7E7065

Roll No. 15ECTCE024

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B. Tech. VII Sem. (Main / Back) Exam., Nov. – Dec. - 2018

Civil Engineering

7CE5A Application of Numerical Methods in Civil Engineering

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 26

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL

2. NIL

UNIT- I

Q.1 (a) Convert $(0.859375)_{10}$ to the corresponding binary fraction. [8]

(b) What is meant by absolute and relative errors? If -

$$y = \frac{0.31x + 2.73}{x + 0.35}$$

Where the coefficients are rounded-off, find the absolute and relative errors in y when $x = 0.5 \pm 0.1$. [8]

OR

Q.1 (a) Explain errors and their types in numerical methods. [8]

(b) Calculate the value of $\sqrt{102} - \sqrt{101}$ correct to four significant figures. [8]

UNIT- II

Q.2 (a) Find a real root of the equation $x^3 - 2x - 5 = 0$ by Bisection method correct upto two decimal places. [8]

(b) Using Newton – Raphson method, find root of the equation $x \sin x + \cos x = 0$. [8]

OR

Q.2 (a) Find root of the equation $x^2 + 4\sin x = 0$ by Regula Falsi method. [8]

(b) Using successive iteration method, find root of the equation $2x = \cos x + 3$ correct to three places of decimals. [8]

UNIT- III

Q.3 (a) Reduce the matrix $A = \begin{bmatrix} 2 & 1 & 3 \\ 4 & 7 & 13 \\ 4 & -3 & -1 \end{bmatrix}$ to the normal form and hence, find its rank. [8]

(b) Use Gauss elimination to solve: [8]

$$2x + y + z = 10$$

$$3x + 2y + 3z = 18$$

$$x + 4y + 9z = 16$$

OR

Q.3 Solve the system of equation: [16]

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 8 & 22 \\ 3 & 22 & 82 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 5 \\ 6 \\ -10 \end{bmatrix}$$

Using the Cholesky method. Also determine A^{-1}.

pto

[8]

8]

1

UNIT- IV

Q.4 (a) Starting with $x^{(0)} = [0.5, -0.5, -0.5]^T$ and using Jacobi method, find the next three iterations for the system: [8]

$$4x + y + z = 2$$
$$x + 5y + 2z = -6$$
$$x + 2y + 3z = -4$$

(b) Write applications of system of equations in civil engineering. [8]

OR

Q.4 Using Gauss Seidel iterative method solve the following system of equations: [16]

$$27x + 6y - z = 85$$
$$6x + 15y + 2z = 72$$
$$x + y + 54z = 110$$

UNIT- V

Q.5 (a) Given the data points (0,1), (1,3), (2,7) and (3,13) satisfying the function $y = f(x)$, compute $f(0.5)$ using Newton's forward interpolation formula. [8]

(b) Using Newton's divided difference formula find f (x) as a polynomial in x, from the following table: [8]

x	f (x)
-1	3
0	- 6
3	39
6	822
7	1611

OR

Q.5 Given the following values of f (x) and f '(x) *[16]*

x	-1	0	1
f (x)	1	1	3
f '(x)	-5	1	7

Estimate the value of f (- 0.5) and f (0.5) using the Hermite interpolation.
