Reg. No.										

INTERNATIONAL CENTRE FOR APPLIED SCIENCES

(Manipal University)

IV SEMESTER B.S. DEGREE EXAMINATION –MAY 2016

SUBJECT: NUMERICAL METHODS IN CIVIL ENGINEERING (CE 245)

16TH MAY, 2016

Time: 3 Hours **Max. Marks: 100**

- ✓ **Answer ANY FIVE Questions.**

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

$$2x_1 + x_2 + 4x_3 = 4$$
$$x_1 - 3x_2 - x_3 = -5$$
$$3x_1 - 2x_2 + 2x_3 = -1$$

1B. Solve the following system of linear equations by 'Jacobi iteration method'. Carry out **FIVE** iterations.

$$20x + y - 2z = 17$$
$$3x + 20y - z = -18$$
$$2x - 3y + 20z = 25$$

(10+10)

2A Solve the following system of linear equations by matrix inversion method using 'Gauss Jordan Elimination method'.

$$2x_1 + x_2 + 4x_3 = 4$$
$$x_1 - 3x_2 - x_3 = -5$$
$$3x_1 - 2x_2 + 2x_3 = -1$$

2B. Find the dominant eigen value and corresponding eigen vector of the matrix.

$$[A] = \begin{bmatrix} 1 & 2 & 3 \\ 0 & -4 & 2 \\ 0 & 0 & 7 \end{bmatrix}$$ by iteration method. Take initial vector $$[x_0] = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$ (10+10)

3. 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. Refer Fig. Q. No. 3. (20)

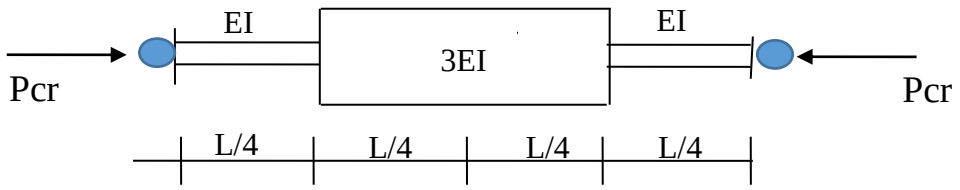

Fig. Q. No. 3

4. A simply supported beam of length L and constant EI, supports a concentrated load P at mid span. Estimate the bending moment and deflections in the beam by considering 4 sub intervals using finite difference method. (20)

5A. Using Simpsons 1/3rd rule evaluate the integral,

$$I = \int_1^2 (e^x / x)\, dx \qquad \text{with n=8.}$$

5B. Find the $\sqrt[3]{\pi}$ by Newton-Rapson method to six decimal places. Take $\pi = 3.1416$. Take initial value $X_0 = 1.3$. Carry out three iterations.

(10+10)

6A. Using Gaussian Quadrature rule evaluate the integral,

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

6B. By "Runge-Kutta" fourth order method, find y (0.1) and y (0.2) for the equation

$\left(\frac{dy}{dt}\right) = \left[\frac{4t}{y} - t.y\right]$, with y (0) =3 and t = 0.1. (10+10)

7A. 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 "Trapezoidal rule".

7B. Find the roots of the equation, $x^3 - 4x = 9$ by Bisection method.

(10+10)

8A. Solve the following system of linear equation by LU Decomposition method

$$\begin{aligned} 2x_1 - x_2 + x_3 &= 7 \\ x_1 + 2x_2 + x_3 &= 0 \\ 3x_1 + x_2 - 2x_3 &= -2 \end{aligned}$$

8B. Estimate the solution at y(2) using Adam's Bashforth method with n=4, $y_1 = 3.13$, $y_2 = 4.5$ and $y_3 = 6.13$.

$\left[\frac{dy}{dx}\right] = \frac{2y}{x}$ With y (1) = 2. (10+10)