Course Code: **20CE1001** **R20**

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code: Advanced Structural Analysis (**20CE1001**) **Course & Branch**: M.Tech - SE

Year & Sem: I-M.Tech & I-Sem **Regulation:** R20

UNIT –I
INTRODUCTION TO MATRIX METHODS OF ANALYSIS

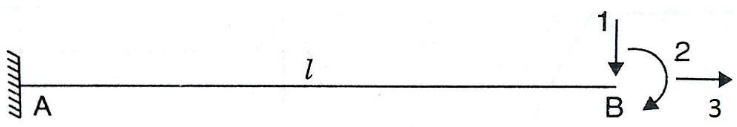
<table>
<tr><td>1</td><td>Explain briefly about flexibility matrix method of Analysis</td><td>[L2][CO1]</td><td>[12M]</td></tr>
<tr><td rowspan="2">2</td><td>a) Find the flexibility matrix of the cantilever shown in Figure 2.1 EI is constant.


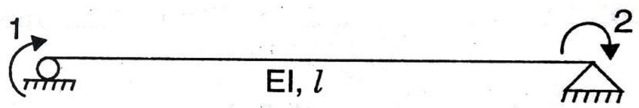
Figure 2.1</td><td>[L1][CO1]</td><td>[12M]</td></tr>
<tr><td>b) For the simply supported beam shown in Figure 2.2. Develop the flexibility matrix


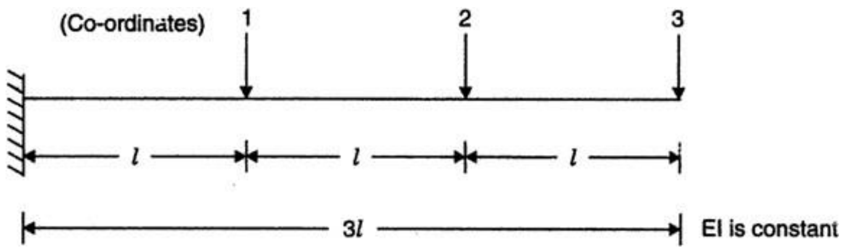
Figure 2.2</td><td>[L3][CO1]</td><td>[12M]</td></tr>
<tr><td>3</td><td>Develop the flexibility matrix for the cantilever with coordinates as shown in Figure 2.3


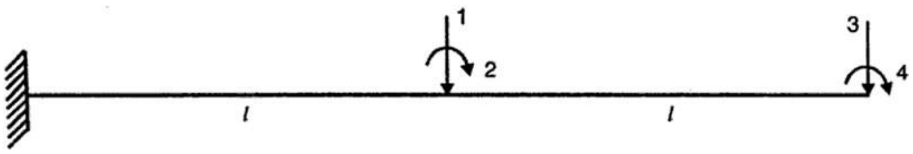
Figure 2.3</td><td>[L3][CO1]</td><td>[12M]</td></tr>
<tr><td>4</td><td>Develop the flexibility matrix for the cantilever beam with reference to the coordinates shown in Figure 2.4


Figure 2.4</td><td>[L3][CO1]</td><td>[12M]</td></tr>
</table>

<table>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>5</td><td>Develop the flexibility matrix for structure with coordinates shown in Figure 2.5

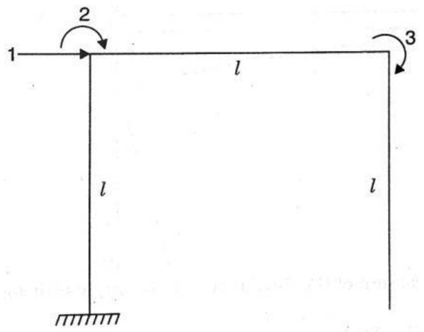


Figure 2.5</td><td>[L3][CO1]</td><td>[12M]</td></tr>
<tr><td>6</td><td>Explain briefly about Stiffness matrix method of Analysis</td><td>[L2][CO1]</td><td>[12M]</td></tr>
<tr><td>7</td><td>Develop the stiffness matrix for the end-loaded prismatic member AB with reference to the Coordinates shown in Figure 2.6

