Engineering Mathematics – III [EM-III]

S.E. Sem. III [INST]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	–	–
Oral Exam	–	–
Term Work	–	–

SYLLABUS

1. **Laplace Transform**
   Functions of bounded variations.
   Laplace Transforms of 1, t^n, e^{at}, sin at, cos at, sinh at, cosh at, erf(t) Linear property of L.T. First shifting theorem Second shifting theorem $L\left\{t^n f(t)\right\}, L\left\{\frac{f(t)}{t}\right\}, L\left\{\int_0^t f(u)du\right\}, L\left\{\frac{d^n}{dt^n f(t)}\right\}$. Change of scale property of L.T. Unit step function. Heavyside, Dirac delta functions, Periodic functions and their Laplace Transforms.
   (a) **Inverse Laplace Transforms :** Evaluation of inverse L.T., partial fractions method, convolution theorem.
   (b) **Applications** to solve initial and boundary value problems involving ordinary diff. Equation with one dependant variable.

2. **Complex Variables :**
   Functions of complex variables, continuity and derivability of a function, analytic functions, necessary condition for f(z) to be analytic, sufficient condition (without proof), Cauchy – Riemann conditions in polar forms. Analytical and Milne – Thomson method to find analytic functions f(z) = u + iv where (i) u is given (ii) v is given (iii) u+v (iv) u–v is given. Harmonic functions and orthogonal trajectories.
   (a) **Mapping :** Conformal mapping, Bilinear mapping, fixed points and standard transformation, inversion, reflection, rotation and magnification.
   (b) **Line Integral** of function of complex variable, Cauchy's theorem for analytical function (with proof), Cauchy's Goursat theorem (without proof), properties of line integral, Cauchy's Integral formula and deduction.
   (c) **Singularities and poles:** Taylor's and Laurent's development (without proof), residue at isolated singularity and it's evaluation.
   (d) **Residue 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. **Fourier series :**
   Orthogonality and orthogonal functions, Expression for the function in a series of orthogonal functions. Dirichlet's conditions, Fourier series of periodic functions with period 2pi or 2ℓ. (Derivation of Fourier coefficients a0, an, bn is not expected) Dirichlet's theorem Even and Odd functions. Half range sine and cosine expressions Parsaval's identities (without proof).

   (a) **Complex form of Fourier Series :**
   Fourier transform and Fourier integral in detail.

Reference :

1. Textbook of Applied Mathematics (*Wartikar P.N., Wartikar J.N.*) Pune Vidyarthi Griha Prakashan, 1981.
2. Advanced Engineering Mathematics (*Kreyszig Erwin*) Wiley Student Edition – New Delhi, 2006 (8^{th} Edition).
3. Complex Variables (*Churchil*) McGraw Hill.
4. Theory of Function Complex Variable (*Shantinarayan*) S. Chand & Co.
5. Engineering Mathematics (*Shastri S.S.*) Prentice Hall.
6. Advanced Modern Engineering Mathematics (*Glyn James*) Pearson Education Ltd., 2004 (3^{rd} Edition)

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