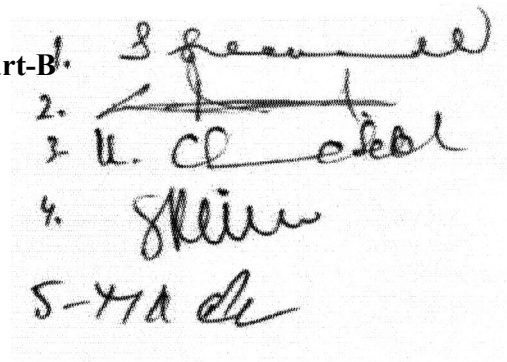


VIKRAMA SIMHAPURI UNIVERSITY::NELLORE

B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS

SEMESTER – VI, CLUSTER-C, PAPER – VIII-C-2 Cluster Elective -VIII-C-2: APPLIED GRAPH THEORY

60 Hrs

UNIT – I (12 hrs) : Matchings

Matchings – Alternating Path, Augmenting Path - Matchings and coverings in Bipartite graphs, Marriage Theorem, Minimum Coverings.

UNIT –II (12 hrs) :

Perfect matchings, Tutte"s Theorem, Applications, The personal Assignment problem -The optimal Assignment problem, Kuhn-Munkres Theorem.

UNIT –III (12 hrs) : Edge Colorings

Edge Chromatic Number, Edge Coloring in Bipartite Graphs - Vizing"s theorem.

UNIT –IV (12 hrs) :

Applications of Matchings, The timetabling problem.

Independent sets and Cliques

Independent sets, Covering number , Edge Independence Number, Edge Covering Number - Ramsey"s theorem.

UNIT –V (12 hrs) :

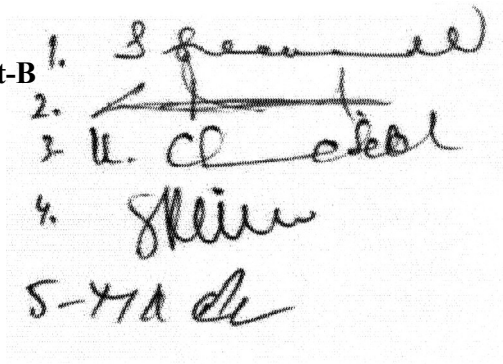
Determination of Ramsey"s Numbers – Erdos Theorem, Turan"s theorem and Applications, Sehur"s theorem. A Geometry problem.

Reference Books :-

1. Graph theory with Applications by J.A. Bondy and U.S.R. Murthy, published by Mac. Millan Press.
2. Introduction to graph theory by S. Arumugham and S. Ramachandran published by SciTech publications, Chennai-17.
3. A text book of Discrete Mathematics by Dr. Swapan Kumar Sarkar, published by S. Chand Publishers.
4. Graph theory and combinations by H.S. Govinda Rao, published by Galgotia Publications.

Instruction to Paper Setter:

Two questions must be given from each unit in Part-A and Part-B



VIKRAMA SIMHAPURI UNIVERSITY::NELLORE

B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS

SEMESTER – VI, PAPER – VIII-(D)-1

Cluster Elective –VIII-(D)-1; NUMERICAL ANALYSIS

60 Hrs

UNIT- I: (10 hours)

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 a series approximation.

UNIT – II: (12 hours)

Solution of Algebraic and Transcendental Equations: The bisection method, The iteration method, The method of false position, Newton Raphson method, Generalized Newton Raphson method. Muller's Method

UNIT – III: (12 hours) Interpolation - I

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

UNIT – IV: (12 hours) Interpolation - II

Newton's formulae for interpolation. Central Difference Interpolation Formulae, Gauss's central difference formulae, Stirling's central difference formula, Bessel's Formula, Everett's Formula.

UNIT – V : (14 hours) Interpolation - III

Interpolation with unevenly spaced points, Lagrange's formula, Error in 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 general interpolation Formula, Inverse interpolation.

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, New – 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

Instruction to Paper Setter:

Two questions must be given from each unit in Part-A and Part-B

VIKRAMA SIMHAPURI UNIVERSITY :: NELLORE.

