Vidyalankar

F.E. : Sem. II

Applied Mathematics - II

SYLLABUS

Time : 3 Hrs.

Theory : 100 Marks

Term work : 25 Marks

- **Prerequisite :**
  Idea of curve tracing in Cartesian, Parametric and Polar forms. Standard curves such as Straight lines, Circles, Parabolas, Hyperbola, Catenary Cissoid, Astroid, Cycloid, Lemniscate of Bernoulli, Cardiode. Concept of Solid Geometry–Planes, Spheres, Cones, Cylinders, Parabolloids.

1. Beta and Gamma functions, Differentiation under integral sign

- Definition of Beta and Gamma functions and properties
- Relation between Beta and Gamma functions (with proof), Duplication formula (with proof).
- Differentiation under the integral sign with constant limits of integration.

2. Differential Equations of first order and first degree

(a) Exact differential equations and those which can be reducible to the exact form by using integrating factors (four rules)

1. Homogeneous differential equations
2. $f(xy)\,ydx + g(xy)\,xdy = 0$
3. $\text{I.F.} = e^{\int f(x)dx}$ where $f(x) = \dfrac{\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}}{N}$
4. $\text{I.F.} = e^{\int g(y)dy}$ where $g(y) = \dfrac{\frac{\partial N}{\partial x} - \frac{\partial M}{\partial x}}{M}$

(b) Linear differential equations and differential equations reducible to the linear form.

(c) Numerical solutions of differential equations using Taylor's series method.

3. Numerical solutions of differential equations of first order and first degree, Differential equations of order n.

(a) Euler's method, Modified Euler's method, Runge Kutta method of 4^{th} order. Comparison of numerical solutions with the exact solutions.

(b) Linear differential equations with constant coefficients–Complimentary functions, particular integrals of differential equations of the type $f(D)y = X$ where X is e^{ax}, $\sin(ax + b)$, $\cos(ax + b)$, x^n, $e^{ax}V$, xV

4. Linear Differential equations with variable coefficients, Method of variation of parameters and Rectification.

(a) Cauchy's homogeneous linear differential equation and Legendre's differential equation

(b) Method of variation of parameters

(c) Simple application of differential equations of first and second order to electrical and mechanical engineering problems (no formulation of differential equation)

(d) Rectification of plane curves

5. **Integral Calculus–Double Integrals**
   (a) Double Integration–Definition, geometrical interpretation, properties and evaluation.
   (b) Evaluation of double integrals by changing the order of integration and changing to polar form.
6. **Integral calculus–Triple Integral and application of double and triple integrals, computer oriented techniques**
   (a) Triple Integration–definition and evaluation (Cartesian, Cylindrical and Spherical polar coordinates), Concept of Jacobians
   (b) Applications of double integrals to compute Area, Mass and Volume. Application of triple integrals to compute Volume.
   (c) Computer oriented techniques in problem solving using Scilab.

Recommended Books :

- Higher Engineering Mathematics (*Dr. B. S. Grewal*) Khanna Publications.
- Differential Equation (*Ross*) Wiley India, 3rd edition..
- A textbook of Applied Mathematics (*P. N. and J. N. Wartikar*) Volume 1 and 2, Pune Vidyarthi Griha.
- Advanced Engineering Mathematics (*Erwin Kreyszing*) Wiley India, 8th edition.
- Elementary Differential Equation (*E. D. Rainville, P. E. & R. E. Bedient*) Prentice Hall, 8th edition.

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