Roll No. | | | | | | | | | | | | | **Total No. of Pages : 03**

Total No. of Questions : 18

B.Tech. (EE) PT (Sem.–6)

NUMERICAL & STATISTICAL METHODS

Subject Code : BTEE-505

M.Code : 72790

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

l. Define relative error and give bound on the relative error of a floating point number in case of rounding and chopping.

2. Find the polynomial $f(x)$ by using Lagrange's formula for the following data:

x	0	1	2	3
$f(x)$	1	3	9	31

3. Define Order of convergence and give order of convergence of Bisection method.

4 Obtain the approximate value of $y(0.1)$ for the initial value problem $y' = 1 + y^2$, $y(0) = 1$ with step size $h = 0.1$ by using Taylor series second order method.

5. Evaluate the following integral $\int_0^3 \frac{1}{x^2+1}\,dx$ using Simpson's $\frac{3}{8}th$ rule with three sub intervals.

6. A Random variable has the following probability distribution:

x	0	1	2	3	4
$p(x)$	0	K	2K	2K	7K

Find K.

7. If X is random variable then prove that E(aX + b) = aE(X) + b, where E(X) is mathematical expectation of X.

8. If X is uniformly distributed with mean 1 and variance $\frac{4}{3}$ then find P(X < 0).

9. Show that mean of Binomial distribution is np, where n is no. of independent trails and p is probability of success of any trail.

10. Give two properties of correlation coefficient.

SECTION-B

11. Use bisection method to find the solution of the equation $3x - e^x = 0$ in the interval [1, 2] accurate within 10^{-2}.

12. Perform four iterations of Gauss-Seidel method using 4-digit rounding arithmetic to solve the system of equations

$$4x_1 + x_2 + x_3 = 2$$

$$x_1 + 5x_2 + 2x_3 = -6$$

$$x_1 + 2x_2 + 3x_3 = -6$$

by taking initial approximation $x^{(0)} = [0.5, -0.5, -0.5]^T$.

13. Determine the largest eigenvalue and the corresponding eigenvector of the matrix

$$\begin{bmatrix} -15 & 4 & 3 \\ 10 & -12 & 6 \\ 20 & -4 & 2 \end{bmatrix}$$

correct to three decimal places using the power method.

14. Evaluate the following integral $\int_0^2 \frac{1}{x^2+2x+10}dx$ using Simpson's $\frac{1}{3}$ rd rule with four sub intervals. Compare with the exact solution.

15. A random sample of 10 boys had following I.Q.'s: 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do these data support the assumption of a population mean I.Q. of 100? Find a reasonable range in which most of the mean I.Q. values of samples of 10 boys lie. (Given $t_{0.05} = 2.62$ for 9 degree of freedom).

SECTION-C

16. Use Runge Kutta method of fourth order to approximate $y(0.2)$ taking step size $h = 0.1$ for the initial value problem $\frac{dy}{dx} = y + e^x$, $y(0) = 0$.

17. A continuous random variable X has the density function $f(x) = \begin{cases} \frac{x^2}{3}, & -1 < x < 2 \\ 0, & elsewhere \end{cases}$

a) Verify that $f(x)$ is a density function.

b) Find $P(0 < x < 1)$.

c) Find the cumulative distribution function $F(x)$.

18. By using the method of least squares, fit a curve of the form $y = ax^b$ to the following data:

x	2	3	4	5
y	27.8	62.1	110	161

NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.