Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA - SEMESTER–II • EXAMINATION – WINTER - 2017

Subject Code: 620005 **Date: 03-01-2018**

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)** 1. Explain different types of numerical errors with suitable examples. **04**

2. Define Matrix, Trace of Matrix and Identity Matrix **03**

(b) Solve the following system of equations using Guass Saidal method. Give the solution correct up to three significant figures. **07**

$20x + 2y + z = 30$
$x - 40y + 3z = -75$
$2x - y + 10z = 30$

Q.2 **(a)** Find a root of the equation $f(x) = e^x - 3x - \sin x$ using Newton Raphson method correct upto 4 significant digits. **07**

(b) Certain corresponding values of x and $\log_{10}x$ are given below. Find $\log_{10} 301$. Also find x when $\log_{10}x = 2.4857$ using Lagrange's Interpolation Method. **07**

X	300	304	305	307
log10 x	2.4771	2.4829	2.4843	2.4871

OR

(b) Determine the constants a and b by the method of least squares such that $y=ae^{bx}$ fits the following data. **07**

x	2	4	6	8	10
y	4.077	11.084	30.128	81.897	222.62

Q.3 **(a)** 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

(b) 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

OR

Q.3 **(a)** Compute f(0.23) and f(0.29) using interpolation method on the following data. **07**

x	0.20	0.22	0.24	0.26	0.28	0.30
f(x)	1.6596	1.6698	1.6804	1.6912	1.7024	1.7139

(b) A rod is rotating in a plane about one of its ends. The following table gives the angle θ through which the rod has turned for different values of time t seconds. Find its angular velocity $\frac{d\theta}{dt}$ and angular acceleration $\frac{d^2\theta}{dt}$ at t=1.0 **07**

T secs	0.0	0.2	0.4	0.6	0.8	1.0
θ	0.0	0.12	0.48	1.10	2.00	3.20

Q.4 **(a)** Compute the integral by $\int_0^{\pi/2} \sin x\,dx$ **07**
(i) Trapozoidal Rule
(ii) Simpson's 1/3 rule taking 6 subintervals.

(b) Use Runge-Kutta method of 4th order to evaluate y(1.1) and y(1.2) by taking h=0.1 for $\frac{dy}{dx} = X^2 + Y^2$, y(1) = 0 **07**

OR

Q.4 **(a)** Find the eigenvalues and eigenvectors of the below matrix **07**

$$\begin{matrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{matrix}$$

(b) Using Milne's method, find y(0.8) given that **07**
$\frac{dy}{dx} = X - Y^2$, y(0)=0, y(0.2)=0.02, y(0.4)=0.0795, y(0.6)=0.1762

Q.5 **(a)** Find the root of $x^4 - x - 10 = 0$ using Birge-Vieta method. Take 1.5 as initial approximation, correct up to 5 decimal places. **07**

(b) What are the pitfalls of Gauss Elimination Method? Solve the following equations using Gauss Elimination Method. **07**
2x + 2y + 4z = 18
x + 3y + 2z = 13
3x + y + 3z = 14

OR

Q.5 **(a)** Form the Taylor series solution of the initial value problem, $\frac{dy}{dx} = xy+1$, y(0)=1 up to five terms and hence compute y(0.1) and y(0.2), correct up to four decimal places. **07**

(b) Evaluate $\int_{-2}^{4} (2X^3 - 3X^2 + 4X - 5)\,dx$ using Gauss Quadrature method. **07**