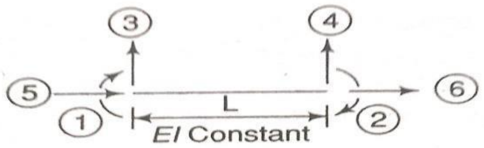


Figure 2.6</td><td>[L3][CO1]</td><td>[12M]</td></tr>
<tr><td>8</td><td>a) Develop the stiffness matrix of the beam as shown in Figure 2.7 with 2 coordinate system

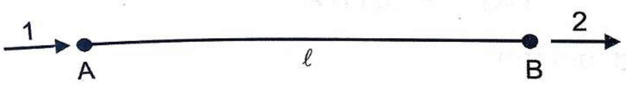


Figure 2.7</td><td>[L3][CO1]</td><td>[6M]</td></tr>
<tr><td></td><td>b) Develop the stiffness matrix of the beam as shown in Figure 2.8 with respect to the 2 degree of freedom given

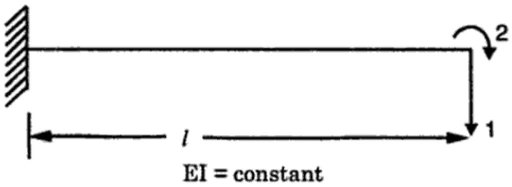
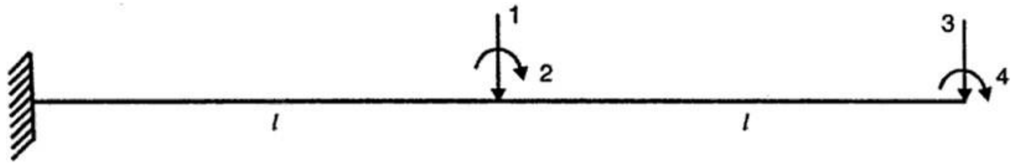
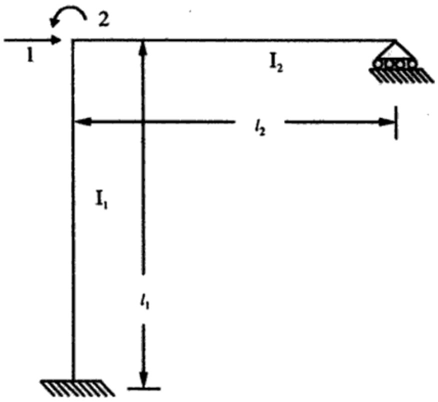
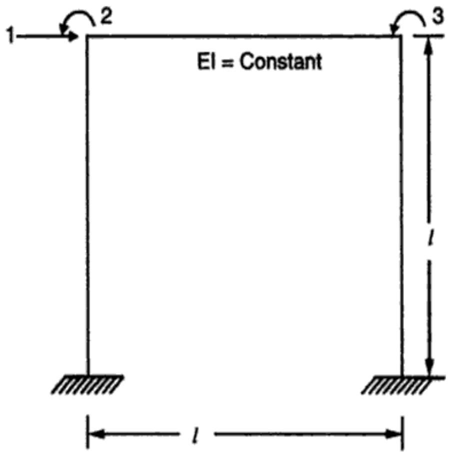


Figure 2.8</td><td>[L3][CO1]</td><td>[6M]</td></tr>
</table>

9	a) Develop the stiffness matrix of the beam as shown in Figure 2.10 with respect to the 4 degree of freedom given  Figure 2.10	[L3][CO1]	**[6M]**
	b) Generate the stiffness matrix for the structure with coordinates as shown in Figure 2.11  Figure 2.11	[L3][CO1]	**[6M]**
10	Generate the stiffness matrix for the structure with coordinate as shown in Figure 2.12 EI is constant  Figure 2.12	[L3][CO1]	**[12M]**

