Maths I Semester syllabi.pdf

Mathematics_IIsem_2016-17AB.pdf

Maths III Semester syllabi.pdf

Mathematics_IVSem_2015-16AB.pdf

Mathematics_Vsem_2015-16AB.pdf

BSc_Mathematics_VI Sem_2015-16AB_web.pdf

ADIKAVI NANNAYA UNIVERSITY

RAJAMAHENDRAVARAM

CBCS / Semester System

(W.e.f. 2016-17 Admitted Batch)

I Semester Syllabus

B.A./B.Sc. MATHEMATICS

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; Change of Variables.

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 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^mV

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.

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

3. Ordinary and Partial Differential Equations Raisinghania, published by S. Chand & Company, New Delhi.
4. Differential Equations with applications and programs – S. Balachandra Rao & HR Anuradha- universities press.

Suggested Activities:

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

ADIKAVI NANNAYA UNIVERSITY
CBCS/SEMESTER SYSTEM

SEMESTER – II : B.A./B.Sc. FIRST YEAR MATHEMATICS SYLLABUS (UPDATED)

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, Bisectors of angles between two planes, Combined equation of two planes, Orthogonal projection on a plane.

UNIT – II (12 hrs) : The Line :

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

UNIT-III: 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; tangent plane; plane of contact; polar plane; pole of a plane; conjugate points; conjugate planes.

UNIT-IV: The Sphere and Cones

Angle of intersection of two spheres; conditions for two spheres to be orthogonal; Power of a point; radical plane; coaxal system of spheres; simplified form 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 homogeneous; condition that the general equation of the second degree should represent a cone.

UNIT V-: 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 the cone; reciprocal cones; intersection of two cones with a common vertex.

Reference Books :

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

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

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

.**4.** 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.

ADIKAVI NANNAYA UNIVERSITY

RAJAMAHENDRAVARAM

CBCS / Semester System

(W.e.f. 2015-16 Admitted Batch)

III Semester Syllabus

B.A./B.Sc. MATHEMATICS

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.

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.

Cyclic Groups :-

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

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

ADIKAVI NANNAYA UNIVERSITY

CBCS/SEMESTER SYSTEM

IV SEMESTER : B.A./B.Sc. MATHEMATICS

PAPER- 4

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.

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 Sequences – Cauchey's general principle of convergence theorem.

UNIT –II (12 hrs) : INFINITIE 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 Ratio Test.
4. Alternating Series – Leibnitz Test.

Absolute convergence and conditional convergence, semi convergence.

UNIT – III (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, uniform continuity.

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

The derivability of a function, on an interval, at a point, Derivability and continuity of a function, Graphical meaning of the Derivative, Mean value Theorems; Role's Theorem, Lagrange's Theorem, Cauchhy's Mean value Theorem

UNIT – V (12 hrs) : RIEMANN INTEGRATION :

Riemann Integral, Riemann integral functions, Darboux theorem. Necessary and sufficient condition for R – integrability, Properties of integrable functions, Fundamental theorem of integral calculus, 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.

ADIKAVI NANNAYA UNIVERSITY

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

SEMESTER – V, PAPER -5

RING THEORY & VECTOR CALCULUS

60 Hrs

UNIT – 1 (12 hrs) RINGS-I : -

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

UNIT – 2 (12 hrs) RINGS-II : -

Definition of Homomorphism – Homorphic Image – Elementary Properties of Homomorphism – Kernel of a Homomorphism – Fundamental theorem of Homomorhphism –
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. Gupta, Published by Laxmi Publications.
5. Vector Calculus by P.C. Matthews, Published by Springer Verlag publicattions.
6. Rings and Linear Algebra by Pundir & Pundir, Published by Pragathi Prakashan.

Suggested Activities:

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

ADIKAVI NANNAYA UNIVERSITY

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) : Matrix :

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

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

Inner product spaces, Euclidean and unitary spaces, Norm or length of a Vector, Schwartz inequality, Triangle in Inequality, Parallelogram law, Orthogonality, Orthonormal set, complete orthonormal set, 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. Matrices by Shanti Narayana, published by S.Chand Publications.
3. Linear Algebra by Kenneth Hoffman and Ray Kunze, published by Pearson Education (low priced edition), New Delhi.
4. Linear Algebra by Stephen H. Friedberg et al published by Prentice Hall of India Pvt. Ltd. 4th Edition 2007.

Suggested Activities:

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

MATHEMATICS MODEL PAPER
FIFTH SEMESTER
PAPER 5 – RING THEORY & VECTOR CALCULUS
COMMON FOR B.A & B.Sc
(w.e.f. 2015-16 admitted batch)

Time: 3 Hours **Maximum Marks: 75**

SECTION-A

Answer any **FIVE** questions. Each question carries **FIVE** marks. **5 x 5 = 25 Marks**

1) Prove that every field is an integral domain.

2) If R is a Boolean ring then prove that (i) a + a = 0 $\forall$ $a \in R$ (ii) a + b = 0 $\Rightarrow$ a = b.

3) Prove that Intersection of two sub rings of a ring R is also a sub ring of R.

4) If $\boldsymbol{f}$ is a homomorphism of a ring R into a ring R^1 then prove that Ker $\boldsymbol{f}$ is an ideal of R.

5) Prove that Curl (grad $\emptyset$) = $\bar{0}$.

6) If $\boldsymbol{f} = xy^2\,\boldsymbol{i} + 2x^2\,yz\,\boldsymbol{j} - 3yz^2\,\boldsymbol{k}$ the find div $\boldsymbol{f}$ and Curl $\boldsymbol{f}$ at the point (1, -1 1).

7) If $R(u) = (u - u^2)i + 2u^3 j - 3k$ then find $\int_1^2 R(u)\,du$.

8) Show that $\int_s (ax\,i + by\,j + cz\,k).N\,dS = 4\frac{\pi}{3}(a+b+c)$ where S is the surface of the sphere $x^2 + y^2 + z^2 = 1$.

SECTION-B

Answer the all **FIVE** questions. Each carries TEN marks. **5 x 10 = 50 Marks**

9(a) Prove that a finite integral domain is a field

OR

9(b) Prove that the characteristic of an integral domain is either a prime or zero.

10(a) State and prove fundamental theorem of homomorphism of rings.

OR

10(b) Prove that the ring of integers Z is a Principal ideal ring.

11(a) If $a = x + y + z$, $b = x^2 + y^2 + z^2$, $c = xy + yz + zx$; then prove that [grad a, grad b, grad c] = 0.

OR

11(b) Find the directional derivative of the function $xy^2 + yz^2 + zx^2$ along the tangent to the curve $x = t$, $y = t^2$, $z = t^3$ at the point (1, 1, 1,).

