Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – SUMMER 2013

Subject Code: 151601 **Date: 14-05-2013**

Subject Name: Computer Oriented Statistical Methods

Time: 10.30 am - 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 **(a)** Determine the value of $y(0.4)$ using Milne's predictor-corrector method given $y' = xy + y^2$, $y(0) = 1$. Use Taylor series method to get the values of $y(0.1)$, $y(0.2)$ and $y(0.3)$. **07**

(b) Evaluate $\int_0^1 x^x \, dx$ using (i) Trapezoidal rule with h = 0.1 **07**

(ii) Simpson's 1/3 and 3/8 rules with h = 1/6.

Q.2 **(a)** Solve $x^3 - 2x^2 - 5x + 6 = 0$ by Graeffe's method by squaring the roots thrice. **07**

(b) State Budan's theorem and apply it to find the number of roots of the equation $f(x) = x^4 - 4x^3 + 3x^2 - 10x + 3$ in the intervals [-1,0]and [0,1]. **07**

OR

(b) Using Lin-Bairstow method, Solve $x^4 - 8x^3 + 39x^2 - 62x + 50 = 0$ upto third iteration starting with $p_0 = 0$ *and* $q_0 = 0$ **07**

Q.3 **(a)** Solve the equations $x^2 + y - 11 = 0$ *and* $x + y^2 - 7 = 0$ starting with initial values $x_0 = 3.5$, $y_0 = -1.5$ by using Newton-Raphson method. **05**

(b) Using secant method, find a root of the equation $x^3 - 9x + 1 = 0$ correct to four decimal places. **05**

(c) Find a root of the equation $x^4 - x - 10 = 0$ correct to three decimal places, using the bisection method. **04**

OR

Q.3 **(a)** Define rate of convergence of an iterative method. **05**
Prove that Newton-Raphson method has second order convergence.

(b) Use false position method to find approximate root of $x^3 - 5x - 7 = 0$ correct to four decimal places. **05**

(c) Find an iterative formula to find square root of a positive number N by Newton-Raphson method, using it find $\sqrt{20}$ correct to four decimal places. **04**

Q.4 **(a)** Apply Runge-Kutta method to find an approximate value of y for $x = 0.2$ in steps of 0.1 if $\frac{dy}{dx} = x + y^2$, given that $y = 1$ when $x = 0$. **05**

(b) Solve the following system of equations by Gauss–Jacobi method correct to three decimal places **05**
$8x - 3y + 2z = 20$, $4x + 11y - z = 33$, $6x + 3y + 12z = 35$

(c) Answer the following (Each question is of one mark) **04**

(i) Give names of any two direct methods to solve the system of simultaneous linear equations.

(ii) Define Ill conditioned system and Well conditioned system.

(iii) Define Truncation error with example.

(iv) What are the normal equations to fit a parabola $y = a + bx + cx^2$ by the method of least squares.

OR

Q.4 **(a)** Fit a second degree curve of the form $y = ax + bx^2$ to the following data by the method of least squares **05**

x :	1	2	3	4	5
y :	1.8	5.1	8.9	14.1	19.8

(b) Obtain the least squares straight line fit to the following data **05**

x :	0.2	0.4	0.6	0.8	1
$f(x)$:	0.447	0.632	0.775	0.894	1

(c) Evaluate $\int_0^1 \frac{1}{1+x}\,dx$ using Gauss-Legendre three-point formula. **04**

Q.5 **(a)** Obtain the Chebyshev linear approximation of the function $f(x) = x^3$ on [0, 1]. **05**

(b) Obtain the cubic spline approximation for a function given by the data **05**

x :	0	1	2	3
y :	1	2	33	244

with M(0) = 0 , M(3) = 0.

(c) If $R = x^3y^2z^2$ and 0.03, 0.01, 0.02 are errors in x, y, z respectively at $x = 1, y = 1, z = 2$. Calculate the absolute error and percentage error in calculating R. **04**

OR

Q.5 **(a)** The first four moments of distribution about x = 2 are 1, 2.5, 5.5 and 16. Calculate the four moments about $\bar{x}$ and about zero. **05**

(b) Find correlation coefficient for the data given below. **05**

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

(c) The number of bacterial cells (X) per unit volume in a culture at different hours (Y) is given below **04**

X :	0	1	2	3	4	5	6	7	8	9
Y :	43	46	82	98	123	167	199	213	245	272

Fit a line of regression of Y on X and estimate the number of bacterial cells after 15 hours.

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