Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2140706 **Date: 03/06/2017**

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.**

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

1 If a is in error by δa and b is in error by δb, then what is the error in $a - b$?

2 If a is in error by δa and b is in error by δb, then state the formula to estimated error in $a \cdot b$?

3 State a draw-back of secant method.

4 Find an interval in which a solution of $f(x) = x^2 - 3$ is guaranteed.

5 Under what condition a matrix A possess inverse?

6 Which of the iterative method from Gauss-Seidal method and Jacobi method converges faster?

7 What is meant by the curve of best fit?

8 State formula for Simpson's $(1/3)^{rd}$ rule to find approximate value of an integration of a function $f(x)$ over $[a, b]$.

9 Using difference table how can you predict the function representing the data is a polynomial of degree 3?

10 State the formula to find the first order backward difference.

11 For the two data sets represented by x and y, write the regression co-efficient of y on x.

12 Which measures are called the measures of central tendency?

13 Find the coefficient of variation for a data with mean 34 and standard deviation 2.25.

14 What is the rate of convergence of Newton-Raphson method?

Q.2 **(a)** Round off 5.37425 to three significant digits. Find relative error and percentage error due to rounding. **03**

(b) Solve to three decimal place accuracy the equation $6x^3 - 2x^2 + 9x - 3 = 0$, using Secant method. **04**

(c) State the condition of convergence for iterative method $x = g(x)$. Find to four decimal place accuracy a solution to $x = \frac{1}{2} + \sin x$ using the method. **07**

OR

(c) State the condition of convergence for Newton-Raphson method. Find the cube root of 5, to four decimal place accuracy, using the method. **07**

Q.3 **(a)** Find a solution of $f(x) = x^2 - 2x - 2$ in the interval $[2,\ 3]$, showing at least four steps of bisection method. **03**

(b) Solve the given system of linear equations, using Gauss elimination method: $x + y + z = 9, 2x - 3y + 4z = 13, 3x + 4y + 5z = 40$. **04**

(c) Find inverse of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$, using Gauss-Jordan method. **07**

OR

Q.3 **(a)** State the conditions on function $f: \mathbb{R} \to \mathbb{R}$ under which it has a solution in an interval $[a, b],\ a < b < \infty$. **03**

(b) Using Budan's theorem, predict the number of real roots of $p(x) = x^3 - 7x + 7$ in the open interval $(0, 2)$. **04**

(c) Write the iterative scheme to solve simultaneously a system of three linear algebraic equations using Gauss-Seidal method with required condition. Apply the scheme to solve the following system to three digit accuracy: **07**
$x + 5y - 3z = 18;\ 9x - 2y + z = 50; -2x + 2y + 7z = 19.$

Q.4 **(a)** If P is the pull required to lift a load W by means of a pulley block, find a linear approximation of the form $P = mW + c$ connecting P and W, using the following data: **03**

P	13	18	23	27
W	51	75	102	119

where P and W are taken in $kg \cdot wt$.

(b) Evaluate $\int_0^6 \frac{dx}{1+x}$; using Trapezoidal rule with $h = 1$. **04**

(c) For the values given in the following table, find the Lagrange's interpolating polynomial: **07**

x	4	5	7	10
y	12	25	32	41

OR

Q.4 **(a)** Prepare the difference table for the function $y = x^2 + e^x$ for $x = 0, 1, 2, 3, 4$ up to three order and label the terms using forward difference operator. **03**

(b) Evaluate $\int_0^3 \frac{dx}{1+x^2}$; using Simpson's $\left(3/8\right)^{th}$ - rule with $h = 0.5$. **04**

(c) Fit a second degree parabola $y = a + bx + cx^2$ to the following data: **07**

x	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y	1.2	1.4	1.9	2.4	2.8	3.3	4.2

Q.5 **(a)** Using Euler's method, find an approximate value of y corresponding to $x = 1$, given that $\frac{dy}{dx} = x^2 + y$ and $y = 1$ when $x = 0$. Use the step size $h = 0.25$. **03**

(b) Using modified Euler's method, find an approximate value of y corresponding to $x = 0.2$, given that $\frac{dy}{dx} = x^2 + y^3$ and $y = 1$ when $x = 0$. Use the step size $h = 0.1$. **04**

(c) Calculate the co-efficient of correlation between the given series of data for x and y in the following table: **07**

x	54	57	55	57	56	52	59
y	36	35	32	34	36	38	35

OR

Q.5 **(a)** Find the expectation for the following discrete probability distribution: **03**

x	10	14	18	25	35
$p(x)$	0.125	0.225	0.325	0.200	0.125

(b) Find the third moment about mean for the following frequency distribution: **04**

x	5	7	10	18	26
$frequency - f$	5	14	22	6	3

(c) Find an approximate value of y for $x = 0.3$ in steps of 0.1, using Runge-Kutta method of fourth order, if $\frac{dy}{dx} = xy$, given that $y = 1.2$ when $x = 0.1$. **07**

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