

S. Y. B. Sc. SEMESTER III

Practical for USMT 301 (CALCULUS III): -

1. Sequences in \mathbb{R}^2 and \mathbb{R}^3 , limits and continuity of scalar fields and vector fields, using “definition and otherwise”, iterated limits.
2. Computing directional derivatives, partial derivatives and mean value theorem of scalar fields.
3. Total derivative, gradient, level sets and tangent planes.
4. Chain rule, higher order derivatives and mixed partial derivatives of scalar fields.
5. Taylor’s formula, differentiation of a vector field at a point, finding Hessian/Jacobian matrix, Mean Value Inequality.
6. Finding maxima, minima and saddle points, second derivative test for extrema of functions of two variables and method of Lagrange multipliers.
7. Miscellaneous Theoretical Questions based on full paper.

Practical for USMT302 (ALGEBRA III): -

1. Rank-Nullity Theorem.
2. System of linear equations.
3. Determinants, calculating determinants of 2×2 matrices, $n \times n$ diagonal, upper triangular matrices using definition and Laplace expansion.
4. Finding inverses of $n \times n$ matrices using adjoint.
5. Inner product spaces, examples. Orthogonal complements in \mathbb{R}^2 and \mathbb{R}^3
6. Gram-Schmidt method.
7. Miscellaneous Theoretical Questions based on full paper.

Practical for USMT 303 (DISCRETE MATHEMATICS): -

1. Derangement and rank signature of permutation.
2. Recurrence relation.
3. Problems based on counting principles, two way counting.
4. Stirling numbers of second kind, Pigeon hole principle.
5. Multinomial theorem, identities, permutation and combination of multi-set.
6. Inclusion-Exclusion principle. Euler phi function.
7. Miscellaneous theory questions from all units.

S. Y. B. Sc. SEMESTER IV

Practical for USMT401 (CALCULUS IV): -

1. Calculation of upper sum, lower sum and Riemann integral.
2. Problems on properties of Riemann integral.
3. Problems on fundamental theorem of calculus, mean value theorems, integration by parts, Leibnitz rule.
4. Convergence of improper integrals, applications of comparison tests, Abel's and Dirichlet's tests, and functions.
5. Beta Gamma Functions
6. Problems on area, volume, length.
7. Miscellaneous Theoretical Questions based on full paper.

Practical for USMT402 (ALGEBRA IV): -

1. Examples and properties of groups.
2. Group of symmetry of equilateral triangle, rectangle, square.
3. Subgroups.
4. Cyclic groups, cyclic subgroups, finding generators of every subgroup of a cyclic group.
5. Left and right cosets of a subgroup, Lagrange's Theorem.
6. Group homomorphisms, isomorphisms.
7. Miscellaneous Theoretical questions based on full paper.

Practical for USMT403 (ORDINARY DIFFERENTIAL EQUATIONS): -

1. Solving exact and non-exact equations.
2. Linear and reducible to linear equations, applications to orthogonal trajectories, population growth, and finding the current at a given time.
3. Finding general solution of homogeneous and non-homogeneous equations, use of known solutions to find the general solution of homogeneous equations.
4. Solving equations using method of undetermined coefficients and method of variation of parameters.
5. Solving second order linear ODEs
6. Solving a system of first order linear ODES.
7. Miscellaneous Theoretical questions from all units.