Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-I Examination January 2010

Subject code: 711507 Subject Name: Numerical Methods

Date:27 / 01 / 2010 Time: 12.00 – 2.30 pm

Total Marks: 60

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Using finite difference technique, analyze a uniform plate, having continuous boundaries, subjected to uniformly distributed load W kN/m^2 on entire plate. **06**

(b) Compute deflections, at atleast at three points, of fixed beam subjected to uniformly distributed load W kN/m on the span L. Use finite difference technique. **06**

Q.2 **(a)** Fit a parabola of pattern $y = a + bx + cx^2$ to the following data: **06**

x	20	40	60	80	100	120
y	5.5	9.1	14.9	22.8	33.3	46.0

(b) (i) Enlist and explain various types of errors. **06**

(ii) Round off number 865250 and 37.46235 correct to four significant number. Calculate absolute, relative and percentage errors.

OR

(b) Write C++ program for Lagrange's formula for interpolation. **06**

Q.3 **(a)** Enlist and explain various methods for solution of algebraic and transdental non-linear equations. **06**

(b) Obtain the root of $e^{-x} = 10x$ to three decimal places using any two methods for solution of non-linear equation. **06**

OR

Q.3 **(a)** Describe various methods to solve numerically ordinary differential equation. **06**

(b) Solve following ODE using Euler's method **06**

$$\frac{dy}{dx} = x + y, \qquad y(0) = 0$$

choose h=0.2 and compute y(0.4) and y(0.6)

Q.4 **(a)** Write and explain various interpolation equations for equal and unequal interval. **06**

(b) Find y(10) using Newton Divided Difference formula. Use following Data **06**

x	5	6	9	11
y	12	13	14	16

OR

Q.4 **(a)** List and explain various methods for solution of large set of simultaneous equations. **06**

(b) Solve following simultaneous equations by Gauss-Seidel and Jacobi's methods. **06**

$$\begin{bmatrix} 1 & 9 & -1 \\ 2 & -1 & 11 \\ 10 & -2 & 1 \end{bmatrix} \begin{Bmatrix} x \\ y \\ z \end{Bmatrix} = \begin{Bmatrix} 10 \\ 20 \\ 12 \end{Bmatrix}$$

Q.5 **(a)** List and derive various rule and formula to carryout numerical integration. **06**

(b) Using Gaussian three point formula, **06**

evaluate $I = \int_1^5 \frac{dz}{z}$.

OR

Q.5 **(a)** Determine the all eigen values and its corresponding eigen vectors for following matrix **06**

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

(b) Determine the largest eigen value and its corresponding eigen vector for following matrix **06**

$$\begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$$

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