

SECTION-B

2. Suppose that the p.d.f. of a random variable X is as follows :

$$f(x) = \begin{cases} cx, & \text{for } 0 < x < 4 \\ 0, & \text{elsewhere} \end{cases}$$

where c is a constant. Determine the value of c and the values of $P(1 \leq X \leq 2)$ and $P(X > 2)$.

3. A sample of 20 items has mean 42 units and standard deviation 5 units. Test the hypothesis that it is a random sample from a normal population with mean 45 units.

4. a) Find the root between 0 and 1 of $x^3 = 6x - 4$ using bisection method.
b) Solve the following system of nonlinear equations using Newton-Raphson method

$$x^2 - y^2 = 4$$

$$x^2 + y^2 = 16$$

5. Does the Lagrange interpolating polynomial have the permanence property?

Use Newton's divided interpolation formula to find $f(12)$ from the following data :

x	11	13	14	18	19	21
$f(x)$	1342	2210	2758	5850	6878	9282

6. Determine the largest eigen value in magnitude and the corresponding eigenvector of the following matrix by using power method

$$\begin{bmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{bmatrix}$$

SECTION-C

7. a) Use Gauss elimination method to solve the following system :

$$3x - 2y + 2z = 12$$

$$x + 2y + 7z = 11$$

$$2x - 2y - z = 3$$

b) Solve the following system of equations using Gauss Jordan method :

$$2x + 8y + 2z = 14$$

$$6x + 6y - z = 13$$

$$2x - y + 2z = 5$$

8. a) Using Trapezoidal rule, evaluate $\int_{-1}^1 \frac{1}{1+x^2} dx$ using 8 intervals. Also compare the result with the actual value of the integral.
- b) i) What is the restriction on the number of nodal points required for using the Simpson's 1/3-rule for integrating $\int_a^b f(x) dx$?
- ii) Using Simpson's 1/3-rule, evaluate $\int_0^1 x e^x dx$. Compare the result with the actual value of the integral.
9. a) Use Euler's method to compute $y(0.2)$ and $y(0.4)$, given that $\frac{dy}{dx} = x + y$; $y(0) = 0$. Take $h = 0.2$ (step-size).
- b) Use fourth-order Runge-Kutta method to compute $y(0.2)$, given that $\frac{dy}{dx} = 1 + \frac{2xy}{1+x^2}$; $y(0) = 0$. Take $h = 0.1$ (step-size).

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