12(a) Evaluate $\int_S F.N ds$, where $F = z\,\mathbf{i} + x\,\mathbf{j} - 3y^2z\,\mathbf{k}$ and S is the surface $x^2 + y^2 = 16$ included in the first octant between $z = 0$, and $z = 5$.

OR

12(b) If $F = \left(2x^2 - 3z\right)i - 2xy\,j - 4x\,k$,then evaluate $\iiint_V \nabla . F\,dV$ where V is the closed region bounded by the planes $x = 0, y = 0, z = 0$ *and* $2x + 2y + z = 4$.

13(a) State and Prove Stoke's theorem.

OR

13(b) Find $\oint_C (x^2 - 2xy)\,dx + (x^2y + z)\,dy$ around the boundary C of the region bounded by $y^2 = 8x$ and $x = 2$ by Green's theorem.

MATHEMATICS MODEL PAPER

FIFTH SEMESTER

PAPER 6 – LINEAR ALGEBRA

COMMON FOR B.A & B.Sc

(w.e.f. 2015-16 admitted batch)

Time: 3 Hours **Maximum Marks: 75**

SECTION-A

Answer any **FIVE** questions. Each question carries **FIVE** marks. **5 x 5 = 25 Marks**

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 subspace of V_3 (F).
2) Express the vector $\alpha = (1, -2, 5)$ as a linear combination of the vectors $e_1 = (1, 1, 1)$, $e_2 = (1, 2, 3)$ and $e_3 = (2, -1, 1)$.
3) If α, β, γ are L.I vectors of the vector space V(R) then show that $\alpha+\beta, \beta+\gamma, \gamma+\alpha$ are also L.I vectors.
4) Describe explicitly the linear transformation T: $R^2 \rightarrow R^2$ such that T (1, 2) = (3, 0), and T (2, 1) = (1,2).
5) Let U(F) and V(F) be two vector spaces and $T: U(F) \to V(F)$ be a linear transformation. Prove that the range set R(T) is a subspace of V(F).
6) Solve the system 2x-3y+z=0, x+2y-3z=0, 4x-y-2z=0.
7) State and prove Schwarz inequality.
8) Show that the set $S = \{(1,1,0), (1,-1,1), (-1,1,2)\}$ is an orthogonal set of the inner product space R^3(R).

SECTION-B

Answer the all **FIVE** questions. Each carries TEN marks. **5 x 10 = 50 Marks**

9(a) Prove that the subspace W to be a subspace of V(F) $\Leftrightarrow a\alpha + b\beta \in W \ \forall a, b \in F$ and $\alpha, \beta \in W$.

OR

9(b) Prove that the four vectors α =(1,0,0), β =(0,1,0), γ =(0,0,1), δ =(1,1,1) in V3(C) form a Linear dependent set, but any three of them are Linear Independent.

10(a) Let W be a subspace of a finite dimensional vector space V(F), then prove that

$$\mathbf{dim}\left(V/W\right) = \mathbf{dim}(V) - \mathbf{dim}(W)$$

OR

10(b) Let W_1 and W_2 be two subspaces of a finite dimensional vector space V(F). Then prove that

$$\mathbf{dim}(W_1 + W_2) = \mathbf{dim}(W_1) + \mathbf{dim}(W_2) - \mathbf{dim}(W_1 \cap W_2).$$

11(a) State and prove Rank-Nullity theorem.

OR

11(b) Define a Linear transformation. Show that the mapping T: $R^3 \rightarrow R^2$ is defined by T (x, y, z) = (x - y, x - z) is a linear transformation.

12(a) State and prove Cayley- Hamilton theorem.

OR

12(b) Find the characteristic roots and the corresponding characteristic vectors of the matrix

$$A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$$

13(a) State and prove Bessel's inequality.

OR

13(b) Applying Gram-Schmidt orthogonalization process to obtain an orthonormal basis of $R^3(R)$ from the basis S = { (1, 1, 0), (-1,1,0), (1, 2, 1,)}.

ADIKAVI NANNAYA UNIVERSITY
RAJAMAHENDRAVARAM
CBCS : MATHEMATICS
W.E. FROM 2015-16 ADMITTED BATCH
VI-Semester -(ELECTIVES & CLUSTERS)

Year	**Semester**	**Paper**	**Subject**	**Hours**	**Credits**	**IA**	**EA**	**Total**
	VI	VII	Elective (any one)* A. Laplace-Transformations B. Numerical Analysis C. Number Theory D. Graph Theory & **Elective Problem Solving Sessions**	5	5	25	75	100
		VIII	Cluster Electives: *** VIII A. 1.Integral Transformations & Problem Solving Sessions	5	5	25	75	100
			2.Special Functions & Problem Solving Sessions	5	5	25	75	100
			3.Project	5	5	50	50	100
			VIII B. 1. Advanced Numerical Analysis & Problem Solving Sessions 2. special Functions & Problem Solving Sessions 3. Project					
			VIII C. 1.Principles of Mechanics & Problem Solving Sessions 2.Fluid Mechanics & Problem Solving Sessions 3.Project					

			VIII D. 1. Applied Graph Theory & Problem Solving Sessions 2.Special Function & Problem Solving Sessions 3.Project						

*Candidate has to choose only one paper from VII(A) or VII(B) or VII(C) or VII(D)

* Candidates are advised to choose Cluster (A) if they have chosen VII (A) and Choose Cluster (B) if they have chosen VII(B) etc. However, a candidate may choose any cluster irrespective of what they have chosen in paper VII

B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS
SEMESTER – VI, PAPER – VII-(A)
ELECTIVE-VII(A); 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.

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

First Shifting Theorem, 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. Laplace transform of Bessel Function, Laplace Transform of Error Function, Laplace Transform of Sine and cosine integrals.

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.

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.**

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

SEMESTER – VI, PAPER – VII-(B)

ELECTIVE–VII-(B); 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.

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

SEMESTER – VI, PAPER – VII-(C)

ELECTIVE– VII-(C) : NUMBER THEORY

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.

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

SEMESTER – VI, PAPER – VII-(D)

ELECTIVE– VII-(D) : GRAPH THEORY

<u>UNIT – I (12 hrs) Graphs and Sub Graphs :</u>

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

<u>UNIT – II (12 hrs)</u>

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

Trees :

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

<u>UNIT – III (12 hrs) :</u>

Applications of Trees - the connector problem.

Connectivity

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

<u>UNIT – IV (12 hrs):</u>

Euler tours and Hamilton cycles

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

<u>UNIT – V (12 hrs)</u>

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

<u>Reference Books :</u>

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.

B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS,
SEMESTER – VI, CLUSTER – A,
PAPER – VIII-A-1
Cluster Elective- VIII-A-1: INTEGRAL TRANSFORMS

60 Hrs

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

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

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

Solution of simultaneous ordinary Differential Equations.
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.

