

**GUJARAT TECHNOLOGICAL UNIVERSITY****MCA - SEMESTER-II • EXAMINATION – WINTER 2013****Subject Code: 2620004****Date: 30-12-2013****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 calculator.

- Q.1** (a) What is Error? What are the Source of Errors? **04**  
 (b) Write a well commented program for Secant Method. **05**  
 (c) Define Blunders, Data Uncertainty and Formulation Error. **05**  
 Multiply 0.1123E51 by 0.1324E51.

- Q.2** (a) Explain Geometrical Interpretation of Newton-Raphson method. **07**  
 Compute a real root of the equation  $e^x - 3x - \sin x = 0$  using Newton-Raphson method  
 (b) What is Inverse Interpolation? The following table gives the values of x and y. Find the value of x corresponding to y = 13.6. **07**

x	30	35	40	45	50
y	15.9	14.9	14.1	13.3	12.5

**OR**

- (b) Give Comparisons of Iterative Methods **07**
- Q.3** (a) The following table gives the values of density of saturated water for various temperatures of Saturated steam. **07**

Temp'c(=T)	100	150	200	250	300
Density hg/m <sup>3</sup>	958	917	865	799	712

Find by Interpolation the densities when temperatures are 130° C and 275° C respectively

- (b) Fit a Parabola, by the method of Least square to the following data. Also estimate y at x=6. **07**

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

**OR**

- Q.3** (a) The following table of x and y is given, Use Cubic Spline interpolation to compute y(1.2) and y'(1) **07**

X	1	2	3	4
Y	1.5	2.2	3.1	4.3

- (b) What interpolation formula can be used for interpolating near the end of a table of equally spaced data? Write down the equation for it. Find a Polynomial satisfied by the following table: **07**

X	-4	-1	0	2	5
F(x)	1245	33	5	9	1335

- Q.4 (a)** Evaluate the following integral : **07**  

$$\int_0^1 (4x-3x^2) dx$$
 by taking  $n=10$  using  
 (i) Trapezoidal rule  
 (ii) Simpson's one-third rule  
 Also Compare them with exact value.
- (b)** Solve  $dy/dx = (x + y)y$ ,  $y(0) = 1$  using Milne's Predictor-Corrector Method for  $y(0.4)$ . The values for  $x=0.1, 0.2$  and  $0.3$  should be obtained by Runge-Kutta method of fourth order. **07**

**OR**

- Q.4 (a)** Evaluate  $\int_{-2}^4 (2x^3 - 3x^2 + 4x - 5) dx$  using Gauss-Quadrature Method. **07**
- Q.4 (b)** Using Runge-Kutta method of fourth order, solve for  $y(0.1), y(0.2)$  and  $y(0.3)$ , given that  $y' = xy + y^2$ ,  $y(0) = 1$ . **07**
- Q.5 (a)** Find Numerically largest Eigen value and Corresponding Eigenvector of the following Matrix using power method by taking  $X_0 = [0, 0, 1]^T$  correct to two decimal digit. **07**

$$\begin{vmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{vmatrix}$$

- (b)** State the necessary and sufficient condition for the convergence of Gauss-Seidel method for solving a system of simultaneous linear equations. Hence; solve the following system of equations, using Gauss Seidel Method Correct up to four decimal places. **07**  

$$\begin{aligned} 8x - 3y + 2z &= 20 \\ 6x + 3y + 12z &= 35 \\ 4x + 11y - z &= 33 \end{aligned}$$

**OR**

- Q.5 (a)** What are the pitfalls of Gauss Elimination method? By the Gauss Elimination method, solve the system **07**  

$$\begin{aligned} 3.15x - 1.96y + 3.85z &= 12.95 \\ 2.13x + 5.12y - 2.89z &= -8.61 \\ 5.92x + 3.05y + 2.15z &= 6.88 \end{aligned}$$
- (b)** Form the Taylor Series of the initial value problem  $dy/dx = xy + 1$ ,  $y(0) = 1$ , up to five terms and hence compute  $y(0.1)$  and  $y(0.2)$ , correct to four decimal places. **07**

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