

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