Finte Fourier Transforms : -

Finte Fourier Sine Transform – Finte Fourier Cosine Transform – Inversion formula for sine and cosine Transforms only statement and related problems.

Reference Books :-

1. Integral Transforms by A.R. Vasistha and Dr. R.K. Gupta Published by Krishna Prakashan Media Pvt. Ltd. Meerut.
2. A Course of Mathematical Analysis by Shanthi Narayana and P.K. Mittal, Published by S. Chand and Company pvt. Ltd., New Delhi.
3. Fourier Series and Integral Transforms by Dr. S. Sreenadh Published by S.Chand and Company Pvt. Ltd., New Delhi.
4. Lapalce and Fourier Transforms by Dr. J.K. Goyal and K.P. Gupta, Published by Pragathi Prakashan, Meerut.
5. Integral Transforms by M.D. Raising hania, - H.C. Saxsena and H.K. Dass Published by S.Chand and Company pvt. Ltd., New Delhi.

B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS
SEMESTER – VI: PAPER – VIII-A-2
ELECTIVE – VIII-A-2: SPECIAL FUNCTIONS

UNIT-I (HERMITE POLYNOMIAL)

Hermite Differential Equations, Solution of Hermite Equation, Hermite's Polynomials, Generating function, Other forms for Hermite Polynomial, To find first few Hermite Polynomials, Orthogonal properties of Hermite Polynomials, Recurrence formulae for Hermite Polynomials. CHAPTER: 6.1 to 6.8

UNIT-II (LAGUERRE POLYNOMIALS-I)

Laguerre's Differential equation, Solution of Laguerre's equation, Laguerre Polynomials, Generating function, Other forms for the Laguerre Poynomials, To find first few Laguerre Polynomials,Orthogonal property of the Laguerre Polynomials, Recurrence formula for Laguerre Polynomials, Associated Laguerre Equation. CHAPTER: 7.1 to 7.9

UNIT-III (LEGENDRE'S EQUATION)

Definition, Solution of Legendre's Equation, Definition of $P_n(x)$ and $Q_n(x)$, General solution of Legendre's Equation(derivationis not required)To show that $P_n(x)$ is the coefficient of h^n in the expansion of $\left(1-2xh+h^2\right)^{\frac{-1}{2}}$, Orthogonal properties of Legendre's Equation, Recurrence formula, Rodrigues formula, CHAPTER: 2.1 to,2.8,2.12,

UNIT-IV (BESSEL'S EQUATION)

Definition, Solution of Bessel's General Differential Equations, General solution of Bessel's Equation, Integration of Bessel's equation in series for n=0,Definition of $J_n(x)$, Recurrence formulae for $J_n(x)$,Generating function for $J_n(x)$. CHAPTER: 5.1 to 5.7

UNIT-V (Beta and Gamma functions)

Euler's Integrals-Beta and Gamma Functions, Elementary properties of Gamma Functions, Transformation of Gamma Functions,Another form of Beta Function, Relation between Beta and Gamma Functions,Other Transformations. CHAPTER: 2.9to 2.15

Prescribed text book: Special Functions by J.N.Sharma and Dr.R.K.Gupta.

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

SEMESTER – VI: PAPER – VIII-B-1
ELECTIVE – VIII-B-1: 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.

B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS
SEMESTER – VI: PAPER – VIII-B-2
ELECTIVE – VIII-B-2: SPECIAL FUNCTIONS

UNIT-I (HERMITE POLYNOMIAL)

Hermite Differential Equations, Solution of Hermite Equation, Hermite's Polynomials, Generating function, Other forms for Hermite Polynomial, To find first few Hermite Polynomials, Orthogonal properties of Hermite Polynomials, Recurrence formulae for Hermite Polynomials. CHAPTER: 6.1 to 6.8

UNIT-II (LAGUERRE POLYNOMIALS-I)

Laguerre's Differential equation, Solution of Laguerre's equation, Laguerre Polynomials, Generating function, Other forms for the Laguerre Poynomials, To find first few Laguerre Polynomials,Orthogonal property of the Laguerre Polynomials, Recurrence formula for Laguerre Polynomials, Associated Laguerre Equation. CHAPTER: 7.1 to 7.9

UNIT-III (LEGENDRE'S EQUATION)

Definition, Solution of Legendre's Equation, Definition of $P_n(x)$ and $Q_n(x)$, General solution of Legendre's Equation(derivationis not required)To show that $P_n(x)$ is the coefficient of h^n in the expansion of $(1-2xh+h^2)^{\frac{-1}{2}}$, Orthogonal properties of Legendre's Equation, Recurrence formula, Rodrigues formula, CHAPTER: 2.1 to 2.8,2.12,

UNIT-IV (BESSEL'S EQUATION)

Definition, Solution of Bessel's General Differential Equations, General solution of Bessel's Equation, Integration of Bessel's equation in series for n=0,Definition of $J_n(x)$, Recurrence formulae for $J_n(x)$,Generating function for $J_n(x)$. CHAPTER: 5.1 to 5.7

UNIT-V (Beta and Gamma functions)

Euler's Integrals-Beta and Gamma Functions, Elementary properties of Gamma Functions, Transformation of Gamma Functions,Another form of Beta Function, Relation between Beta and Gamma Functions,Other Transformations. CHAPTER: 2.9to 2.15

Prescribed text book: Special Functions by J.N.Sharma and Dr.R.K.Gupta.

B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS
SEMESTER – VI, CLUSTER-B, PAPER – VIII-C-1

Cluster Elective – VIII-C-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)

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

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

Cluster Elective–VIII-C-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)

4. Fundamentals of Mechanics of fluids by I.G. Currie published by (CRC, 2002)

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)

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

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

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

Cluster Elective -VIII-D-1: 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.

B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS
SEMESTER – VI, CLUSTER-D, PAPER – VIII-D-2
Cluster Elective -VIII-D-2: Special Functions

UNIT-I (HERMITE POLYNOMIAL)

Hermite Differential Equations, Solution of Hermite Equation, Hermite's Polynomials, Generating function, Other forms for Hermite Polynomial, To find first few Hermite Polynomials, Orthogonal properties of Hermite Polynomials, Recurrence formulae for Hermite Polynomials. CHAPTER: 6.1 to 6.8

UNIT-II (LAGUERRE POLYNOMIALS-I)

Laguerre's Differential equation, Solution of Laguerre's equation, Laguerre Polynomials, Generating function, Other forms for the Laguerre Poynomials, To find first few Laguerre Polynomials,Orthogonal property of the Laguerre Polynomials, Recurrence formula for Laguerre Polynomials, Associated Laguerre Equation. CHAPTER: 7.1 to 7.9

UNIT-III (LEGENDRE'S EQUATION)

