Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E –Ist SEMESTER–EXAMINATION – JULY- 2012

Subject code: 711507N **Date: 11/07/2012**

Subject Name: Numerical Methods

Time: 2:30 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)** List various methods for solution of linear simultaneous equations. Give algorithm/flowchart of Gauss Elimination method. **06**

(b) Solve following systems using any of the methods used for solution of linear simultaneous equations. **08**

$10x + 2y + z = 9$

$2x + 20y – 2z = -44$

$-2x + 3y + 10z = 22$

Q.2 **(a)** Find one of the roots of the equation $\sin x + x - 1 = 0$ to 3 decimal places using Newton Raphson's method. **07**

(b) Using the method of least squares, find the straight line $y = ax + b$, that fits the following data: **07**

x	0.5	1.0	1.5	2.0	2.5	3.0
y	15	17	19	14	10	7

OR

(b) Fit the parabola of the form $y = a + bx + cx^2$ to the data given below, using the method of moment. **07**

x	3	4	5	6	7
y	31.9	34.6	33.8	27.0	31.6

Q.3 **(a)** Write an algorithm/flowchart for Newton's forward difference interpolation formula. **07**

(b) Using suitable interpolation formula, find the pressure for a temperature of 142 °C. The temperature v/s pressure data are given below. **07**

Temperature in °C	140	150	160	170	180
Pressure, kgf/cm^2	3.685	4.854	6.302	8.076	10.225

OR

Q.3 **(a)** Derive basic formulation of plate analysis using finite difference method. **07**

(b) Using the finite difference method, compute the deflection at L/4 interval of a simply supported beam subjected to uniformly distributed load. Take EI constant. **07**

Q.4 **(a)** Explain Eigen value problem showing some of the Structural Engineering applications. Also illustrate the basic method for solution of eigen value problems. **07**

(b) Determine the largest eigen value and corresponding eigenvector of the matrix **07**

$$A = \begin{bmatrix} 2 & 3 & 2 \\ 4 & 3 & 5 \\ 3 & 2 & 9 \end{bmatrix}$$

OR

Q.4 Find all the eigen values and their corresponding eigen vectors of the following matrix using Jacobi's method. **14**

$$A = \begin{bmatrix} 3 & 2 & 1 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$$

Q.5 **(a)** Find dy/dx and d^2y/dx^2 at x=1.6 for the different value of x & y tabulated as given below: **07**

X	1.0	1.2	1.4	1.6	1.8	2.0	2.0
Y	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

(b) Derive the Gaussian integration formula when n=2, and apply this formula to evaluate the integral **07**

$$\int_{-1}^{1} \frac{1}{1+x^2}\,dx$$

OR

Q.5 **(b)** Explain with illustration various types of errors occur in computations. **06**

(a) Solve following ordinary differential equation for x=0.5 given that y=0 at x=0 by Picard's method. **08**

$$\frac{dy}{dx} = x^2 + y^2$$

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