

GUJARAT TECHNOLOGICAL UNIVERSITY
M.E.- SEMESTER-I • EXAMINATION – WINTER 2013

Subject Code: 712006**Date: 06/01/2014****Subject Name: Numerical Methods****Time: 10.30 To 13.00****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 Gauss Seidel method for solution of linear simultaneous equations and give its algorithm. **06**
- (b)** Solve following systems using any of the methods used for solution of linear simultaneous equations. **08**

$$\begin{aligned}x + 2y + z &= 8 \\2x + 3y + 4z &= 20 \\4x + 3y + 2z &= 16\end{aligned}$$

- Q.2 (a)** List various methods for interpolation & extrapolation of values. Explain any one method, which is used for unevenly spaced interval. **07**
- (b)** Following table gives the values of x and $\log_{10}x$, determine $\log_{10}303$. **07**

x	300	304	305	307
$\log_{10}x$	2.4771	2.4829	2.4843	2.4871

OR

- (b)** Find Newtons central difference interpolating polynomial for the data given below and evaluate $f(0.35)$. **07**

x	0.1	0.2	0.3	0.4	0.5
$y=f(x)$	1.45	1.57	1.78	2.05	2.28

- Q.3 (a)** Write steps to determine the roots of algebraic and transcendental equations by Newton Raphson's method. **07**
- (b)** Determine one of the roots of the equation $x \log_{10}x - 4.77 = 0$ to three decimal places using Newton Raphson's method. **07**

OR

- Q.3 (a)** Derive basic expressions for bending moment, deflection and rotation in a beam using finite difference method. **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.4 (a)** Explain the use of Eigen value problem in Structural Engineering. Give basic steps for solution of eigen value problem. **07**
- (b)** Determine the largest eigen value and corresponding eigenvector of the matrix **07**

$$A = \begin{bmatrix} 4 & 1 & -1 \\ 2 & 3 & -1 \\ -2 & 1 & 5 \end{bmatrix}$$

OR

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

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

- Q.5 (a)** Find dy/dx and d^2y/dx^2 at 2.2 for the different value of x & y tabulated as given below: **07**

x	1.4	1.6	1.8	2.0	2.0
y	4.0552	4.953	6.0496	7.3891	9.025

- (b)** Evaluate following integral I using Gaussian 2-point and 3-point formula. **07**

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

OR

- Q.5 (a)** Evaluate following integral I taking four equal interval using Simpson's one third rule. **06**

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

- (b)** Solve following ordinary differential equation using Runge-Kutta method of fourth order in the interval of $0 \leq x \leq 0.4$, taking $h=0.1$ **08**

$$10 \frac{dy}{dx} = x^2 + y^2, \quad y(0) = 1$$
