Seat No.: _____ Enrolment No._____

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**

$$x + 2y + z = 8$$
$$2x + 3y + 4z = 20$$
$$4x + 3y + 2z = 16$$

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 vales 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 $xlog_{10}x-4.77 = 0$ 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 $0 \le x \le 0.4$, taking $h=0.1$ **08**

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

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