Vidyalankar

S.E. Sem. IV [CMPN]

Applied Mathematics - IV

SYLLABUS

Time : 3 Hrs. **Theory :** 100 Marks

Term Work : 25 Marks

1. Matrices :

1.1 Brief revision of vectors over a real field, inner product, norm, Linear independence and orthogonality of vectors.

1.2 Characteristic polynomial, characteristic equation, characteristic roots and characteristic vectors of a square matrix, properties of characteristic roots and vectors of different types of matrices such as orthogonal matrix, Hermitian matrix, Skew-Hermitian matrix, Diagonable matrix, Cayley Hamilton's theorem (without proof) Functions of a square matrix, Minimal polynomial and Derogatory matrix.

2. Complex variables :

2.1 Functions of complex variables, Analytic function, necessary and sufficient conditions for f(z) to be analytic (without proof)

2.2 Milne-Thomson method to determine analytic function f(z) when it's real or imaginary or its combination is given. Harmonic function, orthogonal trajectories.

2.3 Mapping : Conformal mapping, linear, bilinear mapping, cross ratio, fixed points and standard transformations such as Rotation and magnification, invertion and reflection, translation.

2.4 Line integral of a function of a complex variable, Cauchy's theorem for analytic function, Cauchy's Goursat theorem (without proof), properties of line integral, Cauchy's integral formula and deductions.

2.5 Singularities and poles:
Idea of Taylor's and Laurent's series development (without proof) for Residue.

2.6 Residue's theorem, application to evaluate real integrals of type.

$$\int_0^{2\pi} f(\cos\theta, \sin\theta)d\theta, \text{ and } \int_{-\infty}^{\infty} f(x)dx$$

3. Mathematical programming :

3.1 Linear optimization problem, standard and canonical form of LPP, basic and feasible solutions, primal simplex method (more than two variables)

3.2 Artificial variables, Big-M method (method of penalty)

3.3 Dual problem, duality principle Dual simplex method. degeneracy and alternative optima unbounded solution.

3.4 Nonlinear Programming, unconstrained optimization, problem with equality constraints Lagranges Multiplier method, Problem with inequality constraints Kuhn-Tucker conditions.

References :

1. Complex Variables (*Churchill*) Mc-Graw Hill
2. Elements of Applied mathematics (*P. N. & J. N. Wartikar*) Pune Vidarthi Gruha Prakashan.
3. Higher Engineering Mathematics (*Dr. B. S. Grewal*) Khanna Publication.
4. Advanced Engineering Mathematics (*E. kreyszing*) Wiley Eastern Limited.
5. Operations research (*Kantiswearup, Manmohan, P. K. Gupta*) S. Chand & Co.
6. Operations Research (*S. D. Sharma*) S. Chand & Co.
7. Matrices (*A. R. Vasishtha*) Krishna Prakashan.

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