Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA - SEMESTER–II • EXAMINATION – SUMMER 2013

Subject Code: 2620004 **Date: 10-06-2013**

Subject Name: Computer Oriented Numerical 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)** Explain the following terms giving suitable examples: Significant figures, Absolute error, Relative error, Truncation error and Round-off error. **07**

(b) What are bracketing methods? Explain graphically bisection method for finding roots of an equation f(x) = 0. **07**

Q.2 **(a)** Answer the following questions:

1. Find the number of positive and negative roots of the polynomial equation: $x^4 + 2x^3 - x^2 - 6x + 7 = 0$. **02**
2. State the principle of least squares and write the normal equations used to fit the curve $y = a + bx + cx^2$ by the method of least squares. **02**
3. Explain the pitfalls of Gauss Elimination method. **03**

(b) Use false-position method to find a root of the equation $x^3 + 9x^2 + 23x + 14 = 0$ correct up to three decimal places. **07**

OR

(b) **07**

Find a root of the following equation correct up to three decimal places using Birge-Vieta method: $x^3 - 4x^2 + 5x - 2 = 0$. *(Take* $r_o = 2.2$*)*

Q.3 **(a)** Find the approximate value of *sin* (π/6) using the Taylor series expansion of the function *sinx* about $x_0 = 0$. **07**

(b) Use Lagrange's interpolation formula to find the value of x when $y = 0.7$ from the following data. **07**

x	1.2	2	2.5	3
y	1.36	0.58	0.34	0.20

OR

Q.3 **(a)** When do we use Newton′s forward difference interpolation formula? The area A of a circle of diameter d is given for the following values: **07**

d	80	85	90	95	100
A	5026	5674	6362	7088	7854

Find the area of a circle of diameter 83 using appropriate Newton′s interpolation formula.

(b) **07**

Find the curve of best fit of the type $y = ae^{bx}$ *to the following data by the method of least squares:*

x	0	5	8	12	20
y	3	1.5	1	0.55	0.18

Q.4 **(a)** Find the value of *sec* 34° using the following data, by numerical differentiation: **07**

$\theta°$	31	32	33	34
$tan\theta°$	0.6008	0.6249	0.6494	0.6745

(b) Compute the value of the integral $\int_0^3 \frac{dx}{x^2+x+1}$, using trapezoidal rule and Simpson's 1/3 rule, taking 6 intervals in each case. **07**

OR

Q.4 **(a)** The distance (s) covered as a function of time (t) by an athlete during his run for the 50 meter race is given in the following table: **07**

Time (seconds)	0	1	2	3	4	5	6
Distance (meters)	0	2.5	8.5	15.5	24.5	36.5	50

What was the speed of the athlete at $t = 2$ seconds?

(b) Find the largest eigen value and the corresponding eigen vector of the following matrix using power method: **07**

$$\begin{bmatrix} 3 & 2 & 4 \\ 2 & 0 & 2 \\ 4 & 2 & 3 \end{bmatrix}$$

Q.5 **(a)** Solve the following system of simultaneous linear equations using Gauss-Elimination method: **07**

$$9x + 2y + z = 50$$
$$x + 5y - 3z = 18$$
$$-2x + 2y + 7z = 19$$

(b) Find $y(1.1)$ and $y(1.2)$ by using Runge-Kutta 3rd order method given that $\frac{dy}{dx} = xy^{1/3}$, $y(1) = 1$. **07**

OR

Q.5 **(a)** Solve the following system of simultaneous linear equations using Gauss-Seidel method: **07**

$$5x - 2y + z = -4$$
$$x + 6y - 2z = -1$$
$$3x + y + 5z = 13$$

(b) Solve $\frac{dy}{dx} = x^2 + y^2 - 2$, with $y(0) = 1$ for $x = 0.4$ by Milne-Simpson's Predictor-Corrector method. Find $y(0.1)$, $y(0.2)$ and $y(0.3)$ using Runge-Kutta 2nd order method. **07**

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