Definition, Solution of Legendre's Equation, Definition of $P_n(x)$ and $Q_n(x)$, General solution of Legendre's Equation(derivationis not required)To show that $P_n(x)$ is the coefficient of h^n in the expansion of $(1-2xh+h^2)^{\frac{-1}{2}}$, Orthogonal properties of Legendre's Equation, Recurrence formula, Rodrigues formula, CHAPTER: 2.1 to 2.8,2.12,

UNIT-IV (BESSEL'S EQUATION)

Definition, Solution of Bessel's General Differential Equations, General solution of Bessel's Equation, Integration of Bessel's equation in series for n=0,Definition of $J_n(x)$, Recurrence formulae for $J_n(x)$,Generating function for $J_n(x)$. CHAPTER: 5.1 to 5.7

UNIT-V (Beta and Gamma functions)

Euler's Integrals-Beta and Gamma Functions, Elementary properties of Gamma Functions, Transformation of Gamma Functions,Another form of Beta Function, Relation between Beta and Gamma Functions,Other Transformations. CHAPTER: 2.9to 2.15

Prescribed text book: Special Functions by J.N.Sharma and Dr.R.K.Gupta.

Guidelines and Evaluation pattern of the project of the cluster

The student who wants to do the project should follow the following.

1. He/She has to select the topic with clear Aim & objectives.

2. He/She has to collect the previous information regarding the topic.

3. He/She has to get the clear idea after getting the reference material ,i.e., how to proceed and what to do (methodology).

4. before going to discuss the topic, every student has to do at least three Seminars on his/her chosen topic.

5. Finally he/She has to come with Results &conclusions.

6. Bibliography (Reference Journals/books should be mentioned).

Evaluation pattern for Project Work:

Seminars **25 Marks (Internal)**	**Report of the project : 50 Marks** **(external 25+ Internal 25)**	**Project Viva voce (External)** **25 Marks**	
1 After 15 days(5 M) 2 After 30 days(5 M) 3 After 45 days(15M)	1.Introduction (Selection of the topic, Aim & objectives) 2.Review of information 3.Methodology 4. Analysis& Discussion 5.Suggestions & Conclusion	Presentation 15	Viva 10

Some of the Suggested Topics For Projects Work

1. Applications of Differential Equations in

a) Physics b)Chemistry c)Mechanics d) Bio-Life Sciences

2. Applications of Graph Theory

a) Chemistry b)Physics

3. Numerical solution of ordinary differential Equations using ‘C’ Language applying

A)Euler Methods b) R-K Methods

4. Applications of Graph Theory

5. Applications of Numerical Integration Using ‘C’ Language.

6. Applications of Laplace transformations in

a) Mechanics b)Electricity

7. Applications of Linear algebra in Electronics.

8. Applications of Linear transformation in Graphics

9. Applications of Interpolation and extrapolation

10. Application of ‘C’ Language for Riemann integration Problems

11. Application of Matrix theory to Chemistry

12. Mathematical modeling for Aqua Culture using differential equations.

13. Project on finding Mathematics in Carpentry, Pottery, String Art.

14. Mathematics – Nature

15. Mathematics – Fine arts

Note: The above areas of project are only suggested, the topics can be chosen according to the convenience & creativity of the Concerned Staff and students.

B.A./ B.Sc THIRD YEAR MATHEMATICS

VI SEMESTER

BLUE PRINT FOR QUESTION PAPER

Elective - VII - A: **LAPLACE TRANSFORMS**

UNIT	SECTION A : 5 marks No. of Questions	SECTION B : 10 marks No. of Questions
I	1	1 (a) or (b)
II	2	1 (a) or (b)
III	2	1 (a) or (b)
IV	1	1 (a) or (b)
V	2	1 (a) or (b)

BLUE PRINT FOR QUESTION PAPER

Elective - VII - B: **NUMERICAL ANALYSIS**

UNIT	SECTION A : 5 marks No. of Questions	SECTION B : 10 marks No. of Questions
I	1	1 (a) or (b)
II	2	1 (a) or (b)
III	1	1 (a) or (b)
IV	2	1 (a) or (b)
V	2	1 (a) or (b)

BLUE PRINT FOR QUESTION PAPER

Elective - VII - C: **NUMBER THEORY**

UNIT	SECTION A : 5 marks No. of Questions	SECTION B : 10 marks No. of Questions
I	1	1 (a) or (b)
II	2	1 (a) or (b)
III	1	1 (a) or (b)
IV	2	1 (a) or (b)
V	2	1 (a) or (b)

BLUE PRINT FOR QUESTION PAPER

Elective - VII - D: **GRAPH THEORY**

UNIT	SECTION A : 5 marks No. of Questions	SECTION B : 10 marks No. of Questions
I	2	1 (a) or (b)
II	1	1 (a) or (b)
III	2	1 (a) or (b)
IV	2	1 (a) or (b)
V	1	1 (a) or (b)

BLUE PRINT FOR QUESTION PAPER

Cluster Elective - VIII –A - 1: **INTEGRAL TRANSFORMS**

UNIT	SECTION A : 5 marks No. of Questions	SECTION B : 10 marks No. of Questions
I	2	1 (a) or (b)
II	1	1 (a) or (b)
III	1	1 (a) or (b)
IV	2	1 (a) or (b)
V	2	1 (a) or (b)

BLUE PRINT FOR QUESTION PAPER

Cluster Elective - VIII –B - 1: **ADVANCED NUMERICAL ANALYSIS**

UNIT	SECTION A : 5 marks No. of Questions	SECTION B : 10 marks No. of Questions
I	1	1 (a) or (b)
II	2	1 (a) or (b)
III	2	1 (a) or (b)
IV	1	1 (a) or (b)
V	2	1 (a) or (b)

BLUE PRINT FOR QUESTION PAPER

Cluster Elective - VIII –C - 1: **PRINCIPLES OF MECHANICS**

UNIT	SECTION A : 5 marks No. of Questions	SECTION B : 10 marks No. of Questions
I	1	1 (a) or (b)
II	2	1 (a) or (b)
III	1	1 (a) or (b)
IV	2	1 (a) or (b)
V	2	1 (a) or (b)

BLUE PRINT FOR QUESTION PAPER

Cluster Elective - VIII –D - 1: **APPLIED GRAPH THEORY**

UNIT	SECTION A : 5 marks No. of Questions	SECTION B : 10 marks No. of Questions
I	2	1 (a) or (b)
II	2	1 (a) or (b)
III	1	1 (a) or (b)
IV	2	1 (a) or (b)
V	1	1 (a) or (b)

BLUE PRINT FOR QUESTION PAPER

Cluster Elective - VIII -A, B, D – 2: **SPECIAL FUNCTIONS**

UNIT	SECTION A : 5 marks No. of Questions	SECTION B : 10 marks No. of Questions
I	2	1 (a) or (b)
II	1	1 (a) or (b)
III	2	1 (a) or (b)
IV	2	1 (a) or (b)
V	1	1 (a) or (b)

