Question Paper

Exam Date & Time: 04-Jun-2018 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
IV SEMESTER B.S. DEGREE MAKE -UP EXAMINATION - MAY / JUNE 2018
DATE: 4 JUNE 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) (10)

Solve the following system of linear equations by 'Gauss Elimination method.

A)

$$x + 2y + z = 3$$
$$x + 3y + 3z = 10$$
$$3x - y + 2z = 13$$

B) (10)

Solve the following system of linear equations by 'Gauss - Siedal iteration method. Carry out **five** iterations.

$$8x - 3y + 2z = 20$$
$$4x + 11y - z = 33$$
$$6x + 3y + 12z = 35$$

2) (10)

By "Runge-Kutta" fourth order method, find y (0.2) for the equation with y (0) =1.

A)

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

B) (10)

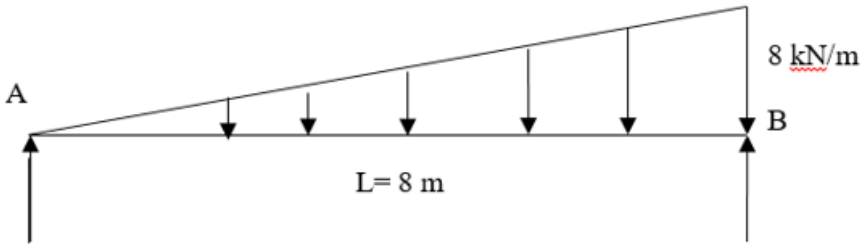
Using Gaussian Quadrature rule evaluate the integral,

$$I = \int_0^2 \frac{1}{(1+x)}\, dx$$

3) (10)

A)

Simply supported beam AB of span L =8m supporting a load of Zero intensity at A, linearly varying to 8 kN/m at B. Estimate the area of the bending moment diagram due to loading on the beam. Assume an interval of 1m. Use Trapezoidal rule.



B) (10)

Evaluate the integral using Simpson's 1/3rd rule with five ordinates.

$$\int_0^{\frac{\pi}{2}} \frac{d\theta}{\sqrt{1-1/2\sin^2\theta}}$$

4) (10)

A) Find largest Eigen value and corresponding Eigen vector of the matrix by power method. Also find all other Eigen values.

$$[A]=\begin{bmatrix}5 & 0 & 1\\ 0 & -2 & 0\\ 1 & 0 & 5\end{bmatrix} \qquad \text{Take initial vector} \quad [x_0]=\begin{bmatrix}1\\0\\0\end{bmatrix}$$

B) (10)

Use Jacobi's method to find all the eigenvalue and eigenvectors of the matrix

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

5) (10)

A) Find a root of the equation using the Bisection Method in 5 stages.

$$x^3 - 4x - 9 = 0$$

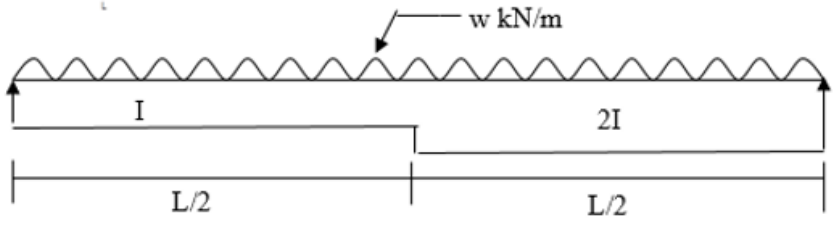
B) (10)

Using Newton–Raphson method, find the real root of the equation, take $X_0 = 10$, Correct to 3 decimal places.

$$x \log_{10} x = 12.34$$

6) (20)

A beam of length L supports a uniformly distributed load of intensity w kN/.m. Calculate the maximum moment and deflections in the beam by considering 4 equal intervals. Use central finite difference method.



7) (10)

A) Solve the given system of equations using Cholesky's method.

$$3x + 2y - z = 4$$
$$2x + 4y + 2z = 8$$
$$-x + 2y + 4z = 5$$

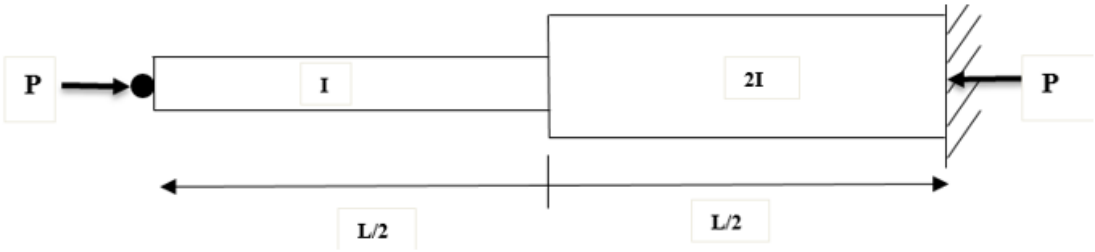
B) (10)

Use Gauss-Jordan method to find the inverse of the matrix

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

8) (20)

Using finite difference method estimate the buckling load for the stepped column shown in figure, which is pinned at one end and fixed at other end. Consider four sub-intervals, and compare the approximate value with the exact Euler critical load.



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