7E4035

# B. Tech. VII Semester (Main) Examination-2015

## CIVIL ENGINEERING # 7CE6A # MODEL PAPER

# APPLICATIONS NUMERICAL METHODS IN CIVIL ENGG.

Time : 3 Hours | Min. Passing Marks : 24 | Maximum Marks : 80

***Instruction 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.)*

### Unit-'I'

**1.** (*a*) Explain the various types of errors. [8]

(*b*) Find the real roots of the equation $x^3+x+1=0$. [8]

**OR**

**1.** (*a*) Find the number of roots of the equation

$f(x)=3x^6-4x^5+5x^2-6x-7=0$ [8]

(*b*) Determine the stepsize that can be used in the tabulation of $f(x) = \sin x$ in the interval $[0, \pi/4]$ at equally spaced nodal points so that the truncation error of the quadratic interpolation is less than $5\times10^{-8}$. [8]

### Unit-'II'

**2.** (*a*) Find a root, correct to three decimal places and lying between 0 and 0.5 of the equation $4e^{-x}\sin x-1=0$. [8]

(*b*) Given that the equation $x^{2.2}=69$ has a root between 5 and 8. Use the method of regula-falsi to determine it. [8]

**OR**

**2.** (*a*) Find the real root of the equation : $x^3-3x-5=0$ correct to four places of decimal by Newton Raphson method. [8]

(*b*) Find the root of the equation $x^3+x-1=0$ by Newton-Raphson method. [8]

### Unit-'III'

**3.** (*a*) Solve the following system by using the Gauss-Jordan elimination method

$x+2y-3z=2$

$6x+3y-9z=6$

$7x+14y-21z^1=13$ [8]

(*b*) Use Gaussian elimination to solve the system of linear equations

$x_1+5x_2=7$

$-2x_1-7x_2=-5$ [8]

**OR**

**3.** (*a*) Use crammer's rule to solve

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

$3x_1-2x_2+4x_3=7$

$3x_1+2x_2-x_3=3$ [8]

(*b*) Solve the system

$0.0003120x_1+0.006032\,x_2=0.003328$

$0.5000x_1+0.8942x_2=0.9471$ [8]

### Unit-'IV'

**4.** (*a*) Solve the system

$2x+y=2$

$2x+1.01y=2.01$ [8]

(*b*) Solve the equations

$2x+3y+z=9$

$x+2y+3z=6$

$3x+y+2z=8$

by the method of LU - Decomposition. [8]

**OR**

**4.** Use power method to find the largest eigen value and corresponding eigen vector of the matrix.

$$A=\begin{bmatrix}1 & 2 & 0\\ 2 & 1 & 0\\ 0 & 0 & -1\end{bmatrix}$$ [16]

### Unit-'V'

**5.** (*a*) Using Newton's forward difference formula, find the sum

$S_n=1^3+2^3+3^3+\dots n^3+(n+1)^3$ [8]

(*b*) Use Lagrange's interpolation formula to find y when x = 1 given that : [8]

| x | 0 | 1 | 3 | 4 |
|---|---|---|---|---|
| y | 5 | 6 | 50 | 105 |

**OR**

**5.** (*a*) Prove by Lagrange's formula :

$y_1=y_3(0.3)(y_3-y_{-3})+0.2(y_{-3}-y_{-5})$ approx. [8]

(*b*) By means of Lagrange's formula, prove that

$$y_0=\frac{1}{2}(y_1+y_{-1})-\frac{1}{8}\left[\frac{1}{2}(y_3-y_1)\right]+\frac{1}{8}\left[\frac{1}{2}(y_{-1}-y_{-3})\right]$$ [8]