## **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**

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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, 07
  Truncation Error, Formulation Error, Blunders and Data Uncertainty
  - (b) State Descarte's rule of sign. Use it to determine the number of positive and negative roots of the polynomial equation  $3x^5 + 2x^4 + x^3 2x^2 + x = 0$ .
  - (c) Explain the pitfalls of Newton-Raphson method.
- **Q.2** (a) Use false position method to find a root of the equation  $x^5 3x^2 100 = 0$ , in **07** the interval [2,3], correct upto three decimal places.
  - (b) Find the root of the following equation correct up to three decimal places 07 using Birge-Vieta method :  $x^3 + 2x^2 + 10x 20 = 0$  (take  $r_0 = 1$ ).

- (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 07 data :

OR								
	у	:	5.1	5.3	5.6	5.7	5.9	6.1
	х	:	0.1	0.2	0.3	0.4	0.5	0.6

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

Temperature (T) °C	:	100	150	200	250	300
Density (d) hg/m <sup>3</sup>	:	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 07 squares :

Х	:	1	2	3	4	5	6
у	:	1200	900	600	200	110	50

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

Volume (V)	:	2	4	6	8	10
Pressure (P)	:	105	42.07	25.3	16.7	13
$d^2 \mathbf{p}/d$						

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.

OR

Q.4	<b>(a)</b>	The population of a city is given in the following table :							
			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.
- Q.5 (a) Using power method, determine the largest eigen value and the corresponding 07 eigen vector of the following matrix :

[1	6	1
1	2	0
0	0	3

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

OR

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

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

(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 4<sup>th</sup> order method.

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