Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA- II[nd] SEMESTER–EXAMINATION –JUNE - 2012

Subject code: 620005 Date: 13/06/2012

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)** Discuss in brief the concept of bracketing techniques used to find roots of equation. Find real root of equation $x^3 - 9x + 1$ using bisection method. Take the initial guess as 2 and 3. (Perform five iterations only) **07**

(b) Answer the following:

1 State Descarte's rule of sign and apply it to estimate the number of positive roots of the polynomial $f(x) = x^5 - x^4 + 3x^3 + 9x^2 - x + 5$. **04**

2 Explain the reasons why Newton Raphson method should not be considered to find roots of polynomial equation. Which method should be used instead? **03**

Q.2 **(a)** Define the terms: Absolute Error, Relative Error, Round Off Error, Truncation Error, Formulation Error, Blunders and Data Uncertainty. **07**

(b) Explain the concept of successive approximation method used to find root of equation. Discuss the convergence of the method using graphical techniques. **07**

OR

(b) Find the real root of polynomial equation $x^3 + x - 1 = 0$ using Birge Vieta method. Take initial guess as 0.5. (Perform two iterations only) **07**

Q.3 **(a)** What do you understand by the term interpolation? Derive Newton's Backward Difference interpolation formula. **07**

(b) Given the following data table obtain a best fit for a hyperbolic equation: **07**

x	0	1	2	3	4	5
y	1.00	0.50	0.33	0.25	0.20	0.17

OR

Q.3 **(a)** Given the following data table interpolate the data at x = 301, using Lagrange's interpolation technique. **07**

x	300	304	305
y	2.4771	2.4829	2.4843

(b) What do you understand by regression analysis? Explain in detail how we can fit a straight line. **07**

Q.4 **(a)** Given the following table differentiate the function at x=0.85. **07**

x	0.50	0.75	1.00	1.25	1.50
f(x)	0.13	0.42	1.00	1.95	2.35

(b) Explain the process of numerical integration. Derive the formula for Simpson's 1/3 rule. **07**

OR

Q.4 **(a)** The population of a city is given in the following table. Find the rate of growth in population in year 2001. **07**

Year (x)	1961	1971	1981	1991	2001
Population (y)	40.62	60.80	79.95	103.56	135.65

(b) Evaluate the function $\int_0^{2.25} \frac{1}{1+x^2}$ for h=0.25 using Simpson's 3/8 rule. **07**

Q.5 **(a)** Solve the following system using Gauss-Seidel iteration method. (Perform three iterations only). **07**

$20x_1 + 2x_2 + x_3 = 30$

$x_1 - 40x_2 + 3x_3 = -80$

$2x_1 - x_2 + 10x_3 = 30$

(b) Find the largest Eigen value and the corresponding Eigen vector of matrix A given by **07**

$$A = \begin{bmatrix} 4 & 0 & 2 \\ 0 & -1 & 0 \\ 2 & 0 & 4 \end{bmatrix}$$

OR

Q.5 **(a)** Solve the following system using Gauss elimination with pivoting: **07**

$2x_1 + 2x_2 + x_3 = 6$

$4x_1 + 2x_2 + 3x_3 = 4$

$x_1 - x_2 + x_3 = 0$

(b) Apply Runge-Kutta 4th order method to differential equation **07**

$\frac{dy}{dx} = x + y$, given y(1) = 5 and h = 0.25 for interval (1, 1.75).

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