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UNIT-II
ANALYSIS OF CONTINUOUS BEAMS & ANALYSIS OF TWO-DIMENSIONAL PIN JOINTED TRUSSES

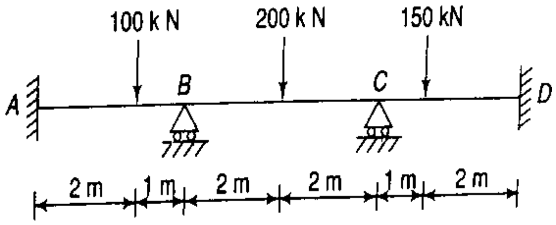
<table>
<tr><td>1</td><td>Analyze the continuous beam shown in Figure 3.1 by displacement method EI is constant


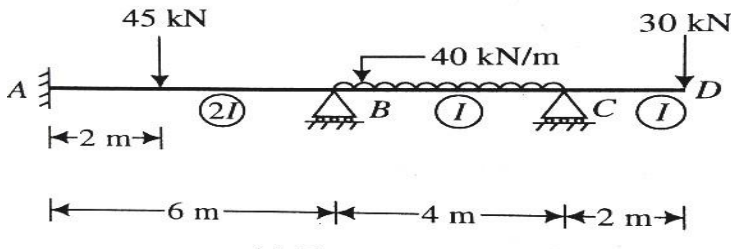
Figure 3.1</td><td>[L4][CO2]</td><td>[12M]</td></tr>
<tr><td>2</td><td>Analyze the continuous beam shown in Figure 3.2 by displacement method


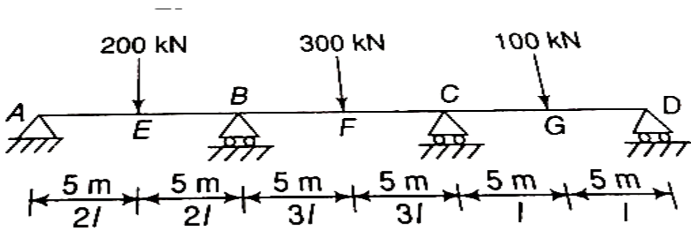
Figure 3.2</td><td>[L4][CO2]</td><td>[12M]</td></tr>
<tr><td>3</td><td>Analyze the continuous beam shown in Figure 3.3 by Flexibility method. The downward settlement of supports B and C in kN-m are 1500/EI and 750/EI.