BLUE PRINT FOR QUESTION PAPER

Cluster Elective - VIII –C - 2: **FLUID MECHANICS**

UNIT	SECTION A : 5 marks No. of Questions	SECTION B : 10 marks No. of Questions
I	2	1 (a) or (b)
II	2	1 (a) or (b)
III	1	1 (a) or (b)
IV	1	1 (a) or (b)
V	2	1 (a) or (b)

ADIKAVI NANNAYYA UNIVERSITY
III-B.Sc. DEGREE EXAMINATIONS

SEMESTER-VI **SUBJECT: MATHEMATICS**

Paper –VII -A **Elective – A**

Title of the Paper: LaplaceTransformations

MODEL PAPER

Time: 3 hours **Max marks: 75M**

SECTION–A

Answer any FIVE from the following questions. Each carries 5 marks. 5X5 = 25 M

1. Find $L\{t^n\}, n$ is a positive integer.
2. Evaluate $L\{F(t)\}\ if\ F(t) = \begin{cases} (t-1)^2, & t > 1 \\ 0, & 0 < t < 1 \end{cases}$
3. State and Prove first shifting theorem in Laplace Transforms.
4. Find $L\{t(3sin2t - 2cos2t)\}$
5. Find $L^{-1}\left\{\frac{3p-2}{p^2-4p+20}\right\}$.
6. Find$L^{-1}\left[\frac{e^{4-3p}}{(p+4)^{5/2}}\right]$.
7. Prove that$L^{-1}\left\{\frac{2p+1}{(p+2)^2(p-1)^2}\right\}=\frac{1}{3}t(e^t - e^{-2t}$
8. Find$L^{-1}\left\{\frac{p}{(p^2+a^2)^2}\right\}$

SECTION – B

Answer the following questions. Each question carries 10 marks. **5 x 10 = 50 M**

9. a) Show that the Laplace transformation of the function $F(t) = t^n, -1 < n < 0$ exists, although it is not a function of class A.

(OR)

b) Find $L\{F(t)\}$, where $\mathrm{F(t)} = \begin{cases} 0 & \text{when } 0 < t < 1 \\ \mathrm{t} & \text{when } 1 < t < 2 \\ 0 & \text{when } \mathrm{t} > 2 \end{cases}$

10. a) State and prove second shifting theorem.

(OR)

b) Let $F\{t\}$ be continuous for all $t \geq 0$ and be of exponential order a as $t \to \infty$ and if $F^1(t)$ is of class A, then show that Laplace transformation of the derivative $F^1(t)$ exists when $p > a$, and $L\{F^1(t)\} = pL\{F(t)\} - F(0)$.

11. a) If $F(t)$ is a function of class A and if $L\{F(t)\} = f(p)$, then $L\{t^n F(t)\} = (-1)^n \frac{d^n}{dp^n} f(p)$, where $n = 1, 2, 3, \ldots$.

(OR)

b) Find the Laplace transformation of $S_i(t)$.

12. a) Show that $L^{-1}\left\{\frac{4p+5}{(p-1)^2(p+2)}\right\} = 3te^t + \frac{1}{3}e^t - \frac{1}{3}e^{-2t}$

(OR)

b) Show that $L^{-1}\left\{\frac{p^2}{(p^4+4a^4)}\right\} = \frac{1}{2a}(coshat.sinat + sinhat.cosat)$.

13. a) Apply convolution theorem to find the inverse Laplace transform of the function $\frac{1}{(p-2)(p^2+1)}$.

(OR)

b) Applying Heaviside's expansion formula, prove that

$$L^{-1}\left\{\frac{1}{p^2+1}\right\} = \frac{1}{3}[e^{-t} - e^{\frac{t}{2}}(cos\sqrt{\frac{3t}{2}} - \sqrt{3}\sin\sqrt{\frac{3t}{2}})]$$

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MODEL PAPER
THREE YEAR B.Sc. DEGREE EXAMINATION
FINAL YEAR EXAMINATIONS
SEMESTER VI Paper –VII B:
ELECTIVE – B: NUMERICALANALYSIS

Time: 3 hours **Maximum Marks: 75**

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SECTION –A

Answer any FIVE of the following questions.
Each carries FIVE marks. **5 x 5 = 25 M**

1) Evaluate the sum S = $\sqrt{3}+\sqrt{5}+\sqrt{7}$ to four significant digits and find its absolute and relative errors.
2) Explain Bisection Method
3) Find a root of the equation $x^3-2x-5=0$ by using Newton- Raphson method.
4) Prove that 1) $E= e^{hD}$ 2) $\nabla = E^{-1}\Delta$.
5) Prove that $\sqrt{1+\delta^2\mu^2} = 1+\delta^2/2$
6) Derive Newton's forward interpolation formula.
7) Find the third divided difference for the function f(x) = x^3 + x + 2 for the arguments 1,3,6,11
8) Using the inverse Lagrange's Interpolation Formula if $y_1 = 4,\quad y_3 = 12, y_4 = 19, y_x = 7$ then find the value of x

Section-B

Answer ALL the questions. Each carries TEN marks 5 x 10 = 50 M

9a) If $u=4x^2y^3/z^4$ and errors in x, y, z be 0.001, compute the relative maximum error in u, when x=y=z=1.

Or

9b) Define absolute, relative, percentage error, and derive general error formula of a function of 'n' variables

10a) Find the root of a equations $\cos x = 3x - 1$ correct to three decimal places using Iteration method.

Or

10b) Find the real root of the equation $x^3-9x+1=0$ by using Regula Falsi Method.

11a) Given, $\sin 45^\circ = 0.7071$, $\sin 50^\circ = 0.7660$, $\sin 55^\circ = 0.8192$, $\sin 60^\circ = 0.8660$, find $\sin 52^\circ$.

Or

11b) State and prove Newton- Gregory backward interpolation formula

12a) Apply Guass forward formula to find the value of f(9) if f(0)=14, f(4)=24, f(8)=32, f(12)=35, f(16)=40

.

Or

12b) State and prove Bessel's formula.

13a) By means of Newton's divided difference formula, find the value f(8) and f(15) from the following table :

x	4	5	7	10	11	13
f(x)	48	100	294	900	1210	2028

.

