Course Code: 19CE0111 **R19**

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY::PUTTUR
(AUTONOMOUS)
Siddharth Nagar, Narayanavanam Road – 517583

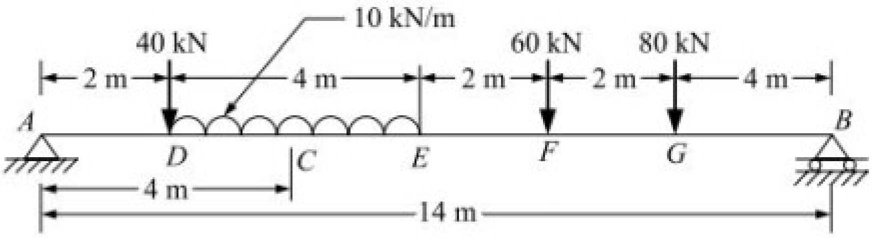
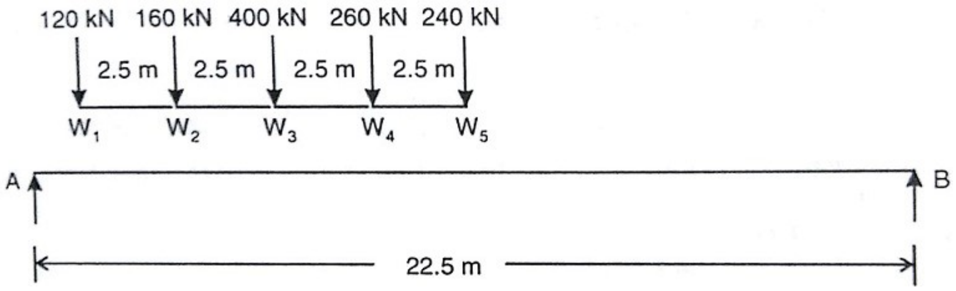
QUESTION BANK (DESCRIPTIVE)

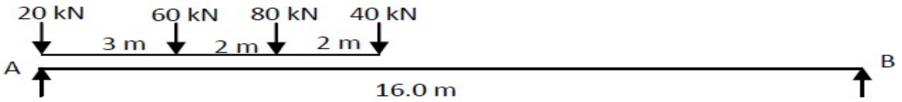
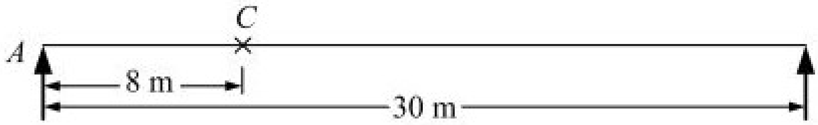
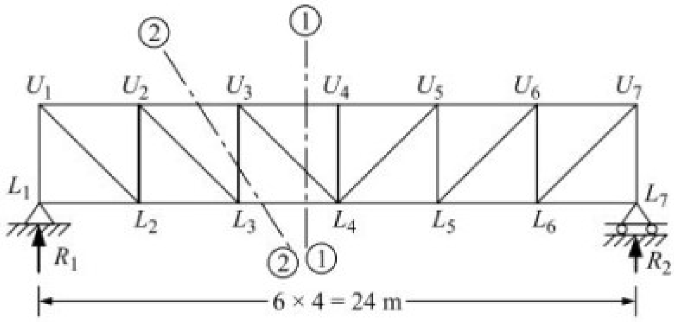
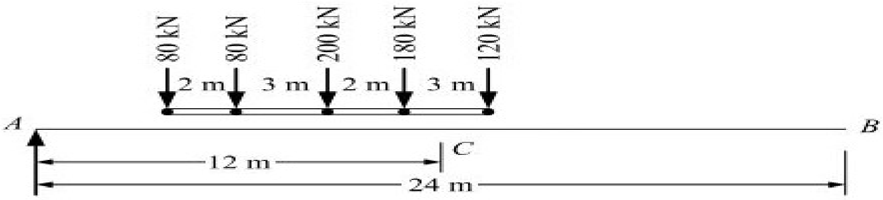
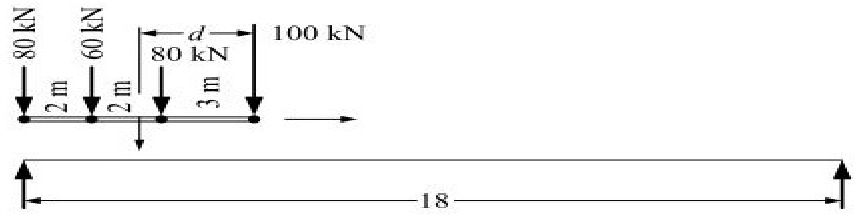
Subject with Code: Structural Analysis (19CE0111) **Course & Branch**: B.Tech - CE