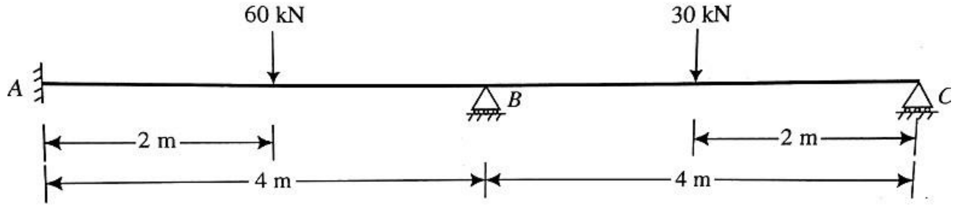
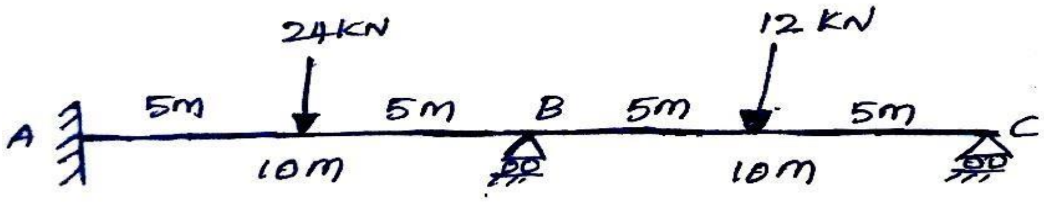
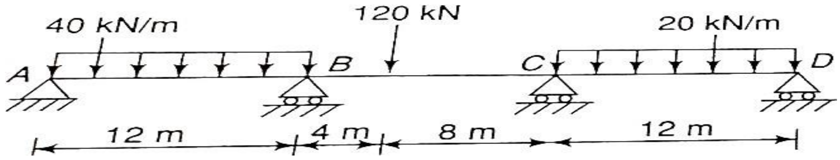
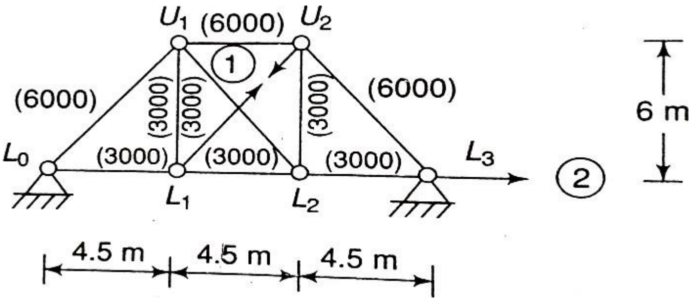
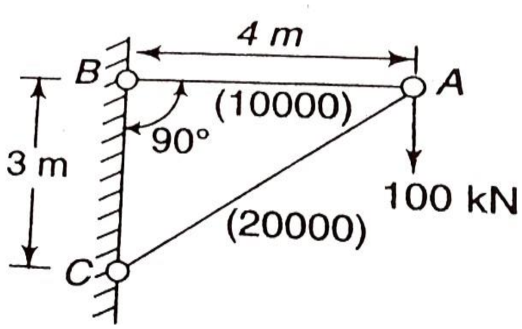
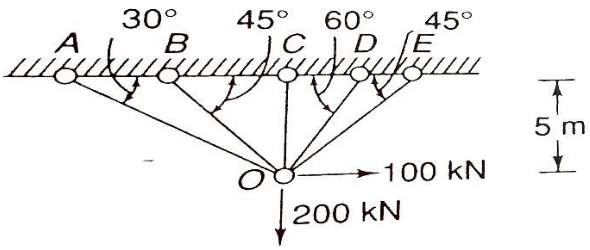
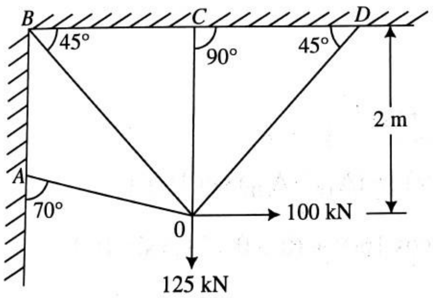
Figure 3.3</td><td>[L4][CO2]</td><td>[12M]</td></tr>
<tr><td>4</td><td>Analyze the continuous beam shown in Figure 3.4, if the downward settlement of supports B and C are 12 mm and 6 mm respectively. Given EI= 20 x 10^{12} N-mm^2 .Use Flexibility matrix method


Figure 3.4</td><td>[L4][CO2]</td><td>[12M]</td></tr>
</table>

5	Analysis a continuous beam as shown in Figure 3.5 if downward settlement B & C is kN-m units are 200/EI and 100/EI respectively. Using Stiffness matrix method  Figure 3.5	[L4][CO2]	**[12M]**
6	Using flexibility matrix method for the beam shown in Figure 3.6 and draw shear force and bending moment diagrams, EI is Constant  Figure 3.6	[L4][CO2]	**[12M]**
7	Develop the flexibility matrix for the pin-jointed plane frame with reference to coordinates 1 & 2 shown in Figure 3.7 The numbers in parentheses are the cross-sectional areas of the members in mm^2  Figure 3.7	[L4][CO4]	**[12M]**
8	Figure 3.8 shows a jip-Crane carrying vertical load of 10kN at A. Determine the deflection of Joint A. Hence calculate the forces in members AB& AC. The cross-sectional area in mm^2. Take $E=200kN\text{-}mm^2$. 	[L4][CO4]	**[12M]**