Or

13b) State and prove Lagrange's Interpolation Formula

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MATHEMATICS MODEL PAPER

SIXTH SEMESTER – VII(C)

NUMBER THEORY

COMMON FOR B.A &B.Sc

(w.e.f. 2015-16 admitted batch)

Time: 3 Hours **Maximum Marks: 75**

SECTION-A

Answer any **FIVE** questions. Each question carries **FIVE** marks. **5 x 5 = 25 Marks**

1. If (a, b) = 1 then prove that (a+b, a-b) is either 1 or 2
2. If c/ab and (b, c) =1 then prove that c/a.
3. Solve the congruence 25x ≡ 15 (mod 120).
4. If a ≡ b (mod m) and c ≡ d (mod m) then prove that ac ≡ bd (mod m)
5. If G is finite and a ∈ G then prove that there is a positive integer n ≤ |G| such that a^n = e.
6. Define the Jacobi symbol
7. Find all primes p such that $\left(\frac{10}{p}\right) = 1$
8. For any positive integer n prove that $\sum_{d/n} \varphi(d) = n$

SECTION-B

Answer the all **FIVE** questions. Each carries TEN marks. **5 x 10 = 50 Marks**

9 (a). State and prove Fundamental theorem of arithmetic.

Or

9 (b). Let d = (826, 1890). Use the Euclidean algorithm to compute d, then express d as a linear combination of 826 and 1890

10 (a). State and prove Wilson's theorem.

Or

10 (b). State and prove Fermat's little theorem.

11 (a).Prove that any complete residue system modulo m forms a group under addition modulo m.

Or

11(b). Let G=(a) be finite group of order n and let G' be a sub group of order m. Prove that m/n.

12(a). Determine whether 219 is a quadratic residue or nonresidue mod 383.

Or

12(b). Let p be an odd prime Then prove that for all n, (n/p) ≡ $n^{(p-1)/2}$(mod p)

13(a). State and prove Mobius inversion formula.

Or

13(b). What is the highest power of 2 dividing 533! ? The highest power of 3 The highest power of 6

The highest power of 6 The highest power of 12 .

ADI KAVI NANNAYYA UNIVERSITY
THREE YEAR B.Sc. DEGREE EXAMINATION
SEMESTER VI MATHEMATICS
Paper –VII D: ELECTIVE – D: GRAPH THEORY
MODEL PAPER

Time: 3 hours **Maximum Marks: 75**

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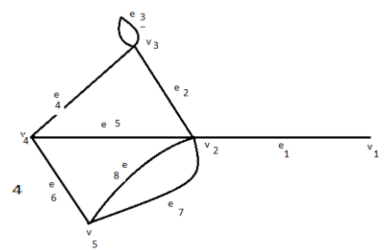
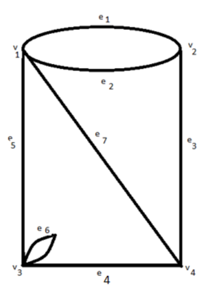
SECTION –A

Answer any FIVE of the following questions. Each carries FIVE marks. 5 x 5 = 25 M

1. Write the vertex set, edge set and degree of every vertex of the graph



2. Define incidence and adjacency matrix and write the incidence and adjacency matrices of the graph



3. Prove that in a tree, any two vertices are connected by a unique path.
4. If G is connected then prove that any two vertices of G lie on a common cycle.
5. Define the vertex cut and edge cut of a graph G(V,E) and give examples.
6. Define Eulerian graph and give an example.
7. Draw the Dodecahedran graph and a Hamilton cycle of it.
8. Explain the Chinese post man problem.

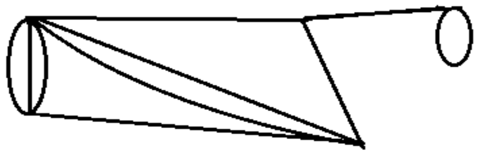
SECTION – B

Answer the following questions. Each question carries TEN mars. 5 x 10 = 50 M

9. (a) Define the degree of a vertex in a graph G and prove that the number of vertices of odd degree is even.

(OR)

(b) Define sub graph of a graph and write four sub graphs of

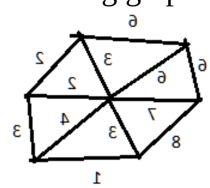


10. (a) Write the Dijkastras algorithm for finding the shortest path between two vertices in a graph and give an example.

(OR)

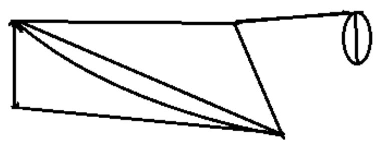
(b) Prove that a connected graph is a tree if and only if every edge is a cut edge.

11. (a) Write the Kruskal's Algorithm for finding a minimal spanning tree and find a minimal spanning tree of the following graph.



(OR)

(b) Define blocks of a graph and draw the blocks of the following graph.



12. (a) Prove that a connected graph has an Euler trail if and only if it has at most two vertices of odd degree.

(OR)

(b) If G is a simple graph with $\nu \geq 3$ and $\delta \geq \frac{\nu}{2}$ then prove that G is Hamiltonian.

13. (a) Write the Fleury's algorithm and give an example.

(OR)

(b) Explain the travelling sales man problem.

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ADIKAVI NANNAYYA UNIVERSITY
III-B.Sc. DEGREE EXAMINATIONS

SEMESTER-VI **SUBJECT: MATHEMATICS**

Paper –VIII-A-1 **Cluster: D**

Title of the Paper: Integral Transformations

MODEL PAPER

Time: 3 hours **Max marks: 75M**

SECTION–A

Answer any **FIVE** from the following questions. Each carries **5** marks. 5X5 = 25M

1. Solve $\frac{d^2y}{dx^2} + y = 0$ under the conditions that $y = 1, \frac{d\ \ y}{dx} = 0\ when\ t = 0.$
2. Solve $(D^2 + 2D + 1)y = 3te^{-t}, t > 0$, subject to the conditions $y = 4, Dy = 2$ $when\ t = 0.$
3. Solve $(D^2 - 1)x + 5Dy = t,\ -2Dx + (D^2 - 4)y = -2$ if $x = 0 = Dx = y = Dy$ when $t = 0.$
4. Solve the integral equation $\int_0^t F(u)\,\mathrm{F}(t-u)\,du = 16\,sin4t.$
5. If $\tilde{f}(p)$ and $\tilde{g}(p)$ are Fourier Transforms of $f(x)$ and $g(x)$ respectively , then prove that $F\{af(x) + bg(x)\} = a\tilde{f}(p) + b\tilde{g}(p)$
6. Find the Fourier Transform of $F(x) = \begin{cases} 1 - x^2, & |x| \le 1 \\ 0, & |x| > 1 \end{cases}$
7. Solve the integral equation $\int_0^\infty f(x) cos\lambda x\, dx = e^{-\lambda}$
8. Find the finite cosine transform of $(1 - \frac{x}{\pi})^2$.

