Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA - SEMESTER–II • EXAMINATION – SUMMER • 2014

Subject Code: 2620004 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.**
4. **Intermediate calculation steps and results are to be shown, even while using the calculator.**

Q.1 **(a)** Define the following terms : Absolute Error, Relative Error, Round-off Error, Truncation Error, Formulation Error, Blunders and Data Uncertainty **07**

(b) State Descarte's rule of sign. Use it to determine the number of positive and negative roots of the polynomial equation $3x^5 + 2x^4 + x^3 - 2x^2 + x = 0$. **04**

(c) Explain the pitfalls of Newton-Raphson method. **03**

Q.2 **(a)** Use false position method to find a root of the equation $x^5 - 3x^2 - 100 = 0$, 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 Birge-Vieta method : $x^3 + 2x^2 + 10x - 20 = 0$ (take $r_0 = 1$). **07**

OR

(b) Explain successive approximation method for finding the roots of an equation f(x) = 0. Give diagrammatic representation for the cases of divergence. **07**

Q.3 **(a)** The following table gives the viscosity of oil as a function of temperature : **07**

T°C :	110	130	160	190
Viscosity :	10.8	8.1	5.5	4.8

Use Langrange's interpolation formula to find the viscosity of oil at a temperature of 120°C.

(b) Determine the regression lines X on Y and Y on X for the following set of data : **07**

x :	0.1	0.2	0.3	0.4	0.5	0.6
y :	5.1	5.3	5.6	5.7	5.9	6.1

OR

Q.3 **(a)** The following table gives the values of density of saturated water for various temperatures of saturated steam : **07**

Temperature (T) °C :	100	150	200	250	300
Density (d) hg/m^3 :	958	917	865	799	712

Find the density of steam at 105°C, using appropriate Newton's interpolation formula.

(b) Fit a curve of the form $y = ax^b$ to the following data by the method of least squares : **07**

x :	1	2	3	4	5	6
y :	1200	900	600	200	110	50

Q.4 **(a)** The following data gives the corresponding values of pressure and specific volume of superheated steam : **07**

Volume (V) :	2	4	6	8	10
Pressure (P) :	105	42.07	25.3	16.7	13

Find dP/dV and d^2P/dV^2 at V = 2.

(b) Evaluate the following integral $\int_1^{2.5} e^{-x/2} dx$ using Trapezoidal rule and Simpson's $1/3$ rd rule, with 6 intervals. **07**

OR

Q.4 **(a)** The population of a city is given in the following table : **07**

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

Find the rate of growth in population in the year 1995 and 2001.

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

Q.5 **(a)** Using power method, determine the largest eigen value and the corresponding eigen vector of the following matrix : **07**

$$\begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

(b) Solve the following differential equation $dy/dx = 1 + y^2$, y(0) = 0, using Runge–Kutta 3rd order method to find y(0.2), y(0.4) and y(0.6). **07**

OR

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

$$20x + y - 2z = 17$$
$$3x + 20y - z = -18$$
$$2x - 3y + 20z = 25$$

(b) Solve $dy/dx = x - y^2$, with y(0) = 1 for x = 0.4 by Adam–Bashforth–Moulton's predictor-corrector method. Obtain y(0.1), y(0.2) and y(0.3) using Runge–Kutta 4th order method. **07**

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