Instructions:
1. Entrance test question paper consists of multiple choice questions for 100 Marks and it is Classified as Part-A, Part-B & Part- C
2. Entrance Test Duration shall be 3 hours
3. Part-A shall be Subject specific for 50 Marks.
    Part – B shall be General Aptitude for 30 Marks
    Part – C shall be Mathematics for 20 Marks

Part – A
Subject Specific (Engineering Discipline)
Syllabus for Mathematics - 50Marks

1. Differential Equations: Existence and Uniqueness of solutions of initial value problems for first order ordinary differential equations, singular solutions of first order ODEs, system of first order ODEs. Partial Differential Equations (PDEs): Lagrange and Charpit methods for solving first order PDEs, Cauchy problem for first order PDEs. Classification of second order PDEs, General solution of higher order PDEs with constant coefficients, Method of separation of variables for Laplace, Heat and Wave equations.

2. Linear algebra: Matrices and determinants, Inverse of a matrix, rank of a matrix, consistency of a system of linear equations. Solution of systems of linear algebraic equations using Gauss elimination and Gauss-Seidel methods. Eigen values and Eigen vectors. **Differential Calculus:** polar curves, angle between polar curves, Curvature and radius of curvature, partial differentiation, maximum and minimum for function of single and two variables. Taylor's and Maclaurin's expansion for a function of single variable. Indeterminate forms. **Vector Calculus:** Vector Differentiation-Scalar and vector point functions, Gradient of a scalar field, divergence and curl of a vector field. Vector integration-Green's theorem in the plane, Stokes and Gauss Divergence theorems

3. Integral Calculus: Multiple integrals. Length, Area, Volume using multiple integrals. Beta and gamma functions**.** Infinite Series: Convergence and divergence of series of positive terms, tests for convergence-ratio test and root test, problems. Fourier Series: Dirichlet's conditions. Expansions of Periodic functions into Fourier series, half range Fourier series, Laplace Transforms, & Fourier Transforms,

4. **Numerical Methods:** Finite differences-Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals- Lagrange's formulae, Newton Raphson Method, Regula falsi. Numerical Integration-Simpson's one-third, three-eighth and Weddles rule. Solutions of first order ODE's-Euler's modified method, Runge-Kutta fourth order method, Milne's Method, Adam-Bashforth Method. Solutions of second order ODE's Runge-Kutta fourth order method, Milne's Method, Adam-Bashforth Method

5. **Statistics and Probability:** Correlation and regression, Probability: Recap of Random Variables. Discrete probability distributions- Binomial and Poisson distributions, continuous probability distributions-Exponential and Normal. Sampling distributions. Standard errors Tests of hypotheses: most powerful and uniformly most powerful tests, Likelihood ratio tests. Analysis of discrete data and chi-square test of goodness of fit. Large sample tests.

References :

1. S.S. Sastry, Introductory Methods of Numerical Analysis.
2. C. H. Edwards, Jr., Advanced Calculus of Several Variables,, Academic Press, New York, 1973 edition.
3. Gupta S.C & Kapoor V.K, Fundamentals of Mathematical statistics, Sultanchand & sons, 5009.
4. F. Charlton, Fluid Dynamics, C. B. S Publisher Delhi (1985).
5. V. Ramana: "Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed.

General Aptitude Test Syllabus (Weightage 30%)

<u>Common to all branches</u>

1. Arithmetical Ability,

2. Data Interpretation,

3. Verbal Ability,

4. Numerical Analysis Quantitative ability,

5. Reading Comprehension data Sufficiency

6. Logical Reasoning, computer awareness.

Reference Books:

1. Quantitative Aptitute by R S Agarwal

2. Fast Track Objective Arithmetic by Rajesh Verma

Mathematics Entrance Test Syllabus for Ph.D- 20 marks
Common to all branches

Linear Transformations: The algebra of Linear Transformation, singular and non-singular transformations, characteristic polynomials, minimal polynomials, Rank and Nullity, Eigen values and Eigen vectors.

Solutions of Linear System of Equations : Introduction to Direct Methods via., Gauss Elimination method, Gauss-Jordan method. Iteration Methods: Gauss Jordan methods, Gauss-Seidel method, Successive Over relaxation method and problems on each method.

Fourier Series : Dirichlet's conditions, Expansions of Periodic functions into Fourier series, Half range Fourier series.

Laplace Transforms: Properties of Laplace transformation, Unit step function, Convolution theorem, Solution of differential equation using Laplace transformation.

Statistical method : Curve fitting by the method of least squares – Fitting the curve of the form $y = ax + b,\ y = ax^2 + bx + c$ and $y = ax^b$. Correlation and regression.

Differential Calculus: polar curves, angle between polar curves, Curvature and radius of curvature, Taylor's and Maclaurin's expansion for a function of single variable.

Differential Equations: Ordinary Differential Equations (ODEs): Existence and Uniqueness of Solutions of initial value problems for first order ordinary differential equations, singular solutions of first order ODEs, system of first order ODEs.

Numerical methods : Solution of ODE of first order : Taylor's series method , Modified Euler's method, RK - 4th method, Milne's method , Newton forward- backward method, interpolation method.

References:

1. B. S. Grewal: "Higher Engineering Mathematics", Khanna publishers, 44th Ed.2018
2. E. Kreyszig: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed. (Reprint), 2016.
3. H.K.Dass and Er. RajnishVerma: "Higher Engineering Mathematics" S.Chand Publication (2014).
4. N.P Bali and Manish Goyal: "A textbook of Engineering Mathematics" Laxmi Publications, Latest edition.