Year & Sem: II-B.Tech & II-Sem **Regulation:** R19

UNIT –I

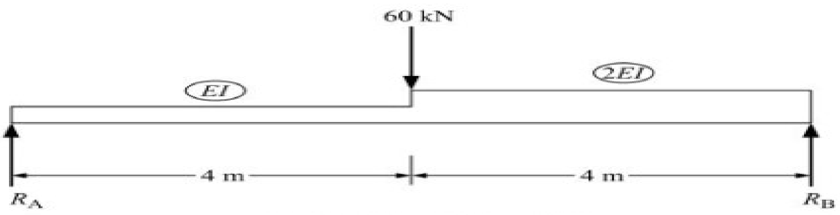
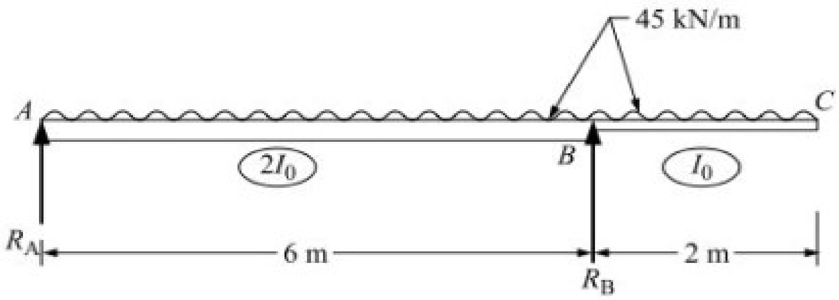
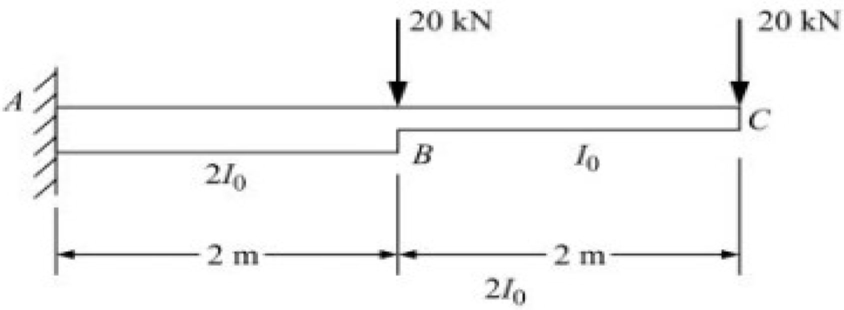
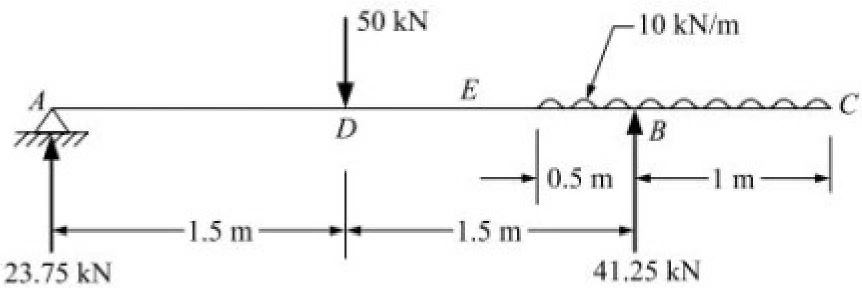
INFLUENCE LINES AND MOVING LOADS

