INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, DESIGN AND MANUFACTURING, KANCHEEPURAM, CHENNAI – 600 127

FACULTY RECRUITMENT

(Ref.: Advt. No. IIITDMK/R/2/2024 dated 15.07.2024)

SYLLABUS FOR WRITTEN TEST

Post: **Assistant Professor Grade-II (Level 10 and Level 11)**

MATHEMATICS, DEPARTMENT OF SCIENCES AND HUMANITIES

Linear Algebra: Finite dimensional vector spaces over real or complex fields; Linear transformations and their matrix representations, rank and nullity; systems of linear equations, characteristic polynomial, eigen values and eigen vectors, diagonalization, minimal polynomial, Cayley-Hamilton Theorem, Finite dimensional inner product spaces, Gram-Schmidt orthonormalization process

Real Analysis: Functions of two or more variables, continuity, directional derivatives, partial derivatives, total derivative, maxima and minima, saddle point, method of Lagrange's multipliers; Double and Triple integrals and their applications. Metric spaces, connectedness, compactness, completeness; Sequences and series of functions, uniform convergence, Weierstrass approximation theorem; contraction mapping principle:

Complex Analysis: Functions of a complex variable: continuity, differentiability, analytic functions, harmonic functions; Complex integration: Cauchy's integral theorem and formula; Liouville's theorem, maximum modulus principle, Morera's theorem; zeros and singularities; Power series, radius of convergence, Taylor's series and Laurent's series; Residue theorem and applications for evaluating real integrals;

Differential Equations: First order ordinary differential equations, second order linear ordinary differential equations with variable coefficients; Cauchy-Euler equation, method of Laplace transforms for solving ordinary differential equations, series solutions (power series, Frobenius method); Legendre and Bessel functions and their orthogonal properties; Systems of linear first order ordinary differential equations, Fourier series; Laplace transforms. Method of characteristics for first order linear and quasilinear partial differential equations; Second order partial differential equations in two independent variables: method of separation of variables for Laplace equation in Cartesian and polar coordinates

Numerical Analysis: Systems of linear equations: Direct methods (Gaussian elimination, LU decomposition, Cholesky factorization), Iterative methods (Gauss-Seidel and Jacobi) and their convergence for diagonally dominant coefficient matrices; Numerical solutions of nonlinear equations: bisection method, secant method, Newton-Raphson method, fixed point iteration; Interpolation: Lagrange and Newton forms of interpolating polynomial, Error in polynomial interpolation of a function; Numerical differentiation and error, Numerical integration: Trapezoidal and Simpson rules,

Probability: Axiomatic definition of a probability measure, properties of the probability measure, finite probability space, conditional probability and Bayes formula. Random variables (discrete and continuous), moments, moment generating function, law of large numbers, central limit theorem and its applications.

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