Question Paper

Exam Date & Time: 24-Apr-2018 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
IV SEMESTER B.S. (ENGG.)
END - SEMESTER THEORY EXAMINATIONS APRIL - 2018
DATE: 24 APRIL 2018
TIME: 9:30 AM TO 12:30 PM
Numerical Methods In Civil Engg. [CE 245]

Marks: 100 **Duration: 180 mins.**

Answer 5 out of 8 questions.

1) A) Solve the following system of linear equations by 'Gauss Jordan Elimination method. (10)

$$x + y + z = 9$$
$$2x - 3y + 4z = 13$$
$$3x + 4y + 5z = 40$$

B) Solve the following system of linear equations by 'Jacobi iteration method'. (10)
Carry out **FIVE** iterations.

$$10x + 2y + z = 9$$
$$x + 10y - z = -22$$
$$-2x + 3y + 10z = 22$$

2) A) Solve the following system of linear equations by matrix inversion method, use 'Gauss Elimination method' to find the inverse of the matrix. (10)

$$2x + y + 4z = 4$$
$$x - 3y - z = -5$$
$$3x - 2y + 2z = -1$$

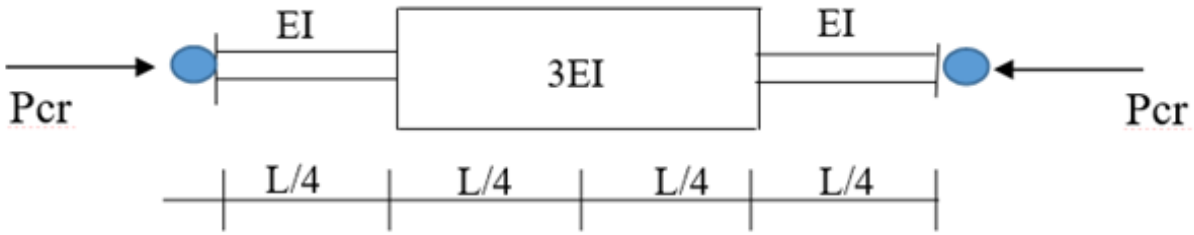
B) Find the dominant Eigen value and corresponding Eigen vector of the matrix. (10)

$$[A] = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$ by iteration method. Take initial vector $[x_0] = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$

3) (20)

Estimate the buckling load for the column with both ends pin-ended

Estimate the buckling load for the column with both ends pin-ended column of length L with variable moment of inertia. Use four sub interval.



4) A simply supported beam of length L and constant EI, supports a UDL for an entire span. Estimate the bending moment and deflections in the beam by considering 4 sub intervals using finite difference method. (20)

5) Using Trapezoidal rule evaluate the integral, (10)

A) $$I = \int_0^{\frac{\pi}{2}} \sin x \, dx \qquad \text{With n=6.}$$

B) Find the root of the given equation by Newton-Raphson method to six decimal places. Take initial value $X_0 = 1$, Carry out five iterations. (10)

$$\cos x - xe^x = 0$$

6) Using Gaussian Quadrature rule evaluate the integral, (10)

A) $$I = \int_0^{\frac{\pi}{2}} \sqrt{\left(1 - 0.25 \sin^2 \theta\right)} \, d\theta$$

B) By "Runge-Kutta" fourth order method, find y (0.1) for the equation, with y (0) =1. (10)

$$, \left(\frac{dy}{dx}\right) - x^2 y = x$$

7) A cantilever beam of span 5m supports a UDL of 4kN/m over the entire span. Consider 1m interval, compute the area of bending moment diagram using "Simpsons 1/3rd rule". (10)

A)

B) Find the roots of the given equation, by Bisection method. (10)

$x^4 - 2x^2 - x = 3$

8) Solve the following system of linear equation by LU Decomposition method (12)

A)

$$5x - 2y + z = 4$$

$$7x + y - 5z = 8$$

$$3x + 7y + 4z = 10$$

B) Use Adam's Bashforth method to find y (4.4) for the given equation, (8)

if $y(4) = 1$, $y(4.1) = 1.0049$ $y(4.2) = 1.0097$, $y(4.3) = 1.0143$.

$$5t\left(\frac{dy}{dt}\right) + y^2 - 2 = 0$$

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