9	Analyze the pin-jointed structure shown in Figure 3.9 by flexibility matrix method. The area of each member is 200mm2. Take E=200KN/mm^2  Figure 3.9	[L4][CO4]	**[12M]**
10	Analyze the pin-jointed structure shown in Figure 3.10 by Stiffness matrix method. The area of each member is 1000 mm^2. Take E=200KN/mm^2  Figure 3.10	[L4][CO4]	**[12M]**

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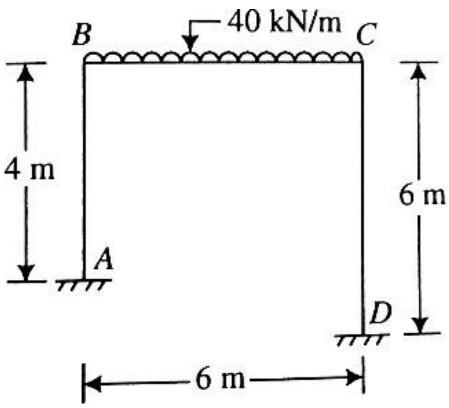
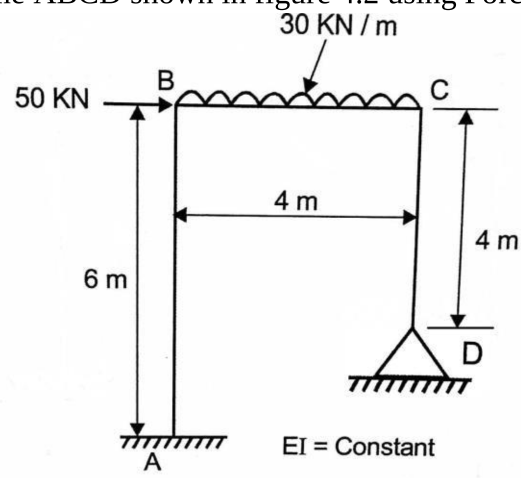
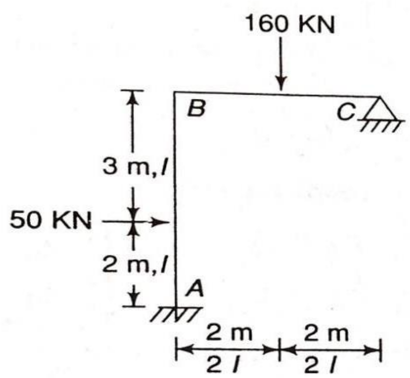
UNIT –III
ANALYSIS OF TWO - DIMENSIONAL PORTAL FRAMES

1	Analyse the rigid jointed plane frame shown in Figure 4.1 by flexibility matrix method. EI is constant throughout 	[L4][CO3]	**[12M]**
2	Analyse the portal frame ABCD shown in figure 4.2 using Force Method 	[L4][CO3]	**[12M]**
3	Analyze the frame shown in figure 4.23 by force method. 	[L4][CO3]	**[12M]**

