Reg.No.									

INTERNATIONAL CENTRE FOR APPLIED SCIENCES

(Manipal University)

IV SEMESTER B.S. DEGREE EXAMINATION – APRIL/ MAY 2017

SUBJECT: NUMERICAL METHODS IN CIVIL ENGINEERING (CE 245)

(BRANCH: CIVIL)

Friday, 21 April 2017

Time: 03 Hours **Max. Marks: 100**

- ✓ **Answer ANY FIVE full Questions.**
- ✓ **Missing data, if any, may be suitably assumed**

1A. Explain the following with an example

i) Ill-conditioned system. ii) System having no solution. iii) Unique solution

1B. Solve the following system of linear equations by 'Gauss-Siedel method'. Show 6 trials.

$8x+3y+2z = 13$

$x+5y+z = 7$

$2x+y+6z = 9$

1C. Solve the following system of linear equations by 'Gauss Elimination Method'

$3.15x - 1.96y + 3.85z = 12.95$

$2.13x + 5.12y - 2.89z = -8.61$

$5.92x + 3.05y + 2.15z = 6.88$ **(3+7+10)**

2A. Using Gaussian Quadrature rule evaluate the integral, $I = \int_0^2 \frac{1}{(1+x)}\,dx$

2B. Find the inverse of the given matrix by "Gauss-Jordan" method.

$$[A] = \begin{bmatrix} 2 & 0 & 1 \\ 3 & 2 & 5 \\ 1 & -1 & 0 \end{bmatrix}$$

Show that $A \times A^{-1} = I$, identity matrix. **(8+12)**

3A. Solve the following system of linear equations by 'Jacobi Iteration Method'

$10x + 2y + z = 9$

$x + 10y - z = -22$

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

3B. Using 'Adam's Bashforth' formula find y (0.4) for the differential function, $\left[\frac{dy}{dx}\right] = \frac{(1+x)^2 y^2}{2}$

with y (0) = 1, y(0.1)=1.06, y(0.2)=1.12 and y(0.3)=1.21.

(10+10)

4A. A simply supported beam of span 6m supports a uniformly distributed load of 2 kN/m over the whole span. Estimate the area of bending moment diagram considering 1m intervals, using (a) Trapezoidal rule (b) Simpson's $1/3^{rd}$ rule. Which method is more appropriate and why?

4B. Using Newton-Rapson method, find the roots of the polynomial, $4x - e^x = 0$ take initial value as 2, correct to 3 decimal places.

4C. Using Newton-Raphson method, find the cube roots of 12, take initial value as 2, correct to 3 decimal places. **(10+5+5)**

5A. Using 'Runge-Kutta Fourth Order' method estimate the y (0.1) and y (0.2), given $\left[\frac{dy}{dx}\right] - x^2 y = x$ with y (0) = 1

5B. Explain the procedure of Jacobi's method of determination of Eigen values and Eigen vectors of a given vector. **(10+10)**

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

(20)

Fig. Q. No. 6

7A. Find the dominant eigen value and corresponding eigen vector of the matrix using iterative method

$$[A] = \begin{bmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{bmatrix}$$ Take initial vector $[x_0] = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$

7B. Solve the given system of equations using Cholesky's decomposition Method

$3x + 2y - z = 4$
$2x + 4y + 2z = 8$
$-x + 2y + 4z = 5$ **(10+10)**

8A. A simply supported beam with variable moment of inertia, supports a uniformly distributed load of w kN/m. estimate the maximum bending moment and deflection in beam by considering four equal intervals.

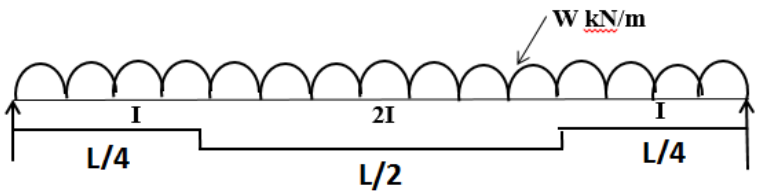

Fig. Q. No. 8A

8B. Find the root of the polynomial, $x^3 + x^2 - 3x - 3 = 0$ by 'Bisection Method', take initial approximate value as 1 and 2. **(14+6)**