

GUJARAT TECHNOLOGICAL UNIVERSITY**MCA – SEMESTER -II EXAMINATION –WINTER-2021****Subject Code: 620005****Date: 22/12/2021****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. .
4. Statistical tables for various distributions are permitted to be used.

- Q.1** (a) 1) Explain different types of numerical errors with suitable examples. **4**
 2) Define the following terms: Absolute Error, Relative Error, and Blunders. **3**
 (b) Find the dominant Eigen value and the corresponding Eigen vector of the **7**
 following matrix using Power method :

$$\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$$

- Q.2** (a) Use Bisection method to find the root of the equation $x^3 - 5x + 1 = 0$, in the **7**
 interval [2, 3], correct upto three decimal places.
 (b) Graphically explain the Newton-Raphson method to find the root of the **7**
 equation $f(x) = 0$.

OR

- (b) Find the root of the equation $x^3 + 3x^2 + 27x - 25 = 0$ using Birge-Vieta method **7**
 (Take $r_0 = 0.5$). Perform only three iterations.

- Q.3** (a) Solve the following system of equations using Gauss elimination method **7**
 $2x + y + z = 10$
 $3x + 2y + 3z = 18$
 $x + 4y + 9z = 16$

- (b) Write a well commented program for Secant method. Also explain it in detail. **7**

OR

- Q.3** (a) From the following table, find P when $t = 142^\circ\text{C}$ and 175°C , using appropriate **7**
 Newton's Interpolation formula.

Temp (t) $^\circ\text{C}$:	140	150	160	170	180
Pressure (P) kgf/cm^2 :	3.685	4.854	6.302	8.076	10.225

- (b) Write an algorithm for Gauss-Seidal Method. **7**

- Q.4** (a) Derive the formula for Newton's Divided Difference Interpolating Polynomial. **7**

- (b) Given the following data find the cubic spline equations for the 4 intervals **7**

x	1	2	3	4	5
f(x)	6	-3	6	2	-6

Find the value of $f(x)$ at $x = 3.8$

OR

- Q.4** (a) Using Lagrange's interpolation formula, find the value of y when $x = 3$, from **7**
 the following data :

x :	0	1	2	4	5
y :	0	16	48	88	0

- (b) The function $y = \sin(x)$ is tabulated below. Find the value of $\text{Cos}(1.74)$ and $\text{Cos}(1.84)$ using interpolation technique. 7

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) Fit a second degree parabola of the form $y = ax^2 + bx + c$ to the following data by the method of least squares 7

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

- (b) Giving suitable examples, explain approximation of functions by Taylor series. 7

OR

- Q.5** (a) Evaluate $\int_0^{1.2} \log(1+x^2) dx$ using 7

(i) Trapezoidal rule

(ii) Simpson's $\frac{3}{8}$ rule, taking $h = 0.2$ for both cases

- (b) Discuss the differences between false-position method and secant method. Also mention convergence criteria for successive approximation method. Illustrate selection of proper function with suitable example. 7
