

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 $\frac{dP}{dV}$ and $\frac{d^2P}{dV^2}$ at $V = 2$.

- (b)** Evaluate the following integral $\int_1^{2.5} e^{-x/2} dx$ using Trapezoidal rule and Simpson's $\frac{1}{3}$ 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 $\frac{dy}{dx} = 1 + y^2$, $y(0) = 0$, 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 $\frac{dy}{dx} = x - y^2$, 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**
