

# M.D.S.UNIVERSITY,AJMER

## B.Sc.(Hons.) Part I

(2020-2021)

### 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
<b>Max. Marks</b>				<b>500</b>
<b>Min. Pass Marks</b>				<b>200</b>

#### General Instructions

**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**).

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**PAPER- I**  
**HIGHER ALGEBRA**

**Duration: 3Hrs.**

**Max.Marks:100**

**UNIT -1**

**Theory of Equations:** Primes and factorization, Division algorithm, Congruences and modular arithmetic, primitive roots of unity, Remainder Theorem, Euler  $\Phi$  function, Roots of an equation, Relations between the roots and coefficients, Transformations in General equations, Descarte's rule of sign, The Diophantine equations  $X^2+Y^2=Z^2$ ,  $X^4+Y^4=Z^4$ , solutions of cubic equation, Biquadratic equations, Farey sequences.

**UNIT II**

**Matrices:** Linear independence of row and column matrices. Equivalence of column and row ranks. Eigen values and Eigen vectors, Cayley Hamilton theorem(without proof), Verification, Using this theorem finding the inverse of a matrix, Partition of matrices, Diagonalisation of matrices, Power of matrices, Applications of a matrices to a system of linear (both homogenous and non homogenous equations), Theorems on consistency of a system of linear equations.

**UNIT III**

**Financial Mathematics:** Risk-Types of risks, measurements of risk, calculation of portfolio risk, speculation and gambling. Time value of money: present and future value for discrete and continuous compounding case. Interest rate and discount rate, Annuities and its kinds, Return, Internal rate of return(IRR), Numerical methods to calculate IRR. Measurement of returns under uncertainty situations.

**PAPER-II**  
**CALCULUS**

**Duration: 3Hrs.**

**Max. Marks: 100**

**UNIT -1**

Derivative of the length of an arc, curvature, various formulae, centre of curvature, chord of curvature and related problems, asymptotes, tests for concavity and convexity, Points of inflexion, singular point, double point, curve tracing (in Cartesian and polar co-ordinates.)

**UNIT II**

Partial differentiation, Partial successive differentiation, Euler's theorem on homogeneous functions, Jacobians, envelopes, evolutes, maxima, minima and saddle points of functions of two variables, Lagrange's multiplier method, 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, volumes and surfaces of solids of revolution.

**PAPER- III**  
**GEOMETRY AND VECTOR CALCULUS**

**Duration: 3Hrs.**

**Max. Marks: 100**

**UNIT -1**

General equation of second degree: Tracing of conics, center of a conic, confocal conics, 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, 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, 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, Paraboloids.

**UNIT III**

Product of four vectors, Reciprocal vectors, 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 (statements and verification only) and problems based on these theorems.

**PAPER - IV**  
**DISCRETE MATHEMATICS**

**Duration: 3Hrs.**

**Max.Marks:100**

**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 algebra as lattices, representation theorem, sum of products for sets, sum of products for Boolean algebra, 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

**Duration:3Hrs.**

**Max.Marks:100**

## UNIT-I

**Probability:** Law of total and compound probability, conditional probability, Baye's theorem, mathematical expectation, moments, moment generating function, cumulants and cumulant generating function, measures of skewness and kurtosis.

## UNIT-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.

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