

# Applied Mathematics – III

S.E. Sem. III [CHEM]

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## EVALUATION SYSTEM

	Time	Marks
<b>Theory Exam</b>	3 Hrs	100
<b>Practical and Oral Exam</b>	–	–
<b>Oral Exam</b>	–	–
<b>Term Work</b>	–	25

## SYLLABUS

### 1. Laplace Transform

- Definition, properties of linearity, Laplace transform of elementary function, Properties of Laplace transform (First and Second Shifting property).
- Theorem on Laplace Transform

$$L\{t^n f(t)\}, L\left\{\frac{f(t)}{t}\right\}, L\left\{\int_0^t f(u)du\right\}, L\{f(at)\}, L\left\{\frac{d}{dt} f(t)\right\} \text{ (with proof)}$$

### 2. Inverse Laplace Transform

- Definition, Inverse Laplace Transform by using partial fraction method, Convolution Theorem (without proof).
- Applications to solve boundary value problem involving ordinary differential equations with one independent variable, Applications to chemical engineering.

### 3. Laplace Transform and Matrices

- Laplace Transform of periodic functions, Heaviside unit step functions, Dirac delta function.
- Types of Matrices, Adjoint of Matrices, Inverse of Matrix.

### 4. Matrices

- Rank of Matrix, Elementary transformation of matrix, Linear dependent and independent of rows and columns of a matrix over a real field.
- Reduction of normal form, Homogeneous linear equations and non-homogenous equations, their consistency.

### 5. Complex Variable

- Functions of complex variable, Continuity (only statement), Derivability of a function, Analytic functions, C-R equations in Cartesian and polar (with proof), Harmonic functions.
- Orthogonal trajectories, Analytical and Milne-Thomson method to find  $f(z)$ .
- Mapping, Conformal mapping, Bilinear transformation, Cross ratio preservation property (with proof).

### 6. Bessels Equation

- Bessels Equation and functions (without proof), Equations reducible to Bessel form, Method of solving the equations and conditions for the four types of Bessels and Modified Bessels equations and functions.
  - Recurrence Relations for Bessels functions. Applications to Chemical engineering e.g., heat transfer for an extended surface.
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**Reference :**

1. Mathematical Methods in Chemical Engineering (Jenson V.G. & Jeffrey, G.V.) – Academic Press, 1970.
2. Mathematical Methods in Chemical Engineering (Pushpacanam S.) – Prentice Hall of India 1998.
3. A text book of Applied Mathematics (*P.N. & J.N. Wartikar*) – Vol. 1 & 2
4. Laplace Transforms (*Lipschutz S.*) – Schaum's Outline Series.
5. Higher Engineering Mathematics (*Dr. B. S. Grewal*)