SECTION – B

Answer **all** the questions. Each question carries **10** marks. 5 x 10 = 50 M

9. a) Solve $(D + 1)^2 y = t\ give\ that\ y = -3, when\ \ t = 0\ and\ y = -1, when\ t = 1.$

(OR)

b) Solve$(D^2 + 1)y = sint\ sin2t, t > 0\ if\ \ y = 1,\ Dy = 0\ when\ t = 0$

10. a) Solve $Dx + Dy = t, D^2x - y = e^{-t}$ if $x(0) = 3, x^I(0) = -2,\ y(0) = 0.$

(OR)

b) Solve $\frac{\partial y}{\partial t} = 2\frac{\partial^2 y}{\partial x^2}$ where $y(0,t) = 0 = y(5,t)$ and $y(x,0) = 10\ sin4\pi x$

11. a) Solve the integral equation $F(t) = 1 + \int_0^1 F(u) . \sin(t - u)\, du$ and verify your solution.

(OR)

b) Solve the integral equation $\int_0^1 \frac{F(u)du.}{(t-u)^{\frac{1}{3}}} = t(1 + t)$

12. a) Find the Fourier Cosine Transform of e^{-x^2}

(OR)

b) State and Prove Parsvel's identity for Fourier Transforms.

13. a) Find the finite cosine transform of $f(x)$ if $f(x)$ = $-\frac{\cos k(\pi-x)}{k \sin k\pi}$.

(OR)

b) Find the finite Fourier sine and cosine transformations of the function

$f(x) = 2x, 0 < x < 4$.

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MODEL PAPER
THREE YEAR B.Sc. DEGREE EXAMINATION
FINAL YEAR EXAMINATIONS
SEMESTER VI Paper –VIII- B-1:
Cluster Elective - VIII –B - 1: ADVANCED NUMERICAL ANALYSIS

Time: 3 hours **Maximum Marks: 75**

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SECTION –A

Answer any FIVE of the following questions.
Each carries FIVE marks. 5 x 5 = 25 M

1) Fit the line y = a +bx using the following data using least square method

X	0	1	2	3
Y	2	5	8	11

2) Prove that $E = e^{hD}$

3) 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
e^x	0.9320	0.9636	0.9855	0.9975	0.9996

4) Evaluate $\int_0^5 \frac{dx}{4x+5}$ by using Trapezoidal Rule.
5) Evaluate $\int_4^{5.2}$ logx dx by using Weddle’s rule.
6) Solve the equations $2x_1 + x_2 + x_3 = 10 : 3x_1 + 2x_2 + 3x_3 = 18 : x_1 + 4x_2 + 9x_3 = 16 :$ Using Gauss elimination method.
7) Using Taylor series method, solve the equation dy/dx =(x^2+y^2) for x=0.4 given that y=0 when x=0
8) Solve by Euler’s method, dy/dx=x+y^2,y(0)=1 and find y(0.3) with h=0.1

Section-B

Answer ALL the questions. Each carries TEN marks 5 x 10 = 50 M

9a) Derive the normal equations to fitting a second degree polynomial.

Or

9b) Determine the constants a and b by the method of least squares such that $y=ae^{bx}$

X	2	4	6	8	10
Y	4.077	11.084	30.128	81.897	222.62

10a) Using the given table, find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x = 1.1

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	7.989	8.403	8.781	9.129	9.451	9.750	10.031

.

Or

10b) Find $f'(0.6)$ and $f''(0.6)$ from the following table :

x	0.4	0.5	0.6	0.7	0.8
f(x)	1.5836	1.7974	2.0442	2.3275	2.6510

.

11a) Obtain general formula for Quadrature. And hence derive Trapezoidal Rule

Or

11b) Find the value of the integral $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's $1/3^{rd}$ and $3/8^{th}$ rule. Hence obtain the approximate value of π in each case.

12a) Solve the following system of equations by using Gauss- Seidel method Correct to three decimal places

$10x + 2y + z = 9; 2x + 20y - 2z = -44; -2x + 3y + 10z = 22;$

Or

12b) Solve the following system of equations by using Gauss- Jacobi method Correct to three decimal places.

$8x - 3y + 2z = 20; 4x + 11y - z = 33; 6x + 3y + 12z = 35;$

13a) Use the Euler's modified method find y at x=0.02 by taking h=0.01 for the differential equation $dy/dx= x^2+y$ and y (0)=1.

.

Or

13b) Apply the fourth order R-K method to find y(0.1) and y(0.2), given $dy/dx= xy+y^2$, y(0)=1

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III.B.Sc: Mathematics

Cluster Elective – VIII-C-1

Principles of Mechanics

Model Paper

Section -A

I. Answer ALL questions. 5 x 10 = 50

1. a) Derive Lagrange's equation form D'Aleberts principle.

(Or)

b) Obtain the equation of motion of a simple pendulum by Lagrangian method and hence deduce the formula for its time period for small aptitude oscillations.

2. a) State Hamilton's principle and derive Lagranges equation from Hamilton principle.

(Or)

b) Derive Lagranges equations for non-conservative system.

3. a) State and prove theorem of conservation for linear momentum.

(Or)

b) State and prove theorem of conservation of angular momentum.

4. a) Derive Hamiltons Canonical equations of motion.

(Or)

b) State and prove principle of least action.

5. a) Show that fundamental Poisson brackets are invariant with respect to canonical transformations.

(Or)

b) State and prove Jacob's Identity.

Section - B

II. Answer any FIVE questions 5 x 5 =25

1. Derive equation of D'Alembert's principle using Newton's- second law of motion.
2. What are holonomic and non-holonomic constraints.
3. Find the equation of motion of one dimensional harmonic oscillator using Hamilton's principle.
4. What is a cyclic coordinate? illustrate with example.
5. Derive Hamilton equation of motion for simple pendulum.
6. Obtain the Lagrangian, Hamilton and equations of motion for a projectile near the surface of the earth.
7. Define and derive relations for canonical and Legendre transformations.
8. Show that Lagrange's bracket is invariant under canonical transformation.

III.B.Sc: Mathematics
Cluster Elective – VIII-C-2
Fluid Mechanics
Model Paper
Section -A

I. Answer ALL questions. 5 x 10 = 50

1. a) Derive equation of continuity and deduce equation for steady flow and incompressible fluids.

(Or)

b) Show that motion specified by $\bar{q} = \frac{k^2(xJ - yi)}{x^2+y^2}$ (k constant) is i) incompressible and determine equations of stream line. ii) Show that flow is of potential kind.

2. a) Derive Euler equation of motion.

(Or)

b) Derive Bernoulli's equation of motion.

3. a) Discuss the flow with axial symmetry of underwater explosion giving spherical gasbubble

(Or)

b) Define the vorticity w in the motion of a continuous medium with velocity v. Derive vorticity equation $\frac{\partial w}{\partial t}$ + (V.∇)w = (w. ∇)V for a motion of an inviscid incompressible fluid of uniform density.

4. a) Define velocity potential and stream function and show that for two dimensional study, flow poisons.

