Syllabus for Entrance Examination - (M. Sc. in Engineering Mathematics)
2024-25

1. **Foundations:** Logic, Sets, Functions, and relations

2. **Linear Algebra:** Vector spaces and vector subspaces, basis and dimension of vector spaces, Linear Transformations, Rank-Nullity theorem, System of linear equations and their solutions, Eigen values and eigenvectors, Cayley-Hamilton Theorem, Matrices and Determinants

3. **Calculus:** Basics of one variable calculus, applications of derivatives, integration and its applications, Taylor's Theorem for functions of one variable, Basics of multivariable calculus, Partial derivatives and its applications to local extremum. Total derivatives, Taylor's Theorem for functions of two and three variables, Change of variables.

4. **Real Analysis:** Sequences, Limit, Continuity, Differentiability and Riemann Integration, Improper Integrals including beta and gamma function, differentiation under integral, Infinite Series.

5. **Differential Equations:** Ordinary Differential Equations of order one and two and its solutions

6. **Numerical Analysis:** Numerical Solutions of linear, non-linear, algebraic and transcendental Equations of one and two variables, Interpolations and Extrapolations, Numerical Differentiations and Integrations. Numerical solution of 1st order ODE.

7. **Statistics and Probability**: Basics of Probability Theory, basics of probability distributions, descriptive statistics, measure of central tendencies and dispersions.

8. **Basic group theory:** Groups and examples, subgroups, generators, orders, cyclic groups, cosets, group homomorphisms

9. **Basics of Metric Spaces:** Metric spaces: definition, properties and example, Convergence of sequences, Open and closed subsets, continuity, Cauchy sequences, completeness, compactness