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SEMESTER - I

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Paper - II   :   Applied Mathematics

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Max. Marks : 55
Time : 3 Hrs

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Note :   Nine questions will be set and students will attempt 5 questions. Question No. 1 will be compulsory consisting of 4 parts based on the conceptual aspects of the whole syllabus. The answers should not be in yes/no. In addition to Question No. 1 there will be four Units in the question-paper each containing two questions belonging to four Units in the syllabus. Students will select one question from each unit.

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UNIT - I

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Bessel Functions : Baessel's functions of the first kind : Generating function, recurrence relations, $J_n(x)$ as solution of Bessel's differential equation, expansion of $J_n(x)$ when n is half and odd integer, orthogonality of $J_n(x)$ (Statement only).
Legendre Polynomials : Generating functions for $P_n(x)$ ($n \geq 0$), recurrence relations and special properties, $P_n(x)$ as solution of Legendre differential equation, Rodrigues formula, orthogonality of $P_n(x)$, associated Legendre polynomials (Introduction only).

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UNIT - II

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Laguerre Polynomials : Generating function and recurrence relations.
Hermite Polynomials : Generating function, recurrence relations, orthogonality of $H_n(x)$.
Complex Variables : Function of complex variable, Analytic functions, Cauchy-Riemann conditions for the function to be analytic, Cauchy's integral theorem, Cauchy's integral formula, Taylor's and Laurent's series, definite Integrals, Jordan's Lemma.

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UNIT - III

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Laplace Transform : Definition, important properties of Laplace transforms, Inverse Laplace transforms and its important properties.

Error Analysis : Types of experimental errors, statistical analysis of random errors, the normal or Gaussian law of error, Propagation of Errors,

method of least squares, applications of method of least squares solution of linear equations, curve fitting.

UNIT - IV

Group Theory : Definition of a group with illustrative examples, group multiplication table, rearrangement theorem, cyclic groups, subgroups and cosets, conjugate elements and class structure, normal division and factor groups, isomorphy and homomorphy, class multiplications, group representation, reducible and irreducible representation, the great orthogonality theorem (statement only) and geometrical interpretation, character of a representation and construction of character of character table with illustrative example of symmetry groups of equilateral triangle, rectangle and square.

References

1.   Mathematical Methods for Physicists - G. Arfken

2.   Mathematical Physics for Physicists and Engineers - L. Pipes.

3.   Theory and Problem of Complex Variables - M.R. Speigel, Schaum's Outlines

4.   Theory and Problems of Laplace Transform - M.R. Speigel, Schaum's Outlines.

5.   Group Theory and Quantum Mechanics - M. Tinkam

6.   Theory of Errors - J. Topping

7.   Numericals Methods - J.H. Mathews Prentice Hall of India.