MATHEMATICS (HONOURS)

Paper III

Time - 3 hours **Full Marks - 100**

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

Group A

ADVANCE CALCULUS (Six questions)

Continuity, Sequential continuity, Properties of continuous functions, Uniform continuity, Chain rule of differentiability, Mean value theorems and their geometrical interpretations, Darboux's intermediate value theorem for derivative, Taylor's theorem with various forms of remainders. Limit and continuity of functions of two variables, Partial differentiation, Change of variables, Euler's theorem on homogeneous functions, Taylor's theorem for functions of two variables, Jacobians, Envelopes, Evolutes, Maxima, Minima and saddle points of function of two variables, Lagrangian multiplier method, Indeterminate forms, Tests for concavity and convexity, Points of inflexion, Multiple points.

Group B

INFINITE SERIES (Three questions)

Definition of sequence, Theorem on limit of sequences, Bounded and monotonic sequences, Cauchy's convergence Criterian, Series of non-negative terms, Comparison tests, Cauchy's integral test, Ratio tests, Raabes, Logarithmic, De-Morgan and Bertrand's tests, Alternating series, Leibnitz's theorem, Absolute and Conditional convergence.

Group C

VECTOR ANALYSIS (Three questions)

Scalar and Vector product of three vectors, Reciprocal Vectors, Vector differentiation, Gradient, Divergence and Curl, Vector integration, Theorem of Gauss, Green, Stokes and problems based on them.

References :-

1. T. M. Apostol - Mathematical Analysis, Narosa Publishing House, New Delhi
2. D. Soma Sundaram & B. Chaudhary - A first course in Mathematical Analysis, Narosa Publishing House, New Delhi. 1997
3. P.K. Jain and S.K. Kaushik - An introduction to real Analysis, S. Chand & Co.

4. Murray R. Spiegel - Theorem and Problem of Advance Calculus, Schaum Publishing Co., New York
5. Earl D. Rainville - Infinite Series, Macmillan Company, New York
6. S. C. Malik - Mathematical Analysis, Wiley Bastem Ltd., New Delhi
7. Laljee Prasad - Infinite Series
8. A. R. Vasistha - Infinite Series
9. K. K. Jha - Advance Real Analysis, NavBharat Prakashan
10. Murray R. Spiegel - Vector Analysis, Schaum Publishing Co. N.York
11. N. Sharan and S.N. Nigam - Introdustion Vector Analysis, Pothishala Pvt. Ltd., Allahabad
12. Shanti Narayan - A text book of Vector Calculus, S. Chand & Co., New Delhi
13. Shanti Narayan - A Course of Mathematical Analysis, S. Chand & Co., New Delhi
14. Gorakh Prasad - Differential Calculus, Pothishala Pvt.Ltd., Allahabad

MATHEMATICS (HONOURS)

Paper IV

Time - 3 hours **Full Marks - 100**

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

Group A

ORDINARY DIFFERENTIAL EQUATION (Five questions)

Linear Differential equation of second order, Transformation of the equation by changing the dependent variable/Independent variable, Method of variation of parameters, Ordinary simultaneous differential equation, Series solutions of differential equations, Power series method, Bessel, Legendre and Hydpergeometric functions and their properties, Convergence, Recurrence and generating relations, Orthogonality of functions, Strum-Liouville problem, Orthogonality of Eigen Functions, Reality Eigen values, Othogonality of Bessel functions and Legendre polynomilas, Laplace transformation-Linearity of the Laplace transformation of derivatives and integrals, Shifting theorems, differentiation and integration of transforms, Convolution theorem, Solution of integral equations and system of differential equations using Laplace transformation.

Group B

Partial Differentiation Equation (Four questions)

Partial differentiation equations of the first order, Lagranges solution, Some special types of equations which can be solved easily by methods, Other than the general method, Charpits general method of solution, Partial differentiation equation of second and higher order classification of linear differentral equations of second order.

Group C

CALCULUS VARIATION (Four questions)

Variational problems with fixed boundries- Euler's equation for functionals containing first order derivatives and one independent variables, Extremals, Functional dependent on higher order derivatives, Functionals dependent on more than one dependent variable, Variable problems in parametric form invariance of Euler's equations under coordinates transformation.

References :-

1. D. A. Murray - Introductory course on differential equation, Orient Lingmann (India) 1967
2. Frank Ayres - Theory and Problem of differential equations, McGraw Hill Book Co., 1972
3. Gorakh Prasad - Differential Equations - Pothishala Pvt. Ltd., Allahabad
4. G. F. Simmons - Differential Equations, Tata McGraw Hill
5. F. A. Codington - An introduction to ordinary Differential Equations
6. Jane Crowin - Differential Equations, Marcel Dekhar, 1994
7. A. S. Gupta - Calculus of variation with applications, Prentice Hall of India, 1997
8. R. Courant and D. Hilbet - Methods of Mathematical Physics, Vol I & II, Wiky Interference, 1993
9. Richard Born - Theory of Problem of Differential Equations McGraw Hill India, 1997
10. A. M. Arthurs - Complementary Variations Principles, Clavendon Press Oxford, 1970
11. J. T. Oden and J. N. Reddy - Variational Methads in Theoretica Mechanics, Springer-Verlag, 1976
12. I. M. Gelfand and S. V. Famin - Calculus of Variation, prentice-Hill, Engle-Word Cliff (New Jersoy), 1963