

MATHEMATICS (GENERAL)**Paper I**

(Same for B.A. & B.Sc.)

Stress should be given on development of ideas and theories rather than on solving problems. Problems should be short and intelligent.

Twelve questions to be set. Six to be answered selecting at least one from each group.

Time - 3 hours**Full Marks - 100****Group A****Set Theory (Two questions)**

General form of De Morgan's laws, Cartesian product of sets, Equivalence relation induced by a partition of a set and fundamental theorem on equivalence relation. Composition and factorization of mapping. Set mapping, Countability of rational, real and algebraic number systems.

Group B**Abstract Algebra (Four questions)**

Two questions from Binary operations and Two questions from Matrices.

Binary operations - Notions of group-Abelian group with examples, Uniqueness of Identity element in a group, Cancellation laws in a group, Definition of subgroup and cyclic group with example, Definition of rings, integral domains and field and their example.

Matrices - Operations of Matrix algebra, Kinds of Matrices, Transpose, Adjoint and inverse of the Matrix, Orthogonal matrices, Solution of consistent systems of Linear equations by Cramer's rule.

Group C**Real Analysis (Four questions)**

One question from sequences of real numbers and three questions from convergent and divergent series.

Sequence of real numbers and their limits, Bounded sequence, Monotonic sequence, Cauchy's general principle of convergence.

Convergent and divergent series, Convergence of series of positive terms, Comparison tests, Cauchy's root test, D'Alembert's ratio test and Raabe's test, Alternating series and Leibnitz test, Absolutely

convergent series, Continuity and differentiability of real function of a single real variable and properties of continuous functions.

Group D

Trigonometry (Two questions)

De Moivre's theorem and its application to the expansion of $\sin x$, $\cos x$ and $\tan x$.

Trigonometric and Exponential function of complex argument, Hyperbolic functions and summation of sine, cosine series and $C + iS$ method, Gregory's series.

Books Recommended

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| 1. Set Theory | - | Das Gupta |
| 2. Set Theory | - | Laljee Prasad |
| 3. Set Theory | - | Satydeo Prasad |
| 4. Modern Algebra | - | Dr. K. K. Jha |
| 5. Modern Algebra | - | Laljee Prasad |
| 6. Modern Algebra | - | Das Gupta |
| 7. Real Analysis | - | Laljee Prasad |
| 8. Infinite Serie | - | Laljee Prasad |
| 9. Matrices | - | Laljee Prasad |
| 10. Matrices | - | Shanti Narayan |
| 11. Trigonometry | - | Laljee Prasad |
| 12. Trigonometry | - | Das Gupta |