

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV (NEW) EXAMINATION – SUMMER 2022****Subject Code:2140706****Date:29-06-2022****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 number $a = 3.141592$ is approximated by 3.14, find absolute error, relative error and percentage error. **03**
- (b) Write an Algorithm for Newton-Raphson method. **04**
- (c) Derive secant method. Use it to find a real root between 0 and 1 of the equation $xe^x - 1 = 0$, correct up to three decimal places. **07**

- Q.2** (a) Evaluate $\int_0^{0.6} e^{-x^2} dx$ using Simpson's 1/3 rule for $n = 6$. **03**

- (b) Fit a straight line to the following data: **04**

x	1	2	3	4	6	8
y	2.4	3	3.6	4	5	6

- (c) Find all the roots of $x^3 - 2x^2 + x - 2 = 0$ using Bairstow's method up to second iteration with $p_0 = q_0 = 0$. **07**

OR

- (c) Using cubic spline, find $y(0.5)$ and $y'(1)$, given $M_0 = M_2 = 0$ **07**

x	0	1	2
y	-5	-4	3

- Q.3** (a) Find a real root of the equation $x^3 - x - 1 = 0$ in the interval (1, 2) by the iteration method. Correct up to three decimal places. **03**

- (b) Use Lagrange formula to find $f(2)$ from the following table: **04**

x	-1	0	2	3
$f(x)$	8	3	1	12

- (c) Apply Budan's theorem to find the number of roots of the equation **07**

$$x^5 + x^4 - 4x^3 - 3x^2 + 3x + 1 = 0$$

in the intervals $[-2, -1]$, $[-1, 0]$, $[0, 1]$ and $[1, 2]$.

OR

- Q.3** (a) Explain ill conditional system with example. **03**

- (b) Use Newton's divided difference formula to determine $f(9)$ for the following data: **04**

x	5	7	11	13	17
$f(x)$	150	392	1452	2366	5202

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

x	1	2	3	4	5
y	5	12	26	60	97

Also, estimate y at x = 6.

- Q.4** (a) Evaluate $\int_0^3 f(x)dx$ from the following table using Simpson's 3/8 rule: 03

x	0	0.5	1	1.5	2	2.5	3
f(x)	1	0.6667	0.5	0.4	0.3333	0.2857	0.25

- (b) Develop a C program for Trapezoidal rule. 04
 (c) Solve $\frac{dy}{dx} = x + y$ using Runge-Kutta method of order four, where $y(0) = 1$, with $x = 0$ to $x = 0.2$. Take $h = 0.1$. 07

OR

- Q.4** (a) The coefficient of correlation between two variables X and Y is 0.48. The covariance is 36. The variance of X is 16. Find the standard deviation of Y. 03
 (b) Write an Algorithm for Gauss elimination method. 04
 (c) State diagonal dominance property. Solve the following system by Gauss-Seidel method correct to three decimal places: 07

$$2x + y + 54z = 110; \quad 27x + 6y - z = 85; \quad 6x + 15y + 2z = 72$$

- Q.5** (a) Calculate the correlation coefficient between x and y using the following data: 03

x	1	4	9	12	15	19
y	4	7	11	14	16	20

- (b) From the following data, find the number of items n: 04

$$r = 0.5, \quad \sum (x - \bar{x})(y - \bar{y}) = 120, \quad \sigma_y = 8, \quad \sum (x - \bar{x})^2 = 90$$

- (c) Define central moments. Calculate the first four moments from the following data: 07

x	0	1	2	3	4	5	6	7	8
f	1	8	28	56	70	56	28	8	1

OR

- Q.5** (a) Calculate the 3-yearly moving averages of the following data: 03

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Sales (millions of rupees)	3	4	8	6	7	11	9	10	14	12

- (b) Find the standard deviation for the following distribution: 04

Age	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of Members	3	61	132	153	140	51	2

- (c) Obtain the line of regression of monthly sales(Y) on advertisement expenditure(X) and estimate the monthly sales when the company will spend Rs. 50,000 on advertisement, if the data on Y and X are as follows: 07

Y(in lac)	74	76	60	68	79	70	71	94
X (in thousand)	43	44	36	38	47	40	41	54
