

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-IV(NEW) EXAMINATION – WINTER 2022****Subject Code:2140706****Date:15-12-2022****Subject Name:Numerical and Statistical Methods for Computer Engineering****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

**MARKS**

- Q.1** (a) If the approximate solution of a problem is  $x_0 = 35.25$  with relative error of at the most 2 %. Find the range of values correct up to four decimal digits in which the exact value of the solution lie. **03**
- (b) Find the positive root of  $x^3 - x - 11 = 0$  by the bisection method correct up to fourth approximation. **04**
- (c) Using three iteration of Gauss Jacobi method solve the following system of the equations: **07**

$$20x + y - 2z = 17$$

$$2x - 3y + 20z = 25$$

$$3x + 20y - z = -18$$

- Q.2** (a) Using Simpson's 3/8 rule, evaluate  $\int_0^3 \frac{dx}{1+x}$ , taking  $n = 6$ . **03**
- (b) By using Lagrange's interpolation formula, find  $y(10)$ . **04**

x	5	6	9	11
y	12	13	14	16

- (c) Find the cubic splines and evaluate  $y(1.5)$  and  $y'(3)$ . **07**

x:	1	2	3	4
y:	1	2	5	11

**OR**

- (c) Fit a curve of the form  $y = ab^x$  for the data using least square criteria and hence find the estimation for y when  $x = 8$ . **07**

x	1	2	3	4	5	6	7
y	87	97	113	129	202	195	193

- Q.3** (a) Using Newton Raphson method find the square root of 10 correct up to three decimal places. **03**
- (b) Prove that 1.  $\delta = E^{\frac{1}{2}} - E^{\frac{-1}{2}}$  2.  $\mu = \frac{1}{2} \left( E^{\frac{1}{2}} + E^{\frac{-1}{2}} \right)$  **04**
- (c) Given that  $\frac{dy}{dx} = y - \frac{2x}{y}$ ,  $y(0) = 1$ . Using Runge-Kutta method of fourth order, compute y for  $x = 0.2$  and  $x = 0.4$ . **07**

**OR**

- Q.3 (a)** Use Trapezoidal rule to approximate the definite integral  $\int_0^1 \frac{dx}{1+x^2}$  with  $n = 4$ . **03**
- (b)** Find Newton's interpolating polynomial satisfying the data **04**
- |   |   |   |   |    |
|---|---|---|---|----|
| x | 4 | 6 | 8 | 10 |
| y | 1 | 3 | 8 | 16 |
- (c)** Use Euler's method to solve the initial value problem  $\frac{dy}{dx} = \frac{x-y}{2}$ , on  $[0, 3]$  with  $y(0) = 1$ , Compare the numerical solution with exact solution for the step size  $h = 0.25$ . **07**

- Q.4 (a)** Find a real root of the equation  $x^3 - x - 1 = 0$  by the regula falsi method. **03**
- (b)** Using Newton's divided - difference interpolation, find  $f(1)$  and  $f(9)$  from the following table: **04**

x	-1	0	2	5	10
y	-2	-1	7	124	999

- (c)** Given that  $\frac{dy}{dx} = x^2 + y^2$ ,  $y(0) = 1$ , Compute  $y(0.3)$  by Milne's predictor-corrector method  $h = 0.1$ . **07**

**OR**

- Q.4 (a)** Apply Budan's theorem to find the number of the roots of the equation  $f(x) = x^4 - 4x^3 + 3x^2 - 10x + 8$  in the interval  $[-1, 0]$  and  $[0, 1]$ . **03**
- (b)** The first moments of a distribution about the value 5 of variable are 2, 20, 40 and 50. Find the mean, variance  $\gamma_1$  and  $\gamma_2$ . **04**
- (c)** Find the roots of the equation  $x^4 + 9x^3 + 36x^2 + 51x + 27 = 0$  to three decimal places to Lin - Bairstow method. **07**

- Q.5 (a)** Develop C program for secant method. **03**
- (b)** Compute the correlation coefficient between X and Y using the following data: **04**

x	2	4	5	6	8	11
y	18	12	10	8	7	5

- (c)** Using Gauss Siedel method solve the following system of the equations: **07**
- $$30x - 2y + 3z = 75$$
- $$2x + 2y + 18z = 30$$
- $$x + 17y - 2z = 48$$

**OR**

- Q.5 (a)** In a lottery of 10,000 tickets, only one ticket bears a prize of Rs. 5,000. The price of a ticket is Rs. 100. Rakesh has on ticket of this lottery. Find his expectation. **03**

- (b)** For the following data find the two regression lines: **04**
- |   |    |    |    |    |    |    |    |    |    |    |
|---|----|----|----|----|----|----|----|----|----|----|
| x | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 |
| y | 10 | 12 | 16 | 28 | 25 | 36 | 41 | 49 | 40 | 50 |

- (c)** Solve  $\frac{dy}{dx} = x + y$ , with  $y(0) = 1$  by Euler's modified method for  $x = 0.1$  correct up to four decimal places by taking  $h = 0.05$ . **07**

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