

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

**GUJARAT TECHNOLOGICAL UNIVERSITY**

**BE - SEMESTER-IV(NEW) – EXAMINATION – SUMMER 2019**

**Subject Code:2140706**

**Date:15/05/2019**

**Subject Name: Numerical and Statistical Methods for Computer Engineering**

**Time:02:30 PM TO 05:00 PM**

**Total Marks: 70**

**Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

**MARKS**

**Q.1 (a)** Find the percentage error in the area of an ellipse when errors of 2% and 3 % are made in measuring its major and minor axes respectively. **03**

**(b)** Using the bisection method, find a root of  $f(x) = 2x - 3\sin x - 5 = 0$  correct up to three decimal places. **04**

**(c)** Interpolate the function  $y = f(x)$  at point  $x = 1.5$  using the following tabulated data. **07**

|   |   |   |    |    |     |     |     |     |
|---|---|---|----|----|-----|-----|-----|-----|
| x | 1 | 2 | 3  | 4  | 5   | 6   | 7   | 8   |
| y | 1 | 8 | 27 | 64 | 125 | 216 | 343 | 512 |

**Q.2 (a)** Using trapezoidal rule find the value of the integral  $\int_0^5 \frac{dx}{1+x}$  with  $h = 1$ . **04**

**(b)** Discuss false position method. **03**

**(c)** Fit a second-degree parabola to the following data using method of least squares. **07**

|   |   |     |     |     |     |
|---|---|-----|-----|-----|-----|
| x | 0 | 1   | 2   | 3   | 4   |
| y | 1 | 1.8 | 1.3 | 2.5 | 6.3 |

**OR**

**(c)** Find the cubic spline in the interval  $[0, 2]$  for the following data: **07**

|   |   |   |    |    |
|---|---|---|----|----|
| x | 0 | 2 | 4  | 6  |
| y | 1 | 9 | 41 | 41 |

**Q.3 (a)** Apply Budan's theorem to find the number of roots of the equation  $x^3 - 3x^2 - 4x + 13$  in the interval  $[-3, -2]$  and  $[-2, -1]$  **03**

**(b)** Find an iterative formula for  $\sqrt{N}$ , where  $N$  is a positive number and hence, find  $\sqrt{12}$  correct up to four decimal places. **04**

**(c)** Using Gauss Seidel method solve the following equations: **07**

$$5x + y - z = 10$$

$$2x + 4y + z = 14$$

$$x + y + 8z = 20$$

**OR**

**Q.3 (a)** Prove that (i)  $(1 + \Delta)(1 - \nabla) = 1$  (ii)  $\Delta \nabla = (\Delta - \nabla)$  **03**

**(b)** Find  $y(32)$  from the following table: **04**

|   |        |        |        |        |
|---|--------|--------|--------|--------|
| x | 25     | 30     | 35     | 40     |
| y | 0.2707 | 0.3027 | 0.3386 | 0.3794 |

- (c) Solve  $x^4 - 8x^3 + 39x^2 - 62x + 50 = 0$  by using Lin-Bairstow method up to third iteration  $p_0 = q_0 = 0$  07

- Q.4 (a) Using Simpson's 1/3 rule, find  $\int_0^{0.6} e^{-x^2} dx$ , by taking  $n = 6$  03

- (b) Find the median of the following data: 04

|                             |     |     |     |     |     |    |    |    |
|-----------------------------|-----|-----|-----|-----|-----|----|----|----|
| Age greater than (in years) | 0   | 10  | 20  | 30  | 40  | 50 | 60 | 70 |
| No. of persons              | 230 | 218 | 200 | 165 | 123 | 73 | 28 | 8  |

- (c) Solve  $\frac{dy}{dx} = y - \frac{2x}{y}$ ,  $y(0) = 1$  in the range  $0 \leq x \leq 0.2$  using modified Euler's method taking  $h = 0.1$ . 07

OR

- Q.4 (a) Write the formula for Runge-Kutta second order method. 03

- (b) Use Lagrange's interpolation formula to find the value of  $y(10)$  for given data: 04

|   |    |    |    |    |
|---|----|----|----|----|
| x | 5  | 6  | 9  | 11 |
| y | 12 | 13 | 14 | 16 |

- (c) Using Runge-Kutta method of fourth order, solve for  $y(0.1)$ ,  $y(0.2)$  and  $y(0.3)$  given that  $y' = xy + y^2$ ,  $y(0) = 1$ . 07

- Q.5 (a) Develop a C program for bisection method. 03

- (b) Two unbiased dice are thrown at random. Find the probability distribution of the sum of the numbers on them. Also find the mean and variance. 04

- (c) Calculate the coefficient of correlation for the following pairs of  $x$  and  $y$ : 07

|   |    |    |    |    |    |    |    |    |
|---|----|----|----|----|----|----|----|----|
| x | 17 | 19 | 21 | 26 | 20 | 28 | 26 | 27 |
| y | 23 | 27 | 25 | 26 | 27 | 25 | 30 | 33 |

OR

- Q.5 (a) Discuss type of Regression. 03

- (b) Find the regression coefficient of  $y$  on  $x$  for the following data: 04

|   |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|
| x | 1   | 2   | 3   | 4   | 5   |
| y | 160 | 180 | 140 | 180 | 200 |

- (c) Given  $\frac{dy}{dx} = \frac{1}{x+y}$ ,  $y(0) = 2$ ,  $y(0.2) = 2.0933$  07

$y(0.4) = 2.1755$ ,  $y(0.6) = 2.2493$ , find  $y(0.8)$  using Milne's Predictor Corrector method.

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