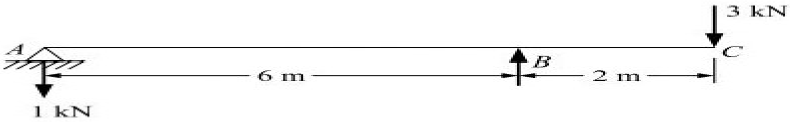
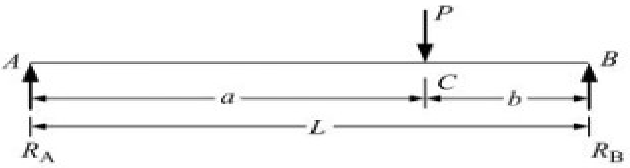
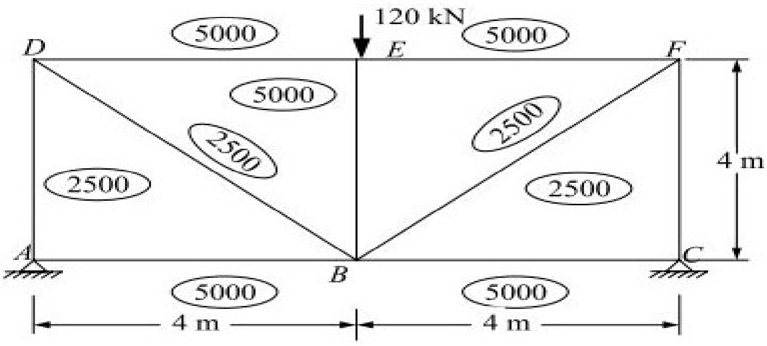
1	. Draw Influence line diagrams for simply supported beams.	[L4][CO2]	**[12M]**
2	Draw Influence line diagrams for cantilever beams.	[L4][CO2]	**[12M]**
3	Using influence line diagrams determine the shear force and bending moment at section C in the simply supported beam shown in Figure .  	[L4][CO2]	**[12M]**
4	A simply supported beam has a span of 15 m. UDL of40 kN/m and 5 m long crosses the girder from left to right. Draw the influence line diagram for shear force and bending moment at a section 6 m from left end. Use these diagrams to calculate the maximum shear force and bending moment at this section.	[L4][CO2]	**[12M]**
5	A train of 5 wheel loads crosses a simply supported beam of span 22.5 m as shown in Figure .Using influence lines, calculate the maximum positive and negative shear forces at mid span and absolute maximum bending moment anywhere in the span.  	[L4][CO2]	**[12M]**
6	A train of concentrated loads shown in Figure. The loads moves from left to right on a simply supported girder of span 16.0 m. Determine absolute maximum bending moment.	[L4][CO2]	**[12M]**

<table>
<tr><td></td><td>
</td><td></td><td></td></tr>
<tr><td>7</td><td>Four point loads, 8, 15, 15 and 10 kN have centre to centre spacing of 2 m betweenconsecutive loads and they traverse a girder of 30 m span from left to right with 10 kN load lending.Calculate the maximum bending moment and shear force at 8 m from the left support.

</td><td>[L4][CO2]</td><td>[12M]</td></tr>
<tr><td>8</td><td>Draw the influence line diagram for forces in the members U3 L4, U3 U4 and U3 L3 of die frame shown in Figure and find the maximum forces developed, when uniformlydistributed load of intensity 40 kN in, longer than the span moves from left to right on bottom chord.

</td><td>[L4][CO2]</td><td>[12M]</td></tr>
<tr><td>9</td><td>A train of 5 wheel loads as shown in Figure crosses a simply supported beamof span 24 m from left to right. Calculate the maximum positive and negative shear force valuesat the Centre of the span and the absolute maximum bending moment anywhere in the span.

</td><td>[L4][CO2]</td><td>[12M]</td></tr>
<tr><td>10</td><td>The simply supported beam shown in Figure is subjected to a set of fourconcentrated loads which move from left to right. Determine.
*(a)*Absolute maximum shear
(b) Absolute maximum moment in the beam.

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

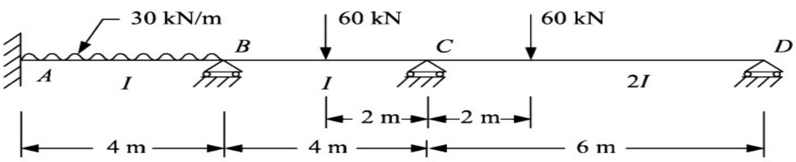
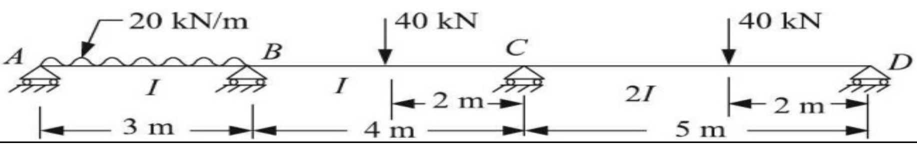
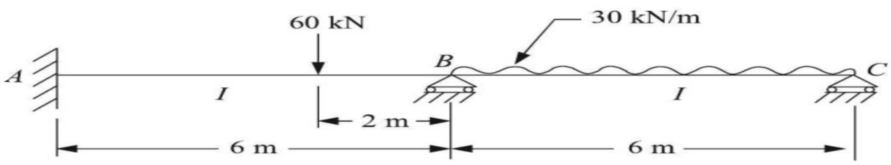
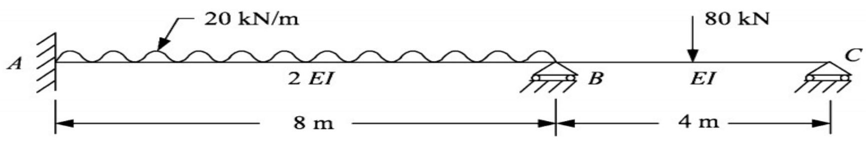
