Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA - SEMESTER– II EXAMINATIONS – SUMMER 2016

Subject Code: 2620004 **Date: 30-05-2016**

Subject Name: Computer Oriented Numerical Methods

Time: 10.30a.m. To 01.00p.m. **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Intermediate calculation steps and results are to be shown, even while using the calculator.**

Q.1 **(a)** Give the graphical representation of the Fixed-Point Iteration method to find the root of the equation f(x)=0, for the cases of convergence as well as divergence. **07**

(b) (1) Using Power method, determine the largest eigen value of the following matrix : **04**

$$\begin{bmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{bmatrix}$$

(2) Define the following terms : Absolute Error, Relative Error, and Blunders. **03**

Q.2 **(a)** Use Bisection method to find the root of the equation $x^3 - 5x + 1 = 0$, in the interval [2,3], correct upto three decimal places. **07**

(b) Find the root of the following equation correct upto three decimal places using Newton-Raphson method : $x^3 - 4x^2 + 3x + 1 = 0$. **07**

OR

(b) Find the root of the following equation correct upto three decimal places using Birge-Vieta method : $x^4 + 24x - 50 = 0$, (take $r_0 = 1.5$). Perform only three iterations. **07**

Q.3 **(a)** The following data gives the melting point of an alloy of lead and zinc, where t is the temperature in °C and p is the % of lead in the alloy. **07**

p :	40	50	60	70	80	90
t :	184	204	226	250	276	304

Using Newton's appropriate interpolation formula, find the melting point of the alloy containing 42% lead.

(b) Derive an expression for Newton's backward difference interpolation formula. **07**

OR

Q.3 **(a)** From the following data, find the value of y at x = 0.5, using Lagrange's interpolation formula. **07**

x :	–2	–1	2	3
y :	–12	–8	3	5

(b) Fit a second degree parabola of the form $y = ax^2 + bx + c$ to the following data by the method of least squares **07**

x :	1	2	3	4	5
y :	5	12	26	60	97

P.T.O.

Q.4 **(a)** From the data, find numerically the first and second order derivatives at x = 1.3. **07**

x :	0.5	0.7	0.9	1.1	1.3	1.5
y :	1.48	1.64	1.78	1.89	1.96	2.00

(b) Evaluate $\int_0^1 \frac{dx}{1+x}$ using two-point Gauss Quadrature formula. **07**

OR

Q.4 **(a)** From the following table, **07**

x :	1.0	1.2	1.4	1.6	1.8	2.0
y :	0	0.128	0.544	1.296	2.432	4.000

find dy/dx and d^2y/dx^2 at x = 1.1.

(b) Evaluate the following integral $\int_0^6 \frac{1}{4x+5}dx$ using Simpson's $1/3$rd and $3/8$th rule, with 12 intervals. **07**

Q.5 **(a)** What is pivotal condensation ? Solve the following system of simultaneous linear equations using Gauss Elimination method. **07**

$$x + y + 2z = 4$$
$$3x + y - 3z = -4$$
$$2x - 3y - 5z = -5$$

(b) Solve the following differential equation $dy/dx = x - 2y$, y(0) = 1, using Runge–Kutta 4th order method to find y(0.1) and y(0.2). **07**

OR

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

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

(b) Given the following differential equation $dy/dx = x^2 + x^4 y$, with y(0) = 3 and starting values y(0.1) = 3.0050, y(0.2) = 3.0202 and y(0.3) = 3.0465. Find y(0.4) using Adam–Bashforth–Moulton's predictor–corrector method. **07**

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