Seat No.: ________ Enrolment No.___________

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (New) EXAMINATION – WINTER 2015

Subject Code:2140706 Date:28/12/2015

Subject Name: Numerical & Statistical Method for Computer Engineering

Time: 2:30pm to 5:00pm 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)** (1) Using method of successive approximation solve the equation $2x - \log_{10} x = 7$ correct to four decimal places. **03**

(2) Using method of False-position, compute the real root of the equation $x \log_{10} x - 1.2 = 0$ correct to four decimals. **04**

(b) (1) Discuss briefly the different types of errors encountered in performing numerical calculations. **03**

(2) Use Newton-Raphson method to find smallest positive root of $f(x) = x^3 - 5x + 1 = 0$ correct to four decimals. **04**

Q.2 **(a)** Solve this system of linear equations using Jacobi's method in three iterations first check the co-efficient matrix of the following systems is diagonally dominant or not? **07**

$$20x + y - 2z = 17$$
$$2x - 3y + 20z = 25$$
$$3x + 20y - z = -18$$

(b) (1) State Budan's theorem and hence show that $p(x) = x^5 - x^4 - 3x^3 + 2x + 5$ has one root in $[-2, -1]$. **03**

(2) Apply Budan's theorem to find the no. of roots of the equation $x^5 + x^4 - 4x^3 - 3x^2 + 3x + 1$ in the interval $[-2, -1]$, $[0,1]$ & $[1, 2]$. **04**

OR

(b) Perform two iterations of the Bairstow method to extract a quadratic factor from the polynomial $p(x) = x^3 + x^2 - x + 2 = 0$. **07**

Q.3 **(a)** State the Direct & iterative methods to solve system of linear equations. Using Gauss-Seidel method, solve **07**

$$2x_1 - x_2 = 7$$
$$-x_1 + 2x_2 - x_3 = 1$$
$$-x_2 + 2x_3 = 1$$

(b) (1) Define ill-conditional linear systems of equations. Determine the condition number of the matrix $A = \begin{bmatrix} 1 & 4 & 9 \\ 4 & 9 & 16 \\ 9 & 16 & 25 \end{bmatrix}$. **03**

(2) From the following data find the value of x when $y = f(x) = 0.390$. **04**

x	20	25	30
$y = f(x)$	0.342	0.423	0.500

OR

Q.3 (a) Obtain the cubic Spline approximation for the function defined by the data. **07**

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

Hence find an estimate of $f(2.5)$.

(b) (1) Fit a straight line for the data. **03**

y	12	15	21	25
x	50	70	100	120

(2) The following table gives distance (in nautical miles) of the visible horizon for the given heights (in feet) above earth's surface. Find the values of y when $x = 390$ feet. **04**

Height (x)	100	150	200	250	300	350	400
Distance (y)	10.63	13.03	15.04	16.81	18.42	19.90	21.47

Q.4 (a) (1) Use Euler's method to find an approximation value of y at $x = 0.1$ for the initial value problem $\frac{dy}{dx} = x - y^2;\ y(0) = 1$. **03**

(2) Find the least squares approximations of second degree for the following data **04**

x	-2	-1	0	1	2
$y = f(x)$	15	1	1	3	19

(b) Solve the initial value problem $\frac{dy}{dx} = -2xy^2;\ y(0) = 1$ with $h = 0.2$ for $y(0.2)$ using Runge-Kutta fourth order method. **07**

OR

Q.4 (a) (1) Evaluate $\int_1^5 \log_{10} x\, dx$ taking 8 subintervals by Trapezoidal rule. **03**

(2) Evaluate $\int_0^1 \frac{dx}{1+x}$ using Simpson's $3/8$ rule. **04**

(b) State different predictor-corrector method. For the initial value problem $\frac{dy}{dx} = y + x^2;\ y(0) = 1$, use Milne's prediction-corrector method to find $y(0.8)$ by taking $h = 0.2$ from following data **07**

x	0	0.2	0.4	0.6
y	1	1.2242	1.5155	1.9063

Q.5 (a) From the following data calculate moments about (i) Assumed mean 25 (ii) Actual mean (iii) zero. **07**

Variable	$0-10$	$10-20$	$20-30$	$30-40$
Frequency	1	3	4	2

(b) Explain co-relation, co-relation Types, co-relation co-efficient. Also state the methods to find correlation between two variables. Find the correlation co-efficient between the serum diastolic blood pressure & serum cholesterol levels of 10 randomly selected persons. **07**

Persons	1	2	3	4	5	6	7	8	9	10
Cholesterol	307	259	341	317	274	416	267	320	274	336
Diastolic B.P.	80	75	90	74	75	110	70	85	88	78

OR

Q.5 (a) The quantities of water (in liters) supplied by municipal corporation on ten consecutive days in certain area are shown below: **07**
218.2, 199.7, 207.3, 185.4, 213.7, 184.7, 179.5, 194.4, 224.3, 203.5.
Evaluate the mean & the first four central moments of the water (in liters) of that area.

(b) State the formula for two regression equations. Also give algorithm for the following data find the line of regression of y on x. **07**

x	1.53	1.78	2.60	2.95	3.42
y	33.5	36.3	40.0	45.8	53.5

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