Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY
MCA SEM-II Examination- Dec.-2011

Subject code: 620005 **Date: 17/12/2011**
Subject Name: Computer Oriented Numerical Methods
Time: 02.30 pm-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)** Define Matrix. Write a program for multiplication of 2 matrices. **07**

(b) Obtain Newton-Cote's quadrature formula. Hence Simpson's 1/3 rule for numerical integration. **07**

Q.2 **(a)** Fit a second degree parabola of the form ax^2+bx+c to the following data by the least square method: **07**

x:	0.5	1	2	3	5
y:	3.1	6.0	11.2	14.8	20

(b) Obtain Lagrange's divided difference interpolation formula. And Compute f(0.3) for the data given below using it. **07**

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

OR

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

x:	20	25	30	35
y:	0.342	0.423	0.5	0.65

Q.3 **(a)** Find the value of and cos 65° from the following table, using numerical differentiation based on Newton's backward interpolation formula: **07**

x°	35	40	45	50	55
y=tan x°	0.7002	0.8391	1.0000	1.1918	1.4281

Backward difference table:

(b) What is meant by significant digits? Define absolute error, relative error and percentage error. **07**

OR

Q.3 **(a)** An object is moving on a straight road. Its distance x meters traveled along the road is given in the table below for various values of time t minutes. Find the velocity and acceleration of the object when t= 0.3 minutes. **07**

t:	0.0	0.1	0.2	0.3	0.4	0.5	0.6
x:	30.13	31.62	32.87	33.64	33.95	33.81	33.24

(b) Giving suitable examples, explain approximation of functions by Taylor series. **07**

Q.4 **(a)** Solve the following system of linear equations by Gauss elimination method. **07**

$5x - y + z = 10$

$2x + 4y = 12$

$x + y + 5z = -1$

(b) Find Eigen Values and Eigen Vector set for principal Eigen value for the following matrix. **07**

$$\begin{bmatrix} 13 & 5 \\ 2 & 4 \end{bmatrix}$$

OR

Q.4 **(a)** A ball at 1200 K is allowed to cool down in air at an ambient temperature of 300 K. Assuming heat is lost only due to radiation, the differential equation for the temperature of the ball is given by **07**

$$\frac{d\theta}{dt} = -2.2067 \times 10^{-12}\left(\theta^4 - 81 \times 10^8\right), \theta(0) = 1200\,\text{K}$$

where θ is in K and t in seconds. Find the temperature at $t = 480$ seconds using Runge-Kutta 4th order method. Assume a step size of $h = 240$ seconds.

(b) Write an algorithm for Gauss-Seidal Method. **07**

Q.5 **(a)** Discuss geometrical interpretation of Newton-Raphson method and also mention convergence criterion and short falls of the 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

Q.5 **(a)** 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. **07**

(b) Find the root of $x^3 - x - 4 = 0$ using Birge-Vieta method. Take 1.5 as initial approximation. **07**

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