

GUJARAT TECHNOLOGICAL UNIVERSITY
ME - SEMESTER- I • EXAMINATION – WINTER 2014

Subject Code: 2713301**Date: 06/01/ 2015****Subject Name: Numerical Methods for Civil Engineering****Time: 2:30 to 5:00 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) Explain and elaborate the types of errors. 07
 (b) Enlist and compare methods for curve fitting. 07

- Q.2** (a) Enlist various methods for solution of linear simultaneous equations. Give algorithm or flowchart of Gauss Elimination method. 07
 (b) Solve following systems using any of the methods used for solution of linear simultaneous equations. 07
 $10x + 2y + 3z = 12$
 $7x + 17y - 5z = -38$
 $-2x + 5y + 10z = 29$

OR

- (b) Explain various rules and formula for numerical integration. 07
- Q.3** (a) Apply the Euler's method to the ordinary differential equation, $dy/dx = x+y$, $y(0) = 1$, using increments of size $h = 0.2$. The exact solution is $y = e^x - 1$. Determine the error and the percentage error at each step. 07
 (b) Solve using Jacobi's method to solve the equations: $20x + y - 2z - 19 = 0$, $2x - 3y + 20z - 29 = 0$, $3x + 20y - z + 23 = 0$. 07

OR

- Q.3** (a) Write C++ program/algorithm for any method for solution of non linear simultaneous algebraic equations. 07
 (b) Derive basic formulation of plate analysis using finite difference method. 07
- Q.4** (a) Explain Eigen value problem showing some of the civil engineering applications. Also elaborate the basic method for solution of Eigen value problems. 07
 (b) Determine the largest Eigen value and corresponding eigenvector of the matrix. 07

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

OR

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

$$\begin{bmatrix} 2 & 7 & 5 \\ 3 & 8 & 10 \\ 9 & 4 & 4 \end{bmatrix}$$

- Q.5** (a) Explain the Laplace Transform method. 07
 (b) Calculate support reactions for a prismatic fixed beam subjected to UDL throughout span, using finite difference method. 07

OR

Q.5 **(a)** Explain the Fourier Transform method. **07**
 (b) Determine the numerical value of integration of $\log_{10}x$ for limit 1 to 2, using **07**
 three-point Gauss-Quadrature rule.
