SYLLABUS FOR THE SUBJECT OF MATHEMATICS

Paper I

Total Marks: 100

Candidates will be asked to attempt three questions from Section A and two questions from section B.

Section A

Limits, Continuity, Differentiability and its Applications, General theorems (Rolle's Theorem, Mean value theorem), Asymptotes, Applications of Maxima and Minima. Definite and Indefinite integrals and their Application, Quadrature, Rectification, Numerical methods of Integration (Trapezoidal and Simpson rule), Multiple integrals and their Applications. Areas and Volumes, Centre of Mass, Reimann-Stijles Integral, Ordinary Differential Equations (O.D.Eqs) and their Applications in Rectilinear motion and Growth/Decay problems. 2nd Order Differential Equations with Applications (Spring Mass and Simple Harmonic Oscillator Problems).

Section B

Sequences and Series, Convergence tests, Power Series, Radius and Interval of Convergence. Complex Analysis, Function of Complex Variable, Demoivre's Theorem and its Application. Analytic Function, Singularities, Cauchy theorem, Cauchy Integral formula.

Conic Sections in Cartesian coordinates, Plane Polar Coordinates and their use to represent the straight line and Conic section. Vector equation for plane and space curves. Tangents and Normals and Binormals, Curvature and torsion, Serre Frenet's Formula.

Recommended Books:

1.   *Anton, H, Calculus: A New Horizon, Ed. 6, John Willey, New York, 1999.*

2.   *Thomas, G. B. Finney. A. R., Calculus, Ed. 9, John Willey, New York, 2005.*

3.   *Yusuf, S.M. Amin. M., Calculus with Analytic Geometry, Ilmi Kitab Khana, Lahore.*

4.   *Zill, D. G. , Cullen, M.R., Differential Equations with Boundary Value Problems, Ed. 3. PWS Publishing Co., 1997.*

5.   *Abell, Braselton, Modem Differential Equations Ed. 2, Thomas Learning Inc. USA, 2001.*

6.   *Curchill, R.V., Brawn J.W., Complex Variables and Applications, Ed. 5, McGraw Hill, New York, 1989.*

7.   *Ghori, Q.K., Mechanics. Ilmi Kitab Khan, Lahore.*

8.   *Weather burn, C.E., Differential Geometry, The English Languages Book Society and Cambridge Uni. Press. 1964.*

9.   *Guggenheinerar, H.W., Differential Geometry, McGraw Hill, 1990.*

Paper II
Total Marks: 100

Section A

Groups: Definition and examples of Groups, Order of a Group, Order of an element of a Group, Abelian and non-Abelian Groups and Cyclic groups. Lagrange theorem and applications, Normal subgroups, Characteristic Subgroups of a group, Normalizer in a group, Centralizer in a group. Fundamental Theorem of Homomorphism, Isomorphism theorems of groups, Automorphisms

Rings, Fields and Vector Spaces: Examples of Rings, Subrings, Integral domains, Fields, Vector spaces, Linear independence/ dependence, Basis and dimension of finitely generated spaces, Examples of Field extension and finite fields, Examples of finite and infinite dimensional vector spaces.

Section B

Metric Spaces and Topological Spaces: Definition and Examples of Metric spaces and topological spaces, Closed and Open Spheres, Interior, Exterior and Frontier of a Set, Sequences in Metric Spaces, Convergence of Sequences. Definition and examples of Normed Spaces. Inner product spaces, Gram-Schmidt Process of Orthonormalization

Matrices and Linear Algebra: Linear transformations, Matrices and their algebra, Reduction of matrices to Echelon and Reduced Echelon form. Solution of a system of homogenous and Non-Homogenous equations, Numerical methods of solving equations (Gauss-Siedal method, Jaccobi method) Properties of Determinants, Eigenvalues and Eigenvectors and the Diagonalization of the Symmetric Matrices.