B.A./B.Sc. THIRD YEAR MATHEMATICS

SEMESTER – VI, PAPER – VIII-(D)-1

Cluster Elective –VIII-(D)-1; NUMERICAL ANALYSIS

MODEL QUESTION PAPER

TIME : 3 Hours ***Max.Marks : 75***

PART – A

I. Answer any FIVE Questions : ***5 X 5 = 25M***

1. Define the following (a) Absolute Error (b) Relative Error (c) Percentage Error.

2. If $y = 4x^6 - 5x$ find percentage error in y at at x=1 if the error in x is 0.04.

3. Find the root of the equation $2x - \log_{10}^{x} = 7$. Which lies between 3.5 and 4 by Regular Falsi Method.

4. Explain merits and demerits of Newton - Rephson Method.

5. Prove the following (a) $E\nabla = \Delta = \nabla E$ (b) $\nabla = 1 - E^{-1}$.

6. Find the Missing form :

x	**0**	**1**	**2**	**3**	**4**
y	**1**	**3**	**9**	**-**	**8**

7. Find cubic polynomial $y(0) = 1, y(1) = 0, y(2) = 1, y(3) = 10$. Hence or other wise find $y(4)$.

8. $y_{20} = 24, y_{24} = 32, y_{28} = 35, y_{32} = 40,$ find y_{25} by Bessel's Formula.

9. Derive the relation between divided Difference and Backward Differences.

10. Derive Lagrange's Interpolation Formula.

PART - B

Answer any FIVE of the following Questions.
Choosing at least ONE Question from Each Section. ***(5 × 10 =50 Marks)***

SECTION - A

UNIT - I

11. Define the types of errors and Establish a general error formulas by taking $\mu = f(x_1, x_2 \ldots\ldots, x_n)$.

12. Given $a = 10 \pm 0.05, b = 0.0356 \pm 0.0002,\ c = 15300 \pm 100, d = 62000 \pm 500$. Find the maximum absolute error in $a + b + c + d, a + 5c - d$.

UNIT - II

13. Explain Bisection method to find a real root of the equation $f(x) = 0$.

14. Explain Muller's method to find root of $f(x) = 0$ by Muller's method find root of the equation $x^3 - x^2 - x - 1 = 0$

UNIT - III

15. If $f(x)$ is a polynomial of degree 'n' and the values of x are equally spaced then prove that $\Delta^n f(x)$ is a constant.

16. Evaluate the following taking interval as 1 using finite deference method :
(a) $\Delta \mathrm{Tan}^{-1} x$ (b) $2x / x!$ (c) Δe^x.

SECTION - B

UNIT - IV

17. Derive Gauss's Backward Interpolation Formula.

18. Using sterling formula find y_{28}. $y_{20} = 49225,\ y_{25} = 48316,\ y_{30} = 47236,$ $y_{35} = 45926,\ y_{40} = 44306.$

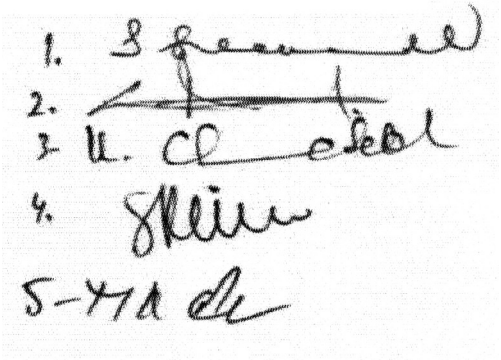
UNIT - V

19. Find the interpolation polynomial for the following using Lagrange's Method :

x	0	1	2	5
y	2	3	12	147

20. Derive Newton's general interpolation formula with divided difference.

Instruction to Paper Setter:
Two questions must be given from each unit in Part-A and Part-B



VIKRAMA SIMHAPURI UNIVERSITY::NELLORE

B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS

SEMESTER – VI: PAPER – VIII-D-2

Cluster Elective –VIII-D-2: ADVANCED NUMERICAL ANALYSIS

60 Hrs

Unit – I (10 Hours)

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

UNIT- II : (12 hours)

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, Maximum and minimum values of a tabulated function.

UNIT- III : (12 hours)

Numerical Integration: General quadrature formula on errors, Trapozoidal rule, Simpson's 1/3 – rule, Simpson's 3/8 – rule, and Weddle's rules, Euler – Maclaurin Formula of summation and quadrature, The Euler transformation.

UNIT – IV: (14 hours)

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, Solution of Tridiagonal Systems,. Iterative methods. Jacobi's method, Gauss-siedal method.

