# MATHEMATICS (HONOURS)
## Paper I

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

Papers I and II for Part I (Honours) written examination will be of 100 marks each.

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

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

## Group A
### MATRICES (Three questions)

Symmetric, Skew-symmetric, Hermitian and skew-Hermitian matrices, Elementary operations on matrices, Inverse of a matrix, Linear independence of row and column matrices, Row rank, Column rank and rank of a matrix, Equivalence of column and row ranks, Eigenvalues, Eigenvectors and the characteristic, equation of matrix, Cayley-Hamilton theorem and its uses in finding inverse of a matrix, Application of matrices to a system of linear (both homogeneous and non-homogeneous) equations, Theorems on consistency of a system of linear equations.

## Group B
### THEORY OF EQUATION (Two questions)

Relation between the roots and coefficients of general polynomial equation in one variable, Transformation of equations, Descarte's rule of signs, Solution of cubic equations (Cardon method), Biquadratic equations.

## Group C
### SET THEORY AND ALGEBRA (Three questions)

Mapping, Equivalence relations and partitions, Congruence modulo $n$, Definition of a group with examples and simple properties, Subgroups, Generation of groups, Cyclic groups, Coset decomposition, Lagrange's theorem and its consequences, Fermat's and Euler's theormes, Homomorphism and Isomorphism, Normal subgroups,

Quotient groups, The fundamental theorem of homomorphism, Permutation groups, Even and odd permutations, The alternating groups, Cayley's theorem, Introduction to rings, Subrings, Integral domains and fields, Characteristic of a ring.

## Group D
## TRIGONOMETRY (Two questions)

De Moivre's theorem and its application, Direct and inverse circular and hyperbolic functions, Logarithm of a complex quantity, Expansion of trigonometrical functions, Gregory's series, Summation of series.

## Group E
## LINEAR PROGRAMMING (Two questions)

The Linear programming problems, problem formulation, Linear programming in matrix notation, Some basic properties of convex sets, Graphical solution of LPP, Theory and application of the simplex method of solution of a LPP.

**References :-**

1. I. N. Heistein - Topics in Algebra, Wiley Eastern Ltd., New Delhi,1975

2. K. B. Dutta - Matrix and Linear Algebra, Prentice Hall of India Pvt Ltd., New Delhi,2000.

3. Chandrika Prasad - Text Book on Algebra & Theory of Equation, Pothishala Pvt. Ltd., Allahabad

4. Burnside and Panton - Theory of Equation

5. M.L. Khanna - Theory of Equation

6. Shanti Narayan - Matrix, S. Chand & Company

7. S.L. Loney - Plane Trigonometry Part II, Mcmillan & Co., London

8. R.S. Verma and K.S. Shukla - Text Book on Trigonometry, Pothishala Pvt. Ltd., Allahabad

9. Laljee Prasad - Linear Programming

10. P.B. Bhattacharya, S.K. Jami & S.R. Nagpaul - First course in Linear Algebra, Willey Eastern, New Delhi, 1983

# MATHEMATICS (HONOURS)
## Paper II

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

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

## Group A
### DIFFERENTIAL CALCULUS (Three questions)

$\varepsilon-\delta$ definition of a limit of a function, Basic properties of limits, Continuous functions and classification of discountinuities, Differentiability, Successive differentiation, Leibnitz theorem, Maclaurin and Taylor series expansions, Asymptotes, Curvature.

## Group B
### INTEGRAL CALCULUS (Two questions)

Integration of irrational algebric functions and transcendental functions, Reduction formulae, Difinite integrals, Quadrature, Rectification, Volumes, and Surface area of solids of revolution.

## Group C
### ORDINARY DIFFERENTIAL EQUATIONS (Three questions)

Degree and order of a differential equation, Equation of first order and first degree, Equations in which the variables are separable, Homogeneous equations, Linear equations and equations reducible to the linear form, Exact differential equations, First order higher degree equations solvable for x,y,p, Clairaut's form and singular solutions, Geometrical meaning of a differential equation, Orthogonal trajectories, Linear differential equations with constant coefficients, Homogeneous linear ordinary differential equations.

## Group D
### Analytical Geometry of Two Dimensions (Two questions)

General Equation of second degree, Tracing of Conics, Confocal Conics Polar equation of Conics.

## Group E

### Analytical Geometry of Three Dimensions (Two questions)

Plane, The straight line and the plane, Sphere, Cone, Cylinder, Central Conicoids, Paraboloids, Plane section of Conicoids, Geometry lines, Confocal Conicoids, Reduction of second degree equation.

### References :-

| 1. | Gorakh Prasad | - | Differential Calculus, Pothishala Pvt. Ltd., Allahabad |
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| 2. | Gorakh Prasad | - | Integral Calculus, Pothishala Pvt. Ltd., Allahabad |
| 3. | Laljee Prasad | - | Differential Calculus |
| 4. | Laljee Prasad | - | Integral Calculus |
| 5. | Dasgupta | - | Differential Calculus |
| 6. | Dasgupta | - | Integral Calculus |
| 7. | J. T. Bell | - | Elementary Treatise on coordinate geomaetry of there dimensions, Macmillan India Ltd.,1994 |
| 8. | D. A. Murray | - | Introduction course in differential equation, Orient Longmann (India), 1967 |
| 9. | E. A. Codington | - | An introduction to ordinary differential equation, Prentice Hall of India, 1961 |
| 10. | P.K. Jain & Khalil Ahmed | - | Analytical Geometry of two Dimensions, Wiley Eastern Ltd. |
| 11. | P.K. Jain & Khalil Ahmed | - | Analytical Geometry of three Dimensions, Wiley Eastern Ltd. |