Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA - SEMESTER–II • EXAMINATION – WINTER 2013

Subject Code: 620005 Date: 31-12-2013

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)** Complete six iterations of the power method to approximate a dominant eigenvector of the given matrix. **07**

$A = \begin{bmatrix} 2 & -12 \\ 1 & -5 \end{bmatrix}$. Take the initial approximation as $x_0 = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$

(b) Discuss in brief the concept of open ended techniques used to find roots of equation. Find real root of equation $x^3 - 8x - 4 = 0$ using Newton Raphson method correct till 4 decimal digits. (Take $x_0 = 2.5$). **07**

Q.2 **(a)** Write a short note on errors in numerical computing. **07**

(b) Find the root of the equation $x^4 + 7x^3 + 24x^2 + x - 15 = 0$ correct up to 4 decimal places using Birge-Vieta method (Hint : Take $r_0 = 0.5$). **07**

OR

(b) Explain the graphical process of finding root using bisection method. Also write a pseudo-code for the same. **07**

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

(b) Fit a straight line to the given data and generate the equation of straight line: **07**

x	1	2	3	4	5
y	12	9	6	2	1

OR

Q.3 **(a)** Given the following table find value of x, at y = 29 using Lagrange's interpolation formula: **07**

x	1	2	4
y	3	10	66

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

Q.4 **(a)** Given the following table find $f'(0.85)$ **07**

x	0.50	0.75	1.00	1.25	1.50
y	0.13	0.42	1.00	1.95	2.35

(b) Explain the process of numerical integration. Derive the formula for Trapezoidal rule. **07**

OR

Q.4 **(a)** Given the following table find $f''(13)$ **07**

x	10	12	14	16	18
y	12	15	20	27	37

(b) Evaluate the function $\int_1^2 \frac{1}{x}..dx$ for h=0.25 using Simpson's 1/3 rule. **07**

Q.5 **(a)** Solve the following system using Gauss elimination method up to 2 significant digits: **07**

$8x_1 + 2x_2 - 2x_3 = 8$
$x_1 - 8x_2 + 3x_3 = -4$
$2x_1 + x_2 + 9x_3 = 12$

(b) Given the following differential equation $\frac{dy}{dx} = x - y$, where y(0.1) = 0.9096 and h = 0.1, Compute y(0.4) using Runge-Kutta second order method. **07**

OR

Q.5 **(a)** Solve the following system using Gauss Seidel method up to 3 significant digits: **07**

$x_1 + x_2 + 4x_3 = 9$
$8x_1 - 3x_2 + 2x_3 = 20$
$4x_1 + 11x_2 - x_3 = 33$

(b) Compute y(2), if y(x) satisfies the equation $\frac{dy}{dx} = \frac{1}{2}(x + y)$, given that y(0) = 2, y(0.5) = 2.636, y(1.0) = 3.595 and y(1.5) = 4.968, using Milne's predictor corrector method **07**

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