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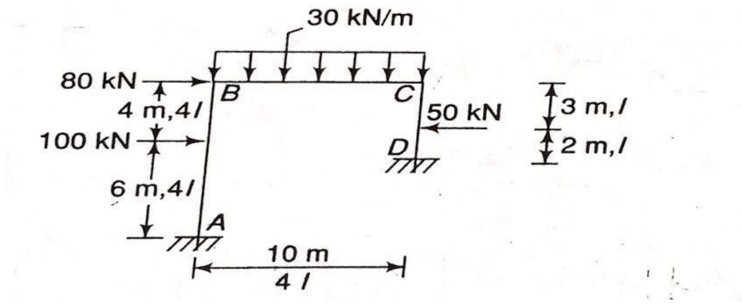
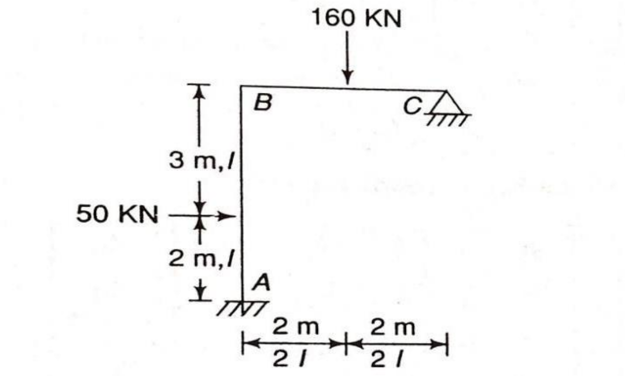
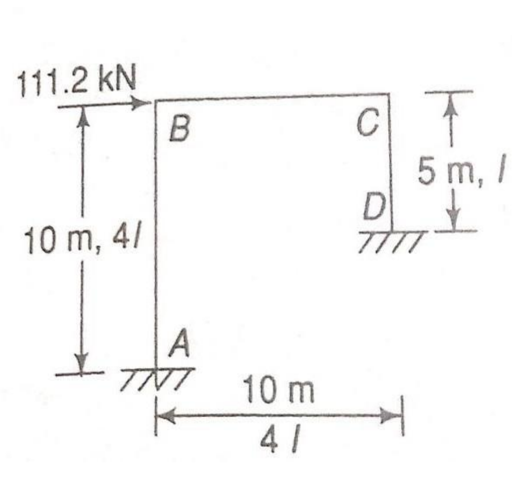
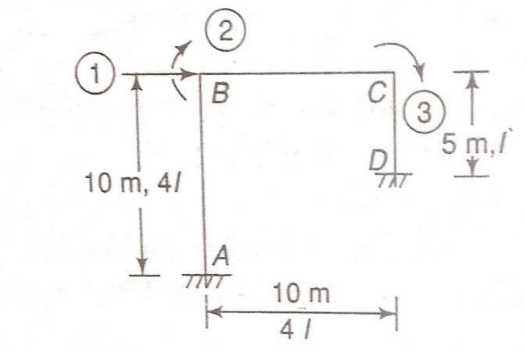
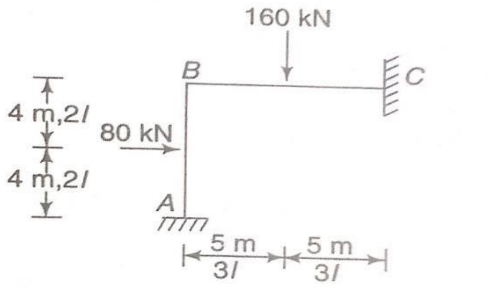
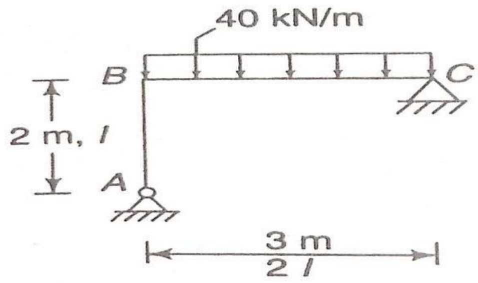
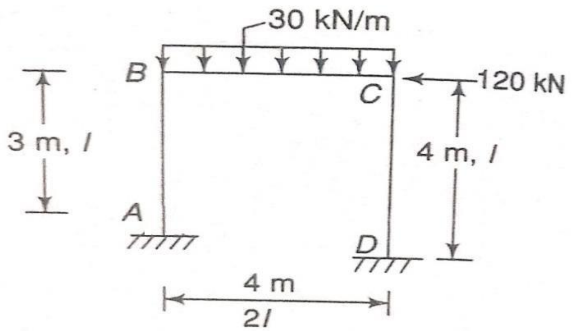
<table>
<tr><td>4</td><td>Analyze the portal frame shown in figure 4.4 by displacement method

</td><td>[L4][CO3]</td><td>[12M]</td></tr>
<tr><td>5</td><td>Analyze the frame shown in figure 4.5 by displacement method.

