B.A. / B. Sc. Semester-I (General)
MATHEMATICS
Paper-I
Mark : 20+80=100

Unit-I(20+20=40)

(Classical Algebra & Vector Algebra)

1. Inequalities : A. M. ≥G.M ≥ H.M. Their generalization like the theorem of weighted mean and m^{th} power theorem. Statement of Cauchy-Schwartz inequality. Weierstrass inequality and their application. DeMoivre's theorem and its applications.

2. Exponential sine, cosine and logarithm of complex number. Direct and inverse circular and hyperbolic functions. Expansion of trigonometry functions. Gregory's series. Summation of series. Revision of definition of vectors and its algebra. Rectangular solution of vector. linear dependent and independent of vectors. Two vectors are linier dependent iff one is scalar multiple of other. Every super set of linearly dependent set of vectors is linearly dependent. The set of non-zero vectors are linearly iff one of them is scalar combination of others.

3. Scalar and vector product of two vectors. Scalar and vector triple product. Product of four vectors. Reciprocal vectors. Simple applications to geometry. Vector equations of straight line, plane and circle. Applications to mechanics: work done, torque.

Unit-II(20+20=40)

(Abstract Algebra & Linear)

1. Revision of set theory, relation and mapping. Equivalence relation, partition of a set, equivalence classes, composition of functions. Congruence modulo n. Binary operation. Group Theory: Group, Abelian group, identity and inverse element in a group is unique. Subgroups, necessary and sufficient condition of a non-empty subset of a group is a subgroup, cyclic group, order of a group and order of an element.

2. Rings and Fields: Properties of Rings directly following from the definition, Unitary and commutative rings. Divisors of zero, Integral domain, Every field is an integral domain, every finite integrals domain is a field. Definitions of Sub-ring and sub-field. Statement of Necessary of sufficient condition for a subset of a ring (field) to be sub-ring (resp. subfield). Matrix: Matrices of real and complex numbers : Algebra of matrices. Symmetric and skew-symmetric matrices, Solution of linear equation with not more than three unknown by matrix method. Rank of a matrix. Characteristics polynomial, characteristics equations, Eigen value & Eigen Vector. Cayley Hamilton theorem(statement only).

3. Vector space/Linear space (Def. and examples), Linear combination, independence and dependence, linear span, basis and dimention (Def. and examples). Subspace (Def. and examples), intersection and union of subspaces, linear sum of two subspaces, direct sum of subspaces, dimension of sum and subspaces. Linear transformation and their representation as matrices, kernal and range of a linear transformation, the algebra of linear transformations, the rank nullity theorem(statement only).

Reference:

1. Advanced Higher Algebra: Ghosh and Chakraborty, U. N, Dhur.
2. Algebra: R.M.Khan, Central
3. Higher Algebra: Mapa, Ashok Pub.
4. Cordinate Geometry: S.B.Sengupta

B.A. / B. Sc. Semester-II (General)
MATHEMATICS
Paper-II
Mark : 20+80=100

Unit-I(20+20=40)
Differential Calculus

1. Idea of $\varepsilon-\delta$ definition of limit and continuity of a function. Indeterminate forms, statement of L'Hospital rule and its applications. Successive differentiation, leibnitz's theorem and its applications. Rolle's theorem and its geometric interpretation. Mean value theorem of Lagrange and Cuchy. Geometric interpretation of Lagrange's mean value theorem Statement of Taylor's and Maclaurin's theorem with Lagrange's and Cauchy's form of remainder. Taylor's and Maclaurin's series (Statement only). Expansions of functions in finite and infinite series like sin(X), Cos(X), exp(X), a_x, $(1+x)_n$, log(1+x) (with restrictions whenever necessary)

2. Sequence and series: Limit of sequence. Convergent and non convergent Cauchy sequence. Convergence of infinite. Statement and use of different tests for convergence of series of non-negative terms.

3. Functions of several variables: Limits and continuity (definition and examples only), Partial derivative. Total differentials. Statement of Schwartza and Youns's theorem on commutative property of mixed derivative. Euler's theorem of homogeneous functions of two variables. Statement of Taylor's theorem for functions of two variables. Jacobian, maxima, minima, saddle points of functions of two points (examples only). Application : Tangent normal sub tangent and sub normal. Length of tangent and normal. Differential of are length. Curvature and rectilinear asymptote for Cartesian and polar curve.

Unit-II(20+20=40)
Integral Calculus

1. Definition of improper integrals, example. Definition and simple properties of beta & Gamma functions & their uses (convergence and important relations being assumed)

3. Reduction formulae such as $\int \sin^n x dx$, $\int \cos^n x dx$, $\int \tan^n x dx$, $\int \sec^n x dx$, $\int \sin^n x \cos^m x dx$, $\int \sin^n x \cos mx dx$ etc where m and n are non-negetive inetegers.