UNIT – V (12 Hours)

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 :

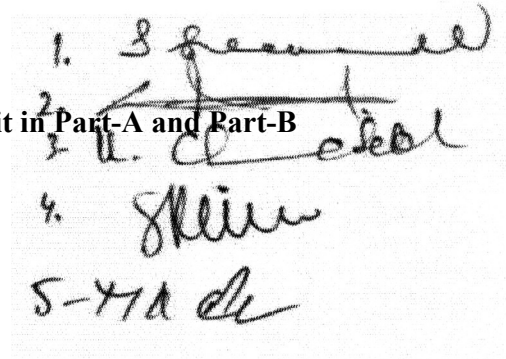
1. Numerical Analysis by S.S.Sastry, published by Prentice Hall India (Latest Edition).
2. Numerical Analysis by G. Sankar Rao, published by New Age International Publishers, New – Hyderabad.
3. Finite Differences and Numerical Analysis by H.C Saxena published by S. Chand and Company, Pvt. Ltd., New 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

Instruction to Paper Setter:

Two questions must be given from each unit in Part-A and Part-B



VIKRAMA SIMHAPURI UNIVERSITY :: NELLORE.

B.A./B.Sc. THIRD YEAR MATHEMATICS

SEMESTER – VI: PAPER – VIII-D-2

Cluster Elective –VIII-D-2: ADVANCED NUMERICAL ANALYSIS

MODEL QUESTION PAPER

TIME : 3 Hours ***Max.Marks : 75***

PART – A

I. Answer any FIVE Questions : ***5 X 5 = 25M***

1. Fitting a second degree parabola by the method of Least-Squares.

2. Fit a exponential curve $y = ab^x$.

3. Find first two Derivatives using Newton's backward difference formula.

4. Find the first and second derivatives of the function tabulated below at x = 15

x	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**
y	**3.325**	**7**	**13.625**	**24**	**38.875**	**59**

5. Derive Trapezoidal Rule.

6. Evaluate $\int_0^1 e^x dx$ using Simpson's $\frac{1}{3}$rd method.

7. Solve by matrix inverse method $x + y - 2z = 3,\ 2x - y + z = 0,\ 3x + y - z = 8$.

8. Explain Gaussian Elimination method .

9. Explain Taylor's Method.

10. Explain modified Euler Method.

PART - B

Answer any FIVE of the following Questions.
Choosing at least ONE Question from Each Section. ***(5 × 10 =50 Marks)***

SECTION - A

UNIT - I

11. Fit an exponential curve of second kind $y = ae^{bx}$.

12. Fit a straight line to the following data :

x	**0**	**5**	**10**	**15**	**20**	**25**
y	**12**	**15**	**17**	**22**	**24**	**30**

and estimate y value when x = 30.

UNIT - II

13. From the Stirling's interpolation formula obtain the following approximation up to 3rd difference.

$$\frac{d}{dy}(yx) = \frac{2}{3}\left(y_{x+1} - y_{x-1}\right) - \frac{1}{12}\left(y_{x+2} - y_{x-2}\right).$$

14. From the following table find the value of x for which y is maximum and find this value of y

x	**1.2**	**1.3**	**1.4**	**1.5**	**1.6**
y	**0.9320**	**0.9636**	**0.9055**	**0.9985**	**0.999**

UNIT - III

15. Derive newton's cote's Quadrature formula.

16. Evaluate $\int_4^{5.2} \log x dx$ using Weddle's Rule.

SECTION - B

UNIT - IV

17. Solve by Tridiagonal system

$x_1 + 2x_2 = 7,\ x_1 - 3x_2 - x_3 = 4,\ 4x_2 + 3x_3 = 5$.

18. Solve by Jacobi's method $10x + 2y + z = 9,\ x + 10y - z = -22,\ -2x + 3y + 10z = 22$.

UNIT - V

19. Compute y at $x = 0.25$ by Euler's method given $y^1 = 2xy, y(0) = 1$:

20. Using Runge – Kutta methods of second order, compute $y(2.5)$ prove

$\frac{dy}{dx} = \frac{x+y}{x}, y(2) = 2$ falling $h = 0.25$.

Instruction to Paper Setter:

Two questions must be given from each unit in Part-A and Part-B