

$$2.13x_y + 5.12x_y - 2.89x_y = -8.61$$

(ii) What is the practical significance of the least square method of curve fitting? Describe the normal equations to fit a given set of data to a linear equation $y = ax + b$.

2. (a) Write an algorithm of Secant method for finding a real root of a non-linear equation.

(b) Write short notes on:

(i) Importance of Neural Network?

(ii) What are the rule-based format used to represent the fuzzy information?

Roll No. _____

23724

**M. Tech, 1st Semester (Civil Engg.
Computer Aided Structural Engg.)**

Examination - February, 2012

NUMERICAL METHODS FOR STRUCTURAL

ENGINEERING

Paper : 21MTCAS1201

Time : Three Hours]

[Maximum Marks : 100

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No candidate in this regard will be entertained after examination.

Note : Attempt any five questions. All questions carry equal marks.

1. (i) Using Power method determine the largest eigen value and corresponding eigen vector of a matrix given by:

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

(ii) Explain Eigen value problem with reference to critical load and buckling of column.

2. (i) Explain in detail absolute, relative errors, inherent error, round-off errors and Truncation errors.

(ii) Evaluate the sum $S = 3^{1/2} + 3^{1/2} + 3^{1/2}$ to 4 significant digit and find its absolute and relative error, if each number is rounded off to 6 decimal digits.

3. (i) Define Interpolation. Find the Lagrange's interpolating polynomial from the following data and $g(1.1)$:

x	0	2	5	6
$g(x)$	1	4	25	40

(ii) What is interpolation and extrapolation? List and explain any one method for unevenly spaced interval.

4. (i) Solve following differential equation using appropriate numerical method. Take $z(0) = 1$, $z(10) = 4$ and $\Delta z = 2$.

$$3 + \frac{d^2y}{dt^2} + \frac{dy}{dt} + z - 1 = 0$$

23724-100 (P-4)(O-8)(22) (2)

(ii) Derive the equations of Numerical integration by Trapezoidal rule, Simpson's 1/3 rule and Simpson's 3/8 rule.

5. (i) Determine one of the roots of the equation $x - \cos x = 0$ to three decimal places using Newton Raphson's method.

(ii) Find a real root of the following equation correct to four decimal places by Regula Falsi method.

$$\log x = \cos x$$

6. (i) Write algorithm for Newton's backward difference interpolation formula.

(ii) Using the finite difference method, compute the slope and deflection at 1 unit interval of a simply supported beam of span 4 unit subjected to point load of 10 unit at mid span. Take EI = 1 unit.

7. (i) Solve the following system of equations using Gauss elimination method:

$$5.92x_1 + 3.05x_2 + 2.15x_3 = 6.88$$

$$3.15x_1 - 1.96x_2 + 3.85x_3 = 12.95$$

23724-100 (P-4)(O-8)(22) (3)

P. T. O.