Department of Mathematics

Ph.D. Entrance Exam Syllabus - 2022

Matrices
Rank of a matrix, Invariance of rank under elementary transformations, Determination of Rank of a matrix by reducing it to the echelon normal forms, Homogeneous systems of m linear equations in n unknowns, Consistency criterion, Solution by elimination method, Eigen values and eigen vectors of a square matrix.

Ordinary Differential Equation
Solution of ordinary differential equation of first order and first degree, Variable separable and reducible to variable separable forms, Homogeneous and reducible to homogeneous forms, Linear equation, Bernoulli equation and reducible to these forms, Exact Equation and reducible to this form with standard integrating factors, Equation of first order and higher degree, Clairaut's equation, Singular solution, Geometric meaning, Orthogonal trajectories in Cartesian and polar forms, Singular solution, Geometric meaning, Orthogonal trajectories in Cartesian and polar forms, Second and higher order linear differential equations with constant coefficients, Complementary function, Particular integrals, Cauchy – Euler differential equation, Simultaneous linear differential equations with constant co efficient, Solutions of second order ordinary linear differential equations with variable, Co-efficients by the following methods, a)When a part of the complementary function is given, b)Changing the independent variable, c)Changing the dependent variable, d)Variation of parameters,e)When the equation is exact, Total differential equations-necessary condition for the equation $Pdx+Qdy+Rdz = 0$ to be integrable, Simultaneous equations of the form $dx/P = dy/Q = dz/R$

Partial Differential Equations
Formation of partial differential equations by eliminating arbitrary constants, Formation of partial differential equations by eliminating arbitrary functions, Linear partial differential Equations of first order, Partial differential equations non- linear in p and q, Solution of partial differential equations Containing p and q only, Solution of partial differential equations of the type $f(p,q,z)=0$, Solution of partial differential equations of the type $f(x,p)=g(y,q)$,Solution of partial differential equations of the type $z=px+qy+f(p,q)$,Solution of partial differential equations by Charpit's method, Second order linear partial differential equations, Second order homogeneous linear partial differential equations, Non homogeneous linear equations.

Linear Programming (Lpp)
Linear inequalities and their graphs statement of the linear programming problem in Standard form, Classification of solutions, Linear inequalities and their graphs statement of the linear programming problem in Standard form., Classification of solutions, Solution of linear programming problems by graphical method, Illustrative examples on the solution of linear programming problems in two variables by the simplex method

Numerical Analysis

Finite differences, Properties of the operator Δ, Backward difference operator∇, The operator E- Shift operator, Relation between the operators Δ,E, ∇,Factorial notation, Method of separation of symbols, Interpolation, Newton Gregory forward and backward interpolation formula, Interpolation with unequal intervals, Numerical Differentiation, Numerical Integration, Newton- Cote's quadrature formula.

Statistics and Probability

Probability, conditional probability, independent events, total probability and Baye's theorem. Random Variable, Probability density function, distribution function, mathematical expectation, variance, Discrete Distributions−Binomial, Poisson, Continuous Distribution – Normal distribution.