UGEMATH 101 (6 CREDITS)

DIFFERENTIAL CALCULUS I (3 Questions)

Successive differentiation, n^{th} order derivative of some standard functions. Leibnitz's theorem. n^{th} derivative of rational functions. Taylor's and Maclaurin's series expansions of functions. Applications of Taylor's and Maclaurin's series. Tangent and Normal, their equations in the Cartesian form, parametric form, Tangents at the origin. Angle between two curves. Length of tangent, normal, sub tangent, subnormal in Cartesian forms.

INTEGRAL CALCULUS I (3 questions)

Integration of rational and irrational functions. Integration by partial fractions, Integration by transformations, Integration by substitution , Integration parts etc.

VECTORS I (2 questions)

Scalar and Vector point functions, vector function of a scalar variables, Continuity of a vector function. differentiation of a vector with respect to the scalar variable " t". Differentiation of a vector function. Derivatives of a sum of vectors, derivatives of a product of vectors (both scalar and vector products.)

COORDINATE GEOMETRY OF TWO DIMENSION I (2 questions)

Change of rectangular axes, Rotation and Shifting of origin. Transformation of the general equation of the second degree. Conditions for the general equation of second degree to represent a parabola, ellipse and hyperbola. Equations of the tangent and normal to a given curve using calculus.

REAL ANALYSIS I (2 questions)

Sequence: Definition, Bounds, Limit of a sequence, Monotonic Sequences and their Convergence, Algebraic operations and limits, Cauchy Sequence, General principle of convergence of a sequence.

BOOKS RECOMMENDED

1. Differential Calculus : A Das Gupta & S B Prasad
2. Integral Calculus : A Das Gupta
3. Vector Analysis : Lalji Prasad/ A Das Gupta & S B Prasad
4. Coordinate Geometry : A Das Gupta
5. Real Analysis : Lalji Prasad

UGEMATH 202 (6 CREDITS)

Differential Calculus II (2 Questions)

Partial Differentiation, Curvature, Asymptotes, Maxima and Minima of functions of two variables.

Integral Calculus II (3 Questions)

Evaluation of definite integrals, reduction formulae, curve tracing, length and area, Surface area and volume of solids of revolution.

Vector II (2 Questions)

Gradient, Divergence and curl and second order vector differential operators in Cartesian coordinates systems.

Co- ordinate geometry of two dimensions II (2 Questions)

Reduction of the general equation of second degree to the standard forms, Chord of Contact, Polar and pair of tangents in reference to general equation of conic, Polar equation.

Real Analysis II (3 Questions)

Series: Definition, Convergent Series, Divergent Series, Pringsheim's theorem, Comparison tests, Cauchy,s root test , D'Alembert's ratio test, Alternating series and Leibnitz test, Absolutely convergent series.

UGEMATH 303 (6 CREDITS)

REAL ANALYSIS III (3 Questions)

Continuity & Derivability of function of one variable, relationship with continuity, Rolle's theorem, Lagrange's Mean Value theorem, Taylor's and Maclaurin's theorem with R_n.

SET THEORY I (2 Questions)

Indexed family of sets, Generalised set of operations & Demorgan laws, Set mapping. Equivalence relation and related fundamental theorem of partition.

COMPLEX VARIABLE I (2 Questions)

Real functions of two variables: Simultaneous and iterated limits: Continuity, partial derivatives, Differentiability and related necessary and sufficient conditions.

ABSTRACT ALGEBRA I (3 Questions)

Binary operations, Notion of group, Abelian group and non-Abelian group with examples. Uniqueness of identity element and inverse elements in a group, different ways of defining a group, concept of Subgroup and cyclic group, Cosets, Lagrange's theorem.

DIFFERENTIAL EQUATIONS (2 Questions)

Differential equations of first order and higher degree, Clairaut's form, singular solution, orthogonal trajectories.

UGEMATH 404 (6 CREDITS)

REAL ANALYSIS IV (2 Questions)

Riemann Integration, definition, Oscillatory sum and integrability condition. Integrability of monotonic and continuous functions. Fundamental theorem of integral calculus.

SET THEORY II (1 Question)

Partial order relation and relate concepts of u.b., l.b., inf., sup, maximal element, minimal element and lattice (definition and examples only), statement of Zorn's lemma.

COMPLEX VARIABLE II (4 Questions)

Functions of complex variables limit, Continuity, derivative, Cauchy-Riemann Equations, Analytic function, Harmonic function. (2 Questions)

Import of some standard transformations e.g., w=z+c, w=cz, w=1/z, w=(az+b) / (cz+d) bilinear). Conformal transformation as transformation effected by analytic function. Special conformal transformation $w=z^2$, $w=e^z$, w=sin z. (2 Questions)

ABSTRACT ALGEBRA II (2 Questions)

Matrices, operations on matrices, matrix algebra, kinds of matrices, Transpose, adjoint and inverse of a matrix, solution of system of linear equations.

DIFFERENTIAL EQUATIONS II (3 Questions)

Linear Equation with constant co-efficients, Homogenous linear equations with variable coefficients. Simultaneous equation s $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ and total differential equation P dx + Q dy + R dz = 0 together with their geometric significance.