

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY
ME SEMESTER – I (NEW) EXAMINATION – SUMMER 2017

Subject Code: 2713301

Date: 08/05/2017

Subject Name: Numerical Methods for Civil Engineering

Time: 02:30 p.m. to 05:00 p.m.

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 Mathematical modelling with example. What is the role of Mathematical modelling in engineering problem solving? **07**
- (b) Explain False-position method graphically. Use it to find real root of $x^3 - 5x + 1 = 0$ correct up to four decimal places. **07**

- Q.2** (a) Determine one of the roots of the equation $x \log_{10} x - 4.77 = 0$ to three decimal places using Newton Raphson method. **07**
- (b) Solve following systems of equation using Gauss-Jordan method. **07**

$$\begin{aligned} 2x + y - 3z &= 11 \\ 4x - 2y + 3z &= 8 \\ -2x + 2y - z &= -6 \end{aligned}$$

OR

- (b) Describe Algorithm for the Gauss-Seidel Method. **07**

- Q.3** (a) Determine the largest Eigen value and corresponding eigenvector of the matrix **07**

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

- (b) Explain the use of Eigen value problem in Structural Engineering. Give basic steps for solution of Eigen value problem. **07**

OR

- Q.3** (a) Use Runge Kutta method of second order to find the solution of the differential equation $dy/dx = x + y$ at $x = 0.1$ correct to four decimal places, take $h = 0.05$. **07**
- (b) Derive basic formulation of plate analysis using finite difference method. **07**

- Q.4** (a) What do we mean by the 'Best Fit'? What is the meaning of 'Least Square'? Find the best line fit for the following record. **07**

x	1.0	1.2	1.4	1.6
y	0	0.182	0.336	0.47

Using your 'Best Line Fit' equation find Y when $X = 1.8$

- (b) What is numerical integration? Derive Trapezoidal and Simpson's 1/3 rule. **07**

OR

- Q.4** (a) Use improved Euler's method to solve $dy/dx + 2xy^2 = 0$ with the initial condition $y(0) = 1$. Compute the value of $y(0.4)$ taking $h = 0.2$ **07**

- (b) Using the finite difference method, compute the deflection and rotation at $L/4$ interval of a simply supported beam subjected to point load of W at the mid span. Take EI constant. **07**

- Q.5** (a) List various methods for interpolation & extrapolation of values. Explain any one method, which is used for unevenly spaced interval. **07**

- (b) Write algorithm for Lagrange's interpolation. Given the values as below evaluate $f(9)$ using Lagrange's interpolation. **07**

x	5	7	11	13	17
$f(x)$	150	392	1452	2366	5202

OR

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

- (b) Explain the Laplace Transform method. **07**
