Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA - SEMESTER–II • EXAMINATION – SUMMER • 2014

Subject Code: 620005 Date: 24-06-2014

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)** What are the sources of errors? Explain any two in detail. **07**

(b) Discuss characteristics of numerical computation with example(s). **07**

Q.2 **(a)** Use Newton-Raphson method to find a real root of the equation $x^3 - 2x - 5 = 0$ correct to three decimal places. **07**

(b) Use Bisection method in maximum six stages to find a real root of the equation $f(x) = \cos x - x e^x = 0$. **07**

OR

(b) Use Bisection method in four stages to find a real root of the equation $f(x) = x \log_{10} x - 102 = 0$. **07**

Q.3 **(a)** Evaluate the values of f(2) and f(6.3) using Lagrangian interpolation formula for the table of values given below. **07**

x	1.2	2.5	4	5.1	6	6.5
f(x)	6.84	14.25	27	39.21	51	58.25

(b) Compute the value of f(7.5), by using suitable interpolation on the following table of data. **07**

x	3	4	5	6	7	8
f(x)	28	65	126	217	344	513

OR

Q.3 **(a)** Use the method of least square approximation to fit a straight line to the following observed data. **07**

Xi	60	61	62	63	64
Yi	40	40	48	52	55

(b) The following table of x and y is given **07**

x	1	2	3	4
y	1.5	2.2	3.1	4.3

Use cubic spline interpolation to compute y(1.2) and y'(1).

Q.4 **(a)** **07**

Show that the matrix $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, satisfies the Matrix equation $A^2 - 4A - 5I = 0$. Hence find A^{-1}.

(b) Solve the system of equations **07**

$x1 + x2 + x3 = 6$

$2x1 + x2 + 3x3 = 13$

$3x1 + 3x2 + 4x3 = 20$

by the Gauss elimination method.

OR

Q.4 **(a)** The population of a city is given in the following table. Find the rate of growth in population in the year 2001 and in 1995. **07**

Year x	1961	1971	1981	1991	2001
Population y	40.62	60.80	79.95	103.56	132.65

(b) **07**

Evaluate $\int_0^1 e^{-x^2} dx$, using

(1) Simpson's one-third rule with 10 sub-intervals and

(2) Trapezoidal rule.

Q.5 **(a)** Compute the largest Eigen value and the corresponding **07**

Eigenvector of the matrix $\begin{bmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{bmatrix}$ by power

Method correct to two decimal digits.

(b) Given $xy = x - y^2$, $y(2) = 1$, evaluate $y(2.1)$, $y(2.2)$ and $y(2.3)$ correct to four decimal places using Taylor series method. **07**

OR

Q.5 **(a)** Compute values of $y(0.1)$ and $y(0.2)$ by 4^{th} order Runge-Kutta method, correct to five significant figures for the initial value problem. **07**

$dy/dx = x + y$, $y(0) = 1$.

(b) For the initial value problem, $dy/dx = xy + 1$, $y(0) = 1$, $y(0.1) = 1.1053$, $y(0.2) = 1.22288$, $y(0.3) = 1.35526$. Compute $y(0.4)$ using Milne's predictor-corrector method. **07**

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