Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) EXAMINATION – WINTER 2018

Subject Code:2140706 **Date:01/12/2018**

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.**

Q.1 **(a)** Discuss about mathematical modeling. **03**

(b) Discuss various types of errors used for numerical calculations. **04**

(c) Obtain cubic spline approximation for the function defined by the data given below for the first two subintervals. Take $M_0 = M_3 = 0$. **07**

x	0	1	2	3
$f(x)$	1	2	33	244

Q.2 **(a)** Write an algorithm for Simpson's rule. **03**

(b) Using Simpson's rule, find $\int_0^{0.6} e^{-x^2} dx$ taking seven ordinates. Show the calculations up to four decimal places. **04**

(c) Define divided difference. Using Newton's divided difference interpolation, find $f(6)$ from the following table: **07**

x	1	2	7	8
$f(x)$	1	5	5	4

OR

(c) Define interpolation. Using Lagrange interpolation, fit a second degree polynomial passing through the points $(0,0)$, $(1,1)$ and $(2,20)$. **07**

Q.3 **(a)** State Budan's theorem. Define diagonally dominant system with example. **03**

(b) Use Newton-Raphson method to find a positive root of $x^3 + x^2 - 1 = 0$ correct up to four decimal places taking $x_0 = 1$. **04**

(c) What do you mean by diagonally dominant system? Solve the following system of linear equations using Gauss-Seidel method: **07**

$9x + y + z = 10,\ 2x + 10y + 3z = 19,\ 3x + 4y + 11z = 0$.

OR

Q.3 **(a)** Explain geometrically the method of false position. **03**

(b) Using Euler's method, find $y(1)$ if $\frac{dy}{dx} = x + y$ and $y(0) = 1$. Take $n = 10$. **04**

(c) Perform one iteration of the Bairstow method to extract a quadratic factor from the polynomial $x^4 + x^3 + 2x^2 + x + 1$ with initial factor $x^2 - 0.5x - 0.5$. **07**

Q.4 **(a)** Write the steps for engineering problem solving. **03**

(b) Determine the condition number of the matrix $\begin{bmatrix} 1 & 4 & 9 \\ 4 & 9 & 16 \\ 9 & 16 & 25 \end{bmatrix}$. **04**

(c) State direct and iterative methods to solve system of linear equations. Solve the following system of linear equations using Gauss elimination method: **07**

$x + y + z = 9,\ 2x - 3y + 4z = 13,\ 3x + 4y + 5z = 40$.

OR

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

(b) Fit a second degree polynomial to the following data using least square method. **04**

y	-3	-2	-1	0	1	2	3
x	12	4	1	2	7	15	30

(c) Calculate the first four moments of the following distribution about the mean. **07**

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

Q.5 **(a)** Develop a C program to fit regression line of y on x through given set of points using the least square method. **03**

(b) The probability distribution of a commodity is given below. **04**

Demand	5	6	7	8	9	10
Probability	0.05	0.10	0.30	0.40	0.10	0.05

Find expected demand.

(c) For the following data, obtain trend values using five years moving average. **07**

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Value	3	7	14	8	10	11	14	12	16	20	25

OR

Q.5 **(a)** Discuss the pitfalls of Gauss elimination. **03**

(b) Define the following terms with examples: **04**

1. Ill-conditioned system
2. Significant figure

(c) Obtain the correlation coefficient for the following data: **07**

x	100	98	78	85	110	93	80
y	85	90	70	72	98	81	74

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