</td><td>[L4][CO3]</td><td>[12M]</td></tr>
<tr><td>6</td><td>Analyze the portal frame shown in figure 4.6 by force method.

</td><td>[L4][CO3]</td><td>[12M]</td></tr>
<tr><td>7</td><td>Determine the stiffness matrix for the portal frame shown in figure 4.7

</td><td>[L4][CO3]</td><td>[12M]</td></tr>
</table>

<table>
<tr><td>8</td><td>Analyze the portal frame shown in figure 4.8 by flexibility method.
</td><td>[L4][CO3]</td><td>[12M]</td></tr>
<tr><td>9</td><td>Calculate the force matrix and also draw the bending moment diagram for the following frame shown in figure 4.9
</td><td>[L3][CO3]</td><td>[12M]</td></tr>
<tr><td>10</td><td>Calculate the displacement matrix for the following frame shown in figure 4.10. And also draw the bending moment diagram.
</td><td>[L3][CO3]</td><td>[12M]</td></tr>
</table>

UNIT –IV

SOLUTION TECHNIQUES

1	A system of linear algebraic equations is given below. Obtain the solution by Cholesky method. $x+2y-3z = 7$ $3x+2y+2z = -5$ $4x - y+5z = 5$	[L2][CO6]	**[12M]**
2	Solve the following system of equations using Gauss elimination method $-4x+ y + 10z =21$ $5x – y + z = 14$ $4x+ 6y + 7z = 12$	[L3][CO6]	**[12M]**
3	List out and explain the direct methods for solving linear equations.	[L2][CO6]	**[12M]**
4	Determine the solution by using Gauss elimination method. $2x_1 – 2x_2 +4x_3 = -3$ $2x_1 + 3x_2 +2x_3 = 5$ $-x_1 + x_2 - x_3 = 1$	[L3][CO6]	**[12M]**
5	Explain briefly about a. Cholesky Method b. Band Matrix and Semi band width	[L2][CO6]	**[12M]**
6	Explain briefly about a. Gauss elimination method. b. Solution of linear simultaneous equations.	[L2][CO6]	**[12M]**
7	Explain briefly about a. Matrix inversion method. b. Static Condensation	[L2][CO6]	**[12M]**
8	Explain briefly about a. Frontal solution technique. b. Direct inversion method.	[L2][CO6]	**[12M]**
9	Obtain the solutions of the following system of simultaneous equation by method of matrix inversion. $2x_1 + 6x_2 +2x_3+4x_4 = 40$ $6x_1 + 3x_2 -2x_3-3x_4 = -1$ $2x_1 -2x_2 +5x_3- x_4 = 2$ $4x_1 - 3x_2 -x_3+4x_4 = 9$	[L2][CO6]	**[12M]**
10	Explain briefly about Frontal solution technique and static condensation	[L2][CO6]	**[12M]**

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UNIT –V
NONLINEAR ANALYSIS OF STRUCTURES

1	Derive the equation of geometrical stiffness for beam elements?	[L3][CO5]	**[12M]**
2	Determine the influence of a constant axial force on transverse vibrations of beams?	[L3][CO5]	**[12M]**
3	Write about nonlinear structural behavior?	[L1][CO5]	**[12M]**
4	Explain nonlinear theories for structural components.	[L2][CO5]	**[12M]**
5	a) Write about Geometric nonlinearities.	[L1][CO5]	**[6M]**
	b) Explain inelastic analysis and creep.	[L2][CO5]	**[6M]**
6	Determine the stability analysis of a simple truss using displacement method.	[L3][CO5]	**[12M]**
7	Derive the equation of geometrical stiffness for bar elements?	[L3][CO5]	**[12M]**
8	Determine the influence of a constant axial force on a beam column which is subjected to axial load P.	[L3][CO5]	**[12M]**
9	Determine the stability analysis of a simple truss using Force method.	[L3][CO5]	**[12M]**
10	Determine the influence of an axial load in a beam column	[L3][CO5]	**[12M]**

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ASST. PROFESSOR, SIETK