4.1 Rectification of plane curves. Volume and surface area of solid formed by revolution of plane curves and areas about x-axis and y-axis.

4.2 Working knowledge of double and triple integrals, change of order of integration.

4.3 Differentiability and integrability of an integral of a function of a parameter. Differentiability under the sign of integration, statements of necessary theorems. Centroid. Centroid of arc, plane area, volume and surface area of revolution.

Reference:

1. Differential Calculus: Das and Mukherjee, U.N.Dhur
2. Integral Calculus: Das and Mukherjee, U.N.Dhur

B.A. / B. Sc. Semester-III (General)
MATHEMATICS
Paper-III
Mark : 20+80=100

Unit-I(20+20)
(Geometry-Two Dimension and Three Dimension)

1. Transformation of rectangular axes, translation, rotation and their combinations, theory of invariants. General equation of second degree in two variables, reduction into canonical form, lengths and position of the axes. Pair of straight lines: Condition that the general equation of second degree in two variables may represent a pair of straight lines. Point of intersection of two intersecting straight lines, angle between two lines given by $ax^2+2hxy+by^2$, equation of bisectors of the angle between the pair of straight lines, equation of two lines joining the origin to the point in which two curves meet. Polar coordinates, polar equation of straight lines, circles and conic referred to a focus as pole, equation of chord, tangent and normal.

2. Rectangular Cartesian co-ordinates in space, concept of geometric vector (directed line segment), projection of vector on a co-ordinate axis, inclination of a vector with an axis, co-ordinates of a vector, direction ratio and direction cosine of a vector. Distance between two points, division of directed line segment in given ratio. Equation of a plane in general form, intercept and normal form, signed distance of a point from a plane, equation plane passing through the intersection of two planes, angle between two intersecting planes, parallel and perpendicularity of two planes.

3. Straight lines in space, equation in symmetric and parametric form, canonical equation of line of intersection of two intersecting planes, angle between two lines, distance of a point from a line, condition of coplanarity of two lines. General equation of sphere , circle, sphere through the intersection of two sphere, radical plane, tangent, normal.

References:

1. Co-ordinate Geometry-S.B.Sengupta.
2. Co-ordinate Geometry-S.L.Lony, Macmillan and Co.

Unit-II(20+20=40)
(Differential Equations)

1. Significance of ordinary differential equation. Geometrical and physical consideration. Formation of differential equation by elimination of arbitrary constant. Meaning of the solution of ordinary differential equation. Concept of linear and non-linear differential equations. Equations of first order and first degree : Statement of existence theorem. Separable, Homogeneous and Exact equation. Condition of exactness, Integrating factor. Rules of finding integrating factor, (statement of relevant results only),Equations reducible to first order linear equations.

2. Equations of first order but not of first degree, Clairaut's equation, Singular solution, Applications : Geometric applications, Orthogonal trajectories. Higher order linear equations with constant co-efficients : Complementary function, Particular Integral, Symbolic operator D.

3. Method of undetermined co-efficients, Method of variation of parameters. Euler's homogeneous equation and Reduction to an equation of constant coefficients. Ordinary simultaneous differential equations.

References:

1. Differential Equations: Ghosh and Chakraborty, U.N.Dhur
2. Differential Equations: M.D.Raisinghania, S. Cand.

B.A. / B. Sc. Semester-IV (General)
MATHEMATICS
Paper-IV
Mark : 20+80=100

Unit-I(20+20=40)
(Linear Programming Problem)

1 What is LPP ? Mathematical form of LPP formulation. LPP in matrix notation. Graphical solution of LPP. Basic solution, Basic feasible solution, degenerate and non-degenerate BFS. Euclidean space, hyperplane, convex set, extreme points, convex functions and concave functions, the hyperplane in convex set. Intersection of two convex sets is convex set, the collection of all feasible solution of a LPP constitutes a convex set. A BFS to a LPP corresponds to an extreme point of convex set of feasible solutions.

2. Slack, surplus and artificial variables, standard form of LPP, Fundamental theorem pf LPP and their applications, theory and application of the simplex method of solution of LPP. Charne's M-technique.

3. Duality. Transportation problem. TP in LPP form. Balanced TP. Optimality test of BFS. Assignment problem. Solution of AP [(Maximization, unbalanced, negative cost and impossible assignment. Traveling salesman problem.

(Problem should be set on simplex and Charne's method, two phase method in such ay that it may contain at most three or four tableau with approximate marks.)