(Or)

b) Define irrotational and incompressible flow- State and prove the Milne – Thomson circle, theorem

5. a) Derive Navier – Stokes equations of motion of a viscous Fluid.

(Or)

b) Define stress and strain of viscous fluid and discuss the relations between stress and rate of strain.

Section - B

II. Answer any Five questions 5 x 5=25

1. For an incompressible fluid q=-wyi + wxj (w constant) show that i) ∇. q =0 ii) flow is not of the potential kind iii) stream lines are circles.
2. The velocity components in a two–dimensional flow for an incompressible fluid are $u=\frac{y^3}{3}+2x-x^2y$; $v= xy^2-2y-\frac{x^3}{3}$
   a) Obtain stream function Ψ b) Obtain velocity potential $\boldsymbol{\phi}$
3. For a three – dimensional flow field described by $V = (y^2+z^2)\,i + (x^2+z^2)\,j + (x^2+y^2)\,k$ find at (1,2,3) i) components of acceleration ii) components of rotation
4. Derive equation of steady motion under conservative body force.

5. Derive equations of velocity components for uniform flow past a fixed infinite circular cylinder
6. Show that the complex potential for two dimensional, Irrotational, incompressible flow satisfy Cauchy – Rieman equations.
7. Discuss stress analysis for fluid motion.
8. Define coefficient of viscosity and in usual notation Prove that $P_{zy}=\mu\frac{dv}{dz}$ .Also find dimensions of μ

ADI KAVI NANNAYYA UNIVERSITY
THREE YEAR B.Sc. DEGREE EXAMINATION
SEMESTER VI MATHEMATICS
Cluster Elective -VIII –D - 1: APPLIED GRAPH THEORY

MODEL PAPER

Time: 3 hours **Maximum Marks:75**

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SECTION –A

Answer any FIVE of the following questions. Each carries FIVE marks.5 x 5 = 25 M

1. Define and give example of maximum and Perfect matching in graphs.
2. Define and give example of M-Alternating Path and Covering of a graph.
3. Prove that every 3-regular graph with out cut edges has a perfect matching.
4. Define an M-alternating tree and give an example.
5. Define Proper k- edge coloring and give an example.
6. Explain the time table problem with an example.
7. A set $S \subseteq V$ is an independent set of G if and only if V/S is a covering of G.
8. Give an example of (3,5) – Ramsey graph.

SECTION – B

Answer the following questions. Each question carries TEN marks. 5 x 10 = 50 M

9. (a) If G is a k-regular bipartite graph with k>0 then prove that G has a perfect matching.

(OR)

(b) In a bipartite graph, prove that the number of edges in a maximum matching is equal to the number of vertices in a minimum covering.

10. (a) Write the Hungarian method.

(OR)

(b) Write the Kuhn – Munkers Algorithm.

11. (a) Let G be a connected graph that is not an odd cycle. Then prove that G has a 2-edge coloring in which both colors are represented at each vertex of degree at least two.

(OR)

(b) If G is bipartite, then prove that $X' = \Delta$.

12. (a) If G is bipartite, and if $p \geq \Delta$, then prove that there exist p disjoint matchings $M_1, M_2, \dots, M_p$ $of\ G\ such\ that\ E = M_1 \cup M_2 \cup\ \dots \cup\ M_p\ and,$
$for\ 1 \leq i \leq p \quad [\varepsilon/p] \leq |M_i| \leq \{\varepsilon/p\}$.

(OR)

(b) If $\delta > 0, then\ prove\ that\ \alpha' + \beta' = \nu$.

13. (a) Prove that $r(k,l) \leq \binom{k+l-2}{k-1}$.

(OR)

(b) If a simple graph G contains no K_{m-1}, then prove that G is degree majorised by some complete m-partite graph H.

ADIKAVI NANNAYA UNIVERSITY, RAJAMAHENDRAVARAM

III B.A/B.Sc VI Semester MATHEMATICS PAPER-VIII (A,B,D-2)

CLUSTER ELECTIVE - *SPECIAL FUNCTIONS*

Time:3Hrs **_Max.Marks:75_**

SECTION-A

Answer <u>any 5</u> questions of the following. **5X5=25**

1. Prove that $H_n^{11}(x) = 4n(n-1)H_{n-2}$

2. Evaluate $\int_{-\infty}^{\infty} xe^{-x^2} H_n(x) H_m(x)\,dx$

3. Prove that $L_n^1(x) = -\sum_{r=0}^{n-1} L_r(x)$

4. Prove that $p_n(0) = 0$ for 'n' odd and $p_n(0) = \dfrac{(-1)^{\frac{n}{2}} n!}{2^n \left\{\left(\frac{n}{2}\right)!\right\}^2}$ for 'n' even

5. Prove that $\int_{-1}^{1} P_m(x) P_n(x)\,dx = 0 \quad if \quad m \neq n$

6. Prove that i) $J_0^{\,1} = -J_1$ ii) $J_2 - J_0 = 2J_0^{\,11}$

7. Prove that $2J_n^{\,1}(x) = J_{n-1}(x) - J_{n+1}(x)$

8. Evaluate $\int_0^a x^4 \sqrt{a^2 - x^2}\,dx$

SECTION-B

Answer <u>all</u> the following questions **5X10=50**

9. a) Prove that $e^{2tx-t^2} = \sum_{n=0}^{\infty} \dfrac{t^n}{n!} H_n(x)$

OR

b) Prove that $\int_{-\infty}^{\infty} e^{-x^2} H_n(x) H_m(x)\,dx = \begin{matrix} 0 & if \;\; m \neq n \\ \sqrt{\pi}\, 2^n n! & if \;\; m = n \end{matrix}$ n

10. a) Prove that $L_n(x) = \dfrac{e^x}{n!} \dfrac{d^n}{dx^n}\left(x^n e^{-x}\right)$

OR

b) Find $L_0(x), L_1(x), L_2(x), L_3(x)$ *and* $L_4(x)$

11. a) Prove that $P_n(x) = \frac{1}{n!2^n}\frac{d^n}{dx^n}\left(x^2 - 1\right)^n$

OR

b) Prove that $(2n+1)xP_n(x) = (n+1)P_{n+1}(x) + nP_{n-1}(x)$

12.a) Show that i) $J_{-n}(x) = (-1)^n J_n(x)$ when n is a positive integer

ii) $J_n(-x) = (-1)^n J_n(x)$ when n is a negative integer

OR

b) Prove that $xJ_n^{\ 1}(x) = -nJ_n(x) + xJ_{n-1}(x)$

13. a) Prove that $\beta_{l,m} = \frac{\Gamma l \ \Gamma m}{\Gamma l + \Gamma m}$

OR

b) When n is a positive integer, Prove that $\Gamma\left(-n + \frac{1}{2}\right) = \frac{(-1)^n 2^n \sqrt{\pi}}{1.3.5.....(2n-1)}$

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