

Dr. Ram Manohar Lal Avadh University Faizabad  
Syllabus of B.A. /B.Sc. Mathematics (for affiliated colleges)

B.A.I /B.Sc. I (Mathematics)

42

Paper I: Algebra and Trigonometry

Marks: 50 65

Algebra

Unit 1. Sequence, Subsequence, Bounded sequence, Limit of a sequence, Convergent sequence, Monotone Sequence, Cauchy sequence, Cauchy's Convergence, Bolzano Weierstrass Theorem for Sequences.

Infinite series, Convergence and Divergence of infinite series, Tests for convergence: Comparison test, Ratio Test, Cauchy's  $n^{\text{th}}$  root test, Raabe's test, Logarithmic Ratio test, De-Morgan and Bertrand test and Higher Logarithmic Ratio test. Alternating series, Leibnitz test, Absolute and Conditional convergence.

Unit 2. Definition and examples of groups, elementary properties of groups, order of an element. Subgroups, properties of subgroups, product of two subgroups. Normalizer, Center of a group. Cyclic groups, properties of cyclic groups, classification of subgroups of cyclic groups.

Unit 3. Permutation groups, even and odd permutations, alternating group, Cosets, Index of subgroup, Lagrange's theorem and consequences including Fermat's theorem.

Normal subgroups, Quotient groups. Group homomorphism and isomorphism, Cayley's theorem, Fundamental theorem of homomorphism.

Unit 4. Definition and examples of rings, properties of rings. Characteristic of a ring. Subrings, Integral domains and Fields, Examples of fields:  $\mathbb{Z}_p$ ,  $\mathbb{Q}$ ,  $\mathbb{R}$ , and  $\mathbb{C}$ . Ideals, operations on ideals.

Trigonometry

Unit-5. Complex functions and separation into real and imaginary parts, Exponential, direct and inverse trigonometric and hyperbolic functions, logarithmic function, Gregory's series, Summation of series.

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Paper II: Calculus

Marks: 50 65

Differential Calculus

Unit 1.  $\epsilon$ - $\delta$  definition of the limit of a function, Continuous functions and classification of discontinuities, Differentiability, Chain rule of differentiability, Rolle's theorem, First and second mean value theorems, Taylor's theorems with Lagrange's and Cauchy's forms of remainder. Indeterminate forms.

Unit 2. Successive differentiation and Leibnitz's theorem. Expansion of functions (in Taylor's and Maclaurin's series), Partial differentiation and Euler's theorem, Jacobians, Maxima and Minima (for functions of two variables).

Unit 3. Tangents and normals (polar form only), Curvature, Envelopes and evolutes, Asymptotes, Tests for concavity and convexity, Points of inflexion, Multiple points, Tracing of curves in Cartesian and polar co-ordinates.

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**Integral Calculus**

**Unit 4.** Reduction formulae, Beta and Gamma functions, Double and triple integrals, Change of order of integration, Dirichlet's integral formula.

**Unit 5.** Rectification, Quadrature, Volumes and surfaces of solids of revolution, Pappus theorem.

**B.A.I /B.Sc. I (Mathematics)**

**Paper III: Geometry and Vector Calculus**

Marks: 50

42  
70

**Geometry**

**Unit 1.** Confocal conics, Polar equation of a conic and its properties. Three dimensional system of co-ordinates, Projection and direction cosines, Plane, Straight line.

**Unit 2.** Sphere, Cone and Cylinder, Central conicoids.

**Unit 3.** Tangent plane and normal to a conicoid, Pole and polar, Conjugate diameters, Generating lines, Plane sections of conicoid.

**Vector Calculus**

**Unit 4.** Vector differentiation and integration, Gradient, Divergence and Curl and their properties.

**Unit 5.** Line integral, Surface integral, Volume integral, Theorems of Gauss Divergence, Green and Stokes, and problems based on these.

~~B.A.I /B.Sc. I (Mathematics)~~

~~Paper IV: Viva Voce~~

~~Marks: 50~~

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