References:

1. Linear Programming Problem- Chakroborty and Ghosh-U.N.Dhur and Sons
2. Operations Research-Kantiswarup et. al, Sultan Chand and Sons.
3. Linear Programming and Theory of Games, P.M.Karak, Central Book Agency.

Unit-II(20+20=40)
(Probability Theory & Vector Calculus)

2. Frequency and Axiometic definition of probability.Random variables. Probability Distribution function. Discrete and continuous random variable, probability mass function and probability density function, mathematical expectation, mean and variance (simple problems only). Binomial, Poission, uniform, Normal, Beta and Gamma Distributions. Moments of a probability distribution, skewness and kurtosis of a probability distributuin, moment generating function. Transformation of one dimensional random variable(simple applications).

2. Vector function, limit and continuity, derivative of vector, derivative of sums and product of vector functions. A necessary and sufficient condition that a proper vector $\hat{a}$ (i) has a constant length that $\hat{a}.d\hat{a}/dt = 0$, (ii) always remains parallel is that $\hat{a}\times d\hat{a}/dt=\tilde{O}$.

3. Vector integration, scalar and vector fields, directional derivatives, gradient of a scalar point function, ∇ operator, divergence, curl and Laplacian.

Line, surface and volume integral. Statement of Gauss's, Stoke's theorem and problem based on these.

References:

1. Ground Work of Mathematical Probability and Statistics-Amritabha Gupta, Academic Pub.
2. Statistical Methods,Vill-I and II-N.G.Das
3. Vector Analysis-Maity and Ghosh, New Central Book Agency.
4. Vector Analysis- Schaum's series, Tata McGrawHill

B.A. / B. Sc. Semester-V (General)
MATHEMATICS
Paper-V
Mark : 50(Theory)+50(Practical)=100
Theory Mark : 10+40=50

Unit-I(20)
Numerical analysis

1. Approximate numbers and significant figures, rounding off numbers. Error and Absolute, relative and percentage errors. Linear operation, Difference, finite difference interpolation. Lagrange interpolation. Newton's forward and backward difference formula. Differentiation formula based on Newton's forward and backward difference formula. Numerical integration, deduction of Trapezoidal, Simpson's 1/3 rule from Newton's forward difference formula.
2. Solution of algebraic and transcendental equations: Bisection, Secent/Regula Falsi, Newton's-Raphson method, iteration method.
3. Solution of linear equations: Gause elimination, Gause-Jordan method. LU Decomposition. Inversion of 3 ×3 non-singular matrices by Gause elimination and Gause-Jordan method.

Refernces:

1. Numerical Analysis-S.A.Mollah, New Central Book Agency.

Unit-II(20)
Computer Science

1. Introduction to ANSI-C : Character set in ANSI-C. Key words: int, char, float, while etc. Constant and Variables, expressions, assignment statements, formatting source files. Header files.Data types, declarations, different types of integers, different kinds of integer constants, floating-point types, initialization, standard input/output. finding address of an object.
2. Operations and expressions, precedence and associatively, unary plus and minus operators, binary arithmetic operators, arithmetic assignment operators, increment and decrement operators, comma operator, relational operators, logical operators.
3. Control flow, conditional and unconditional bracing, looping, nested loops. if-else, do-while, for, switch, break, continue, goto statements etc., Infinite loops.

Arrays and Pointers

References:

1 Programming in ANSI-C-E.Balaguruswami, Tata MacGrawHill.
2 Let Us C- Kanethkar,BPB Pub.

Practical(40)

(Practical-Simple C-Programming and Numerical analysis through C programming):

(Laboratory Work Book:5.Viva-Voci-5, C-Programming-30.

1. Ascending / Descending order. Finding Largest / smallest.
2. Sum of finite series. Mean and variance.
3. Conversion of binary to decimal and decimal to binary.
4. Checking whether a number is prime or not. Generation prime numbers.
5. Solution of Quadratic equation. Newtone-Raphson's method. Lagrange interpolation.
6. Bisection method. Newton-Raphson method.
7. Trapezoidal Rule. Simpson's 1/3 rule.
8. Value of Determinant.
9. Cramer's Rule (for two variables).
10. Matrix addition, subtraction, transposition.

B.A. / B. Sc. Semester-VI (General)
MATHEMATICS
Paper-VI
PROJECT
Mark : 20+80=100

This paper is a Dissertation paper. Each student will select an advanced topic in Mathematics and undergo critical study under the guidance of a teacher. At the end of semester he/she will submit his study note book (40-50 pages). He/she will deliver an open power point presentation and will face questions from the teachers and spectators on his topic during his/her presentation.

Mark Distribution:
Internal assessment: 20
Dissertation note book: 20
Power point presentation: 40
Viva:20
Total:100

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