Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA – SEMESTER II –EXAMINATION – WINTER 2015

Subject Code: 620005 **Date: 07/12/2015**

Subject Name: Computer Oriented Numerical Methods

Time:02:30 PM to 05:00 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) Explain the following terms : 04

1. Blunders
2. Formulation Errors
3. Data Uncertainty
4. Total Numerical Error

(b) Let x= 0.00458529. Find the absolute error if x is rounded-off to three decimal digits. 03

(c) What are the similarities and differences between Secant method and False Position method of finding root of a given equation f(x) = 0. Which one is best? Why? 07

Q.2 (a) Geometrically explain Newton-Raphson method to find a root of the equation f(x) =0 and hence drive the general formula. Also, discuss the pit-falls of Newton-Raphson method. 07

(b) Obtain positive numerical solution of $x^3 + x^2 - 3x - 3 = 0$ using bisection method correct to four significant figures. Using Descarte's rule of sign, find how many roots the function has. 07

OR

(b) Can Birge-Vieta method be used to find roots of any f(x) = 0 ? Find the root of the equation $x^3 + 2x^2 + 10x - 20 = 0$ correct up to three significant digits using Birge-Vieta method (Hint : Take $r_0 = 1$). 07

Q.3 (a) Discuss different type of difference table in detail with an assumed suitable example. 07

(b) Fit the following data with the power model ($y = ax^b$). Use the resulting power equation to predict y at $x = 9$. 07

x	2.5	3.5	5	6	7.5	10	12.5	15	17.5	20
y	13	11	8.5	8.2	7	6.2	5.2	4.8	4.6	4.3

OR

Q.3 (a) From the following table, find P when t = 142 °C and 175 °C, using appropriate Newton's Interpolation formula. 07

Temp (t) °C :	140	150	160	170	180
Pressure (P) kgf/cm^2 :	3.685	4.854	6.302	8.076	10.225

(b) What is inverse interpolation? Estimate value of x given following data when y = 0.390. 07

x	0	1	3	4	7
F(x)	1	3	49	129	813

Q.4 (a) The values of pressure and specific volume of super heated steam are as follows : 07

Volume (V) :	2	4	6	8	10
Pressure (P) :	105.00	42.07	25.30	16.70	13.000

Find the rate of change of pressure with respect to volume when V = 2 and V = 8.

(b) Evaluate $\int_{-2}^{2} \frac{3x}{(4-x)^2}\, dx$ using Trapezoidal and Simpson's 1/3rd rule with six intervals. 07

OR

Q.4 (a) A body is in the form of a solid of revolution, whose diameter d in cm of its sections at various distances x cm from one end is given in the table below. Compute the volume of the solid. 07

x :	0	2.5	5.0	7.5	10.0	12.5	15.0
d :	5.00	5.5	6.00	6.75	6.25	5.5	4.00

(b) The function y = sin(x) is tabulated below. Find the value of Cos(1.74) and Cost (1.84) using interpolation technique. 07

x	1.70	1.74	1.78	1.82	1.86
sin(x)	0.9917	0.9857	0.9782	0.9691	0.9585

Q.5 (a) Given the following differential equation $\frac{\mathbf{dy}}{\mathbf{dx}} = \frac{1-xy}{\mathbf{x}^2}$, with y(1) = 1. Compute y(1.1), y(1.2) and y(1.3) using Runge-Kutta third order method and obtain y(1.4) using Milne- Simpson's predictor corrector method. 07

(b) Using Gauss Seidal method, solve the following set of simultaneous equations upto three decimal place accuracy. Do partial Pivoting 07

$x + 3y + z = 10$
$x + 2y + 5z = 12$
$4x + y + 2z = 16$

OR

Q.5 (a) Given the following differential equation $\frac{\mathbf{dy}}{\mathbf{dx}} = (\mathbf{x}+\mathbf{y})\mathbf{e}^{-\mathbf{x}}$, with y(–0.1) = 0.9053. 07

Compute y(0), y(0.1) using Runge-Kutta second order method and obtain y(0.3) using Adam- Bashforth-Moulton's predictor corrector method.

(b) Find numerically largest eigen value and corresponding eigen vector of the following matrix using power method by taking $X_0 = [1,1,0]^T$. 07

$$\begin{bmatrix} 3 & 2 & 4 \\ 2 & 0 & 2 \\ 4 & 2 & 3 \end{bmatrix}$$

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