Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV(New) EXAMINATION – SUMMER 2016

Subject Code:2140706 Date:01/06/2016

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.**

MARKS

Q.1 **Short Questions** **14**

1 Define: Accuracy and Precision

2 If a=0.8461538461 is approximated by 0.84615 then find percentage relative error.

3 What is convergence rate of Bisection method and Newton Raphsonmethod.

4 Write any two pitfalls of Newton Raphson method.

5 The error caused by truncating an infinite series to a finite number of terms is called _____ and the error associated with chopping and rounding is called _____.

6 Check the following system is diagonally dominant or not. Justify your answer.

$10x-4y+z=7; x+5y-2z=5; 8x-4y-3z=6$

7 Employ partial pivoting to the following system of equations:

4x+2y-z = -2; 5x+y+2z = 4; 6x+y+z = 6

8 Write appropriate Simpson'sintegration formula to solve the integration $\int_0^{1.8} f(x)dx$,dividing the interval into 9 equal parts.

9 Define ill-conditioned system.

10 Can you apply False position method to obtain a root of the equation $f(x)=xe^x-2=0$ in the interval $(0,0.5)$? Justify your answer.

11 Find the arithmetic mean of the following frequency distribution.

x:	1	2	3	4
f:	4	5	2	1

12 What is mode of the following frequency distribution?

Data values x:	1	2	3	4
frequency f:	4	7	10	8

13 What is the approximate value of the $\int_1^2 f(x)dx$, using trapezoidal rule with h=1, where f (1) = 2, f (2) =4.

14 Find the approximate root of the equation $f(x)=x^3+x=0$ afterthe first iteration of Newton Raphson method with initial guess $x_0=1$.

Q.2 **(a)** Discuss the steps of an engineering problem solving. **03**

(b) Perform three iterations of Bisection method to obtain a root of the equation $f(x)=\cos(x)-xe^x=0$ in the interval $(0.5,1)$. **04**

(c) 1) Test the convergence condition for the equation $x = \frac{1}{3}(\cos(x)+1)$ in the interval $(0, \pi/2)$ and then solve the equation using successive approximation method correct up to three places of decimals taking initial guess as $x_0 = 0.5$. **07**

2)Apply Budan's theorem to the equation $x^4 - 7x^2 + 6x - 1 = 0$ to draw the inference about the roots in the interval $(-2, -1)$.

OR

(c) Perform one iteration of the Bairstow method to extract a quadratic factor $x^2 + px + q$ from the polynomial $x^4 + x^3 + 2x^2 + x + 1 = 0$. Use the initial approximation r= 0.5, s = 0.5. Also, calculate the relative approximate error in r and s after first iteration. **07**

Q.3 **(a)** Write an algorithm to fit a straight line using least square method. **03**

(b) The following system of equations was generated by applying mess current law to the circuit. Use Gauss Elimination method to find the current in the circuit. **04**

$$2I_1 - I_2 + 3I_3 = 8$$
$$-I_1 + 2I_2 + I_3 = 4$$
$$3I_1 + I_2 - 4I_3 = 0$$

(c) State the Direct & iterative method to solve system of linear equations. Arrange following system of equations into diagonally dominant form and solve it using Gauss Seidel method. **07**

$$10x_1 + x_2 + x_3 = 12$$
$$2x_1 + 2x_2 + 10x_3 = 14$$
$$2x_1 + 10x_2 + x_3 = 13$$

OR

Q.3 **(a)** Write an algorithm for Simpson's 1/3rd rule to integrate the tabulated function. **03**

(b) A train is moving at the speed of 30m/sec. Suddenly brakes are applied. The speed of the train per second after t seconds is given by the following table. **04**

Time(t)	0	5	10	15	20	25	30
Speed(v)	30	24	19	16	13	11	10

Apply Simpson's three-eight rule to determine the distance moved by the train in 30 seconds.

(c) Obtain cubic Splines approximation for the following data and hence compute f (1.5). **07**

X	1	2	3
f(x)	-8	-1	18

Q.4 **(a)** Use following data to evaluate f (2.5). **03**

x:	0	1	2	3
f(x):	1	2	1	10

(b) Use following data to construct a Lagrange's polynomial of degree two. **04**

x:	0.0	0.6	1.2
f(x):	1	0.825336	0.362358

(c) From the following data obtain the two regression lines and the correlation coefficients. **07**

x:	100	98	78	85	110	93	80
y:	85	90	70	72	95	81	74

OR

Q.4 **(a)** Using Euler's method compute y (0.3) for the initial value problem $y' = y^2 - x^2, y(0) = 1$ taking the step size h=0.1. **03**

(b) Use the Runge-Kutta 4th order method with h=0.1 to find the approximate solution for y(1.1) for the initial value problem $\frac{dy}{dx} = 2xy, y(1) = 1$ **04**

(c) Fit a polynomial of degree two using least square method for the following experimental data. Also estimate y(2.4) **07**

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

Q.5 **(a)** Find standard deviation from the following data. **03**

Class	9-11	12-14	15-17	18-20
Frequency	2	3	4	1

(b) Find correlation coefficient for the data given below. **04**

x:	4	5	9	14	18	22	24
y:	16	22	11	16	7	3	17

(c) Use the finite difference approach with h=0.25 to solve the boundary value problem y" = x + y, y (0) =1, y (1) =1. **07**

OR

Q.5 **(a)** In a college, IT department has arranged one competition for IT students to develop an efficient program to solve a problem. Ten students took part in the competition and ranked by two judges given in the following table. Find the degree of agreement between the two judges using Rank correlation coefficient. **03**

Ist Judge	3	5	8	4	7	10	2	1	6	9
IInd Judge	6	4	9	8	1	2	3	10	5	7

(b) The following data represents the number of foreign visitors in a multinational company in every 10 days during last 2 months. Use the data to find median. **04**

x:	0-10	10-20	20-30	30-40	40-50	50-60
No. of visitors f:	12	18	27	20	17	06

(c) The table below shows the demand for a new hard disk for each of the last 7 months. **07**

Month	1	2	3	4	5	6	7
Demand	23	29	33	40	41	43	49

1) Calculate a two month moving average for months two to seven.
2) What would be your forecast forthe demand in month eight?
3)Calculate Mean Square Error(MSE).