Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– I (New course)• REMEDIAL EXAMINATION – SUMMER 2015

Subject Code: 2713301 **Date:12/05/2015**

Subject Name: Numerical Methods for Civil Engineering

Time: 10:30 am to 1:00 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 following types of errors (i) Truncation errors, (ii) Inherent errors (iii) Round-off errors (iv) Absolute errors (vi)Relative errors **07**

(b) Explain the methods to solve linear simultaneous equations. Elaborate its uses in civil engineering. **07**

Q.2 **(a)** Explain the Laplace Transform method and its application to the civil engineering. **07**

(b) Find the root of the following equations using bisection method up to three decimal places, x^3 ï 4x ï 9 = 0 **07**

OR

(b) How Newton Raphson method is applicable to civil engineering? Explain with one typical civil engineering problem. **07**

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

(b) Using the finite difference method, compute the deflection at L/5 interval of a simply supported beam subjected to uniformly distributed load. Take EI constant. **07**

OR

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

(b) Explain Eigen value problem showing some of the Civil Engineering applications. Also illustrate the basic method for solution of Eigen value problems. **07**

Q.4 **(a)** Determine the largest Eigen value and corresponding eigenvector of the matrix. **07**

$$\begin{bmatrix} 3 & 4 & 6 \\ 2 & 5 & 7 \\ 4 & 5 & 9 \end{bmatrix}$$

(b) Using suitable interpolation formula, find the strength for a temperature of 147 °C. The temperature v/s strength data are given below. **07**

Temperature (^{0}C)	140	150	160	170	180
Strength (N/mm^2)	55	52	46	42	37

OR

Q.4 Find all the Eigen values and their corresponding Eigen vectors of the following matrix using Jacobiôs method. **14**

$$\begin{bmatrix} 2 & 4 & 6 \\ 2 & 7 & 7 \\ 5 & 5 & 9 \end{bmatrix}$$

Q.5 **(a)** Explain ñPrinciple of Least Squaresò. Write its application to civil engineering. **07**

(b) Apply the Eulerôs method to the ordinary differential equation, dy/dx= x+y y(0) =1, using increments of size h = 0.1. The exact solution is y = ï 1 ï x + $2e^x$. Determine the error and the percentage error at each step. **07**

OR

Q.5 **(a)** Solve the following equations by Gauss Jordan method: **07**

x + y + 2z = 3

4x +2y -z = 8

3x + 4y + 3z = 4

(b) Explain and derive Trapezoidal rule for numerical integration. Write its uses in civil engineering. **07**

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