PUNJAB PUBLIC SERVICE COMMISSION
COMBINED COMPETITIVE EXAMINATION (CCE) SYLLABUS

MATHEMATICS

Total Marks: 100

Topics

1. CALCULUS AND ANALYTICAL MATHEMATICS

- Differential calculus: limits, continuity, differentiability, the Mean Value Theorem, maxima and minima.
- Integral calculus: indefinite and definite integrals, the Fundamental Theorem of Calculus.
- Sequences and Series: convergence, tests for convergence, absolute and conditional convergence, and power series.
- Vector calculus: vector-valued functions, vector fields, line integrals, divergence and curl.
- Analytic and vector geometry: straight lines, planes, circles, and spheres.

2. ANALYSIS, COMPLEX ANALYSIS, AND TOPOLOGY

- Real analysis: the real number system, suprema and infima, sequences, subsequences, and Cauchy sequences.
- Metric spaces: metric spaces, open and closed sets, convergence, completeness, and continuous mappings.
- Topology: topological spaces, bases, open and closed sets and Hausdorff spaces.
- Complex analysis: complex numbers, complex functions, limits, continuity, differentiability, analytic functions, and the Cauchy-Riemann equations.

3. ALGEBRA AND DISCRETE MATHEMATICS

- Linear Algebra: matrices, determinants, systems of linear equations, rank, vector spaces, subspaces, basis, dimension, linear transformations, eigenvalues, eigenvectors.
- Abstract algebra: binary operations, groups, subgroups, cyclic groups, cosets, and Lagrange's theorem etc.
- Set Theory and discrete mathematics: sets, relations, functions, mathematical logic, and mathematical induction.

4. DIFFERENTIAL EQUATIONS AND MATHEMATICAL METHODS

- Ordinary differential equations: first-order differential equations including separable, homogeneous, linear, Bernoulli and exact equations.
- Partial differential equations: formation of partial differential equations (PDEs), first-order PDEs, and second-order PDEs.

5. NUMERICAL MATHEMATICS

- Numerical Errors and Approximation.
- Bisection, Newton-Raphson, Secant, and fixed-point methods.
- Numerical solutions of systems of linear equations.
- Gaussian elimination, Jacobi, and Gauss-Seidel methods.

Suggested readings:

1. Calculus and Analytical Mathematics: James Stewart, *Calculus*
2. Algebra and Discrete Mathematics: David C. Lay, *Linear Algebra and Its Applications*
3. Analysis, Complex Analysis and Topology: Stephen Abbott, *Understanding Analysis*
4. Differential Equations and Mathematical Methods: Boyce & DiPrima, *Elementary Differential Equations and Boundary Value Problems*
5. Numerical Mathematics: Burden & Faires, *Numerical Analysis*

Note: **The above list is only suggestive and not exhaustive. Candidates may consult other standard books and relevant material covering the prescribed syllabus.**

End of Document