201 Advanced Calculus

Max. Marks : 30
Internal Assessment: 04
Time : 3 Hours

Section-I (3 Questions)

Definition of a sequence. Theorems on limits of sequences. Bounded and monotonic sequence. Cauchy's convergence criterion. Series of non- negative terms. Comparison tests. Cauchy's integral test. Ratio tests. Raabe's Logarithmic, de'Morgan and Bertrand's tests, gauss test. Alternating series. Leibnitz's theorem. Absolute and conditional convergence.

Section-II (3 Questions)

Continuity, Sequential continuity. Properties of continuous functions. Uniforms continuity. Chain rule of differentiability. Mean value theorems and their geometrical interpretations. Darbous'x intermediate value theorem for derivatives. Taylor's theorem's 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.

Section-III (2 Questions)

Envelopes, Evolutes, Maxima, Minima and saddle points of functions of two variables. Lagrange's multiplier method. Indeterminate forms.

Section-IV (2 Questions)

Beta and Gamma functions, Double and triple integrals. Dirichlet's integrals. Change of order of integration in double integrals.

Note : The examiner is requested to set ten question in all, selecting questions section wise as indicated in the syllabus. The candidate is required to attempt five questions selecting at least one question from each section.

Books; Recommended:

1. Gabriel Klaumber, Mathematical Analysis, Marcel Dekkar, Incl. New York, 1975.
2. T.N. Apostal, Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
3. R.R.Goldberg, Real Analysis, Oxford & I.B.H. Publishing Co.,New Delhi,1970

4. D.Soma Sundaram and B.Choudhary, A first Course in Mathematical Analysis, Narosa Publishing House, New Delhi, 1997
5. Gorakh Prasad, Differential Calculus, Pothishala Pvt. Ltd, Allahabad,1982
6. Murry R.Spiegal, Theory and Problem of Advanced Calculus, Schaum Publishing Co., New York, 1992
7. Gorakh Prasad, Integral Calculus, Pothishala Pvt. Ltd., Allahabad.
8. S.C.Malik, Mathematical Analysis, Wiley Eastern Ltd., New Delhi.
9. Earl D. Rainville, Infinte Series, The Macmillan Co., New York.
10. Shanti Narayan, A Course of Mathematical Analysis.

202 Differential Equations

Max. Marks:30
Internal Assessment:03
Time : 3 Hours

Section-I (2 Questions)

Series solutions of differential equations, Power Series method, Bessel, Legendre and Hypergeometric equations, Bessel, Legendre and Hypegeometric functions and their properties convergence, recurrence and generating relations. Orthogonality of function. Strum- Liouville problem. Orthogonality of eigh- functions. Relity of eign values. Orthogonality of Bessel functions and Legendre polynomials.

Section-II (2 Questions)

Laplace Transformation-Linerity of the Laplace transformation. Existence theorem for Lapace transforms. Laplace transforms of derivatives and integrals. Shifting theorems. Differentiation and integration of transforms. Convolution theorem. Solution of integral equations and system of differential equations using the Laplace transformation.

Seciton-III (3 Questions)

Partial Differential equations of first order. Lagrange's solution. Some special types of equations which can be solved easily by methods other than the general method. Charpit's general method of solution.

Partial differential questions of second and higher orders. Classification of linear partial differential equations of second order. Homogenous and non-homogenous equations with constant coefficients. Partial differential equations reducible to equations with constant coefficients. Monge's methods.

Section-IV (3 Questions)

Calculus of Variations, Variational problems with fixed boundaries- Euler's equations for functionals containing first order derivative and one independent variable. Extremals. Functionals dependent on higher order derivatives. Functionals dependent on more than one independent variable. Variational problems in parametric form. Invariance of Euler's equation under coordinates transformation. Variational problems with Moving Boundaries- functionals dependent on one and two functions. One sided variations.

Sufficient conditions for an Extremum-Jacobi and Legendre conditions. Second Variation. Variational Principle of least action.

Note: The examiner is requested to set ten question in all selecting question section wise as indicated in the syllabus. The candidate is required to attempt five quotation selecting at least one question form each section.

Books Recommended :

1. Erwrin Ereyszig, Advanced Engineering Mathematics, John Wiley & Sons Inc., New York,1999
2. D.A.Murray Introductory Course on Differential Equations, Orient Longman, (India), 1967
3. A.R.Forsyth, A Treatise on Differential Equations, Macmillan and Co.Ltd., London
4. I.N.Sneddon, Elements of Partial differential Equations ,McGraw-Hill Book Company 1988
5. Frank Ayres, Theory and Problems of differentials equations, McGraw-Hill Book Company, 1972
6. I.N.Sneddon, Special functions on Mathematics, Physics and Chemistry.
7. W.W.Bell, Special functions for Scientists & Engineers.
8. A.S.Gupta, Calculus of Variations with Applications, Prentice-Hall of India, 1997
9. I.M.Geff and S.V.Fomin, Calculus of Variations, Prentice- Hill, Englewood Cliffs (New Jersey). 1963

BM-203 Mechanics

Max Marks: 30
Internal Assessment:03
Time : 3 Hours

Section-I (3 Questions)

Analytical conditions of equilibrium of Coplanar forces. Virtual work. Catenary.

Section-II (2 Questions)

Forces in three dimensions. Poinsot's central axis. Wrenches. Null lines and planes. Stable and unstable equilibrium.

Section-III (3 Questions)

Velocities and accelerations along radial and transverse direction and along tangential and normal directions. Simple harmonic motion. Elastic string.

Motion on smooth and rough plane curves. Motion in a resisting medium. Motion of particles of varying mass.

Section-IV (2 Questions)

Central Orbits, Kepler's laws of motion.

Motion of a particle in three dimension. Acceleration in terms of different coordinate systems.

Note: The examiner is requested to set ten questions in all selecting questions wise as indicated in the syllabus. The candidate is required to attempt five questions selecting at least one question from each section.

Books Recommended:

1. S.L.Loney, Statics, Macmillan Company, London.
2. R.S.Verma, A Text Book on Statics, Pothishala Pvt. Ltd. Allahabad.
3. S.L.Loney, An elementary Treatise on the Dynamics of a particle and Rigid Bodies, Cambridge University Press, 1956.
4. F. Chorlton, Dynamics, CBS Publishers, New Delhi.