

M.D.S.UNIVERSITY,AJMER

B.Sc.(Hons.) Part I

(2015-2016)

MATHEMATICS

SCHEME

Paper	Nomenclature	Teaching Hrs./Week	Examination Duration	Max.Marks
I	HIGHER ALGEBRA	5	3	100
II	CALCULUS	5	3	100
III	GEOMETRY AND VECTOR CALCULUS	5	3	100
IV	DISCRETE MATHEMATICS	5	3	100
V	MATHEMATICAL STATISTICS	5	3	100
Max. Marks				500
Max. Pass Marks				200

PAPER- I

HIGHER ALGEBRA

Duration:3Hrs.

Max.Marks:100

Note. Paper is divided into three independent units. The question paper is divided into three parts Part-A, Part-B and Part-C.

Part A-(20Marks) is *compulsory* and contains **10** questions (**50 words**) at least 3 questions from each unit, each question is of **2** marks.

Part B- (20Marks) is *compulsory* and contains **5** questions (**100 words**) at least one question from each unit, each question is of **4** marks.

Part C-(60Marks) contains 6 questions two from each unit. Candidates required to attempt 3 questions, one from each unit. Each question is of **20** marks (**400 words**).

UNIT-1

Number system, basic binary operations on the set of integers, ordering of the integers, inequalities, well ordering principle, mathematical induction, division algorithm, divisibility principle, and their distributions, greatest common divisor, least common multiple, Euclidian algorithm, fundamental theorem of arithmetic, Fibonacci sequence, linear Diophantine equations, Diophantine equations of second degree, general integer solutions of the equations of $x^2 + y^2 + z^2 = w^2$, $(x, y, z, w) = 1$, $x^n + y^n = w^n$, prime numbers, Goldbach conjecture.

UNIT –II

Congruence's, special divisibility test, Chinese remainder theorem, congruence of higher degree, Fermat's theorem and its applications, Euler's ϕ function, perfect numbers.

Continued fractions: Conversion, quadratic surd, convergents, formation of convergents, property of convergents, recurring continued fractions, relation between successive convergents, complete quotient, relation between convergents and fraction, the difference.

Recurring series: Order and sum of a recurring series. summation of series.

Theory of equations: General properties of equations, character and position of the roots, representation of equations and its roots graphically.

UNIT – III

Relations between roots and coefficients, symmetric functions of roots, transformations of equations, Solutions of cubic equations, solutions of multivariable linear equations using vedic mathematics and other methods.

Note: Use of vedic mathematics methods should be promoted.

PAPER-II CALCULUS

Duration:3Hrs.

Max.Marks:100

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UNIT -1

Tangents and normals, pedal equation, Derivative of the length of an arc, maxima, minima and saddle points of functions of two variables, Lagrange's multiplier method, expansions, partial differentiation, Euler's theorem on homogeneous functions.

UNIT –II

Curvature, various formulae, centre of curvature, chord of curvature and related problems, evolutes, envelopes, asymptotes, concavity and convexity, singular point, double point, curve tracing (in Cartesian and polar co-ordinates.), Jacobians, Beta and Gamma functions.

UNIT –III

Double and triple integrals, Dirichlet's integrals, change of order of integration in double integrals, quadrature, rectification, intrinsic equation, volume and surfaces of solids of revolution.

PAPER-III
GEOMETRY AND VECTOR CALCULUS

Duration: 3Hrs.

Max.Marks:100

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UNIT -1

Ellipse and hyperbola: Various properties of ellipse and hyperbola.

General equation of second degree: Tracing of conics, center of a conic, co-ordinates of the center, equation of the conic referred to center as origin, asymptotes of a conic, lengths and position of axes of a standard conic, eccentricity, foci, directrices, axis, latus rectum of a conic, vertex and focus of the parabola, tracing of ellipse and hyperbola.

The polar equation of a conic: Polar co-ordinates, polar equation of a straight line, circle and conic, focal chord, auxiliary circle, tracing of conic $l/r=1 + e \cos\theta$, tangents, asymptotes, perpendicular lines, normal, polar to a conic.

UNIT – II

Sphere: Plane section of a sphere, tangent plane, pole and polar plane, orthogonal spheres, radical plane, radical centre.

Cone: Reciprocal cone, right circular cone, enveloping cone.

Cylinder: Right circular cylinder, enveloping cylinder.

Central conicoids: Ellipsoid, tangent plane, polar, polar lines, enveloping cone, enveloping cylinder, section with a given center, normal, conjugate diameters and diametral planes and their properties, general equation of second degree in three dimensions, intersection of a line and a conicoids, tangent lines and tangent plane, condition of tangency, plane section with a given center, diametral plane, principal planes and principal directions.

UNIT – III

Vector differentiation: gradient, divergence and curl, identities involving these operators and related problems.

Vector Integration: Line and surface integral, theorems of Gauss, Green's and Stoke's and problems based on these theorems.

PAPER - IV
DISCRETE MATHEMATICS

Duration:3Hrs.

Max.Marks:100

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UNIT-I

Sets Relations and Functions: Combination of sets, finite and infinite sets, uncountable infinite sets, binary relations, equivalence relations and partitions, partial order relations and lattices. Chains and anti-chains, a job scheduling problem, one-to-one, onto and invertible functions, Mathematical functions, exponential and logarithmic functions, sequences, indexed classes of sets, recursively defined functions, cardinality, algorithms and functions.

UNIT-II

Logic and Propositional Calculus: Propositions and compound propositions, basic logical operations, propositions and truth tables, tautologies and contradictions, logical equivalence, algebra of propositions, conditional and bi-conditional statements, arguments, logical implication, propositional functions, quantifiers, negation of quantified statements.

Boolean Algebra: Basic definitions, duality, basic theorems, Boolean algebras as lattices, representation theorem, sum of products form for sets, sum of products form for Boolean algebras, minimal Boolean expressions, prime implicants, logic gates and circuits, truth tables Boolean functions.

UNIT-III

Graph Theory: Data structures, graphs and multigraphs, subgraphs, isomorphic and homeomorphic graphs, paths, connectivity, the bridges of Königsberg, traversable multigraphs, labeled and weighted graphs, complete, regular and bipartite graphs, tree graphs, planar graphs, graph colorings, shortest paths.

Directed Graphs: Directed graphs, basic definitions, rooted trees, sequential representation of directed graphs,

PAPER-V
MATHEMATICAL STATISTICS

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UNTT-I

Probability: Law of total and compound probability, conditional probability, Bay's theorem, mathematical expectations, moments, moment generating functions, cumulants and cumulant generating functions, measures of skewness and kurtosis.

UNTT-II

Univariate probability distribution: Binomial and Poisson's distributions, fitting of Binomial and Poisson distribution, rectangular distribution with important properties.

UNIT-III

Normal distribution and its properties, the principle of least squares and curve fitting,
Bivariate distribution: Correlation and regression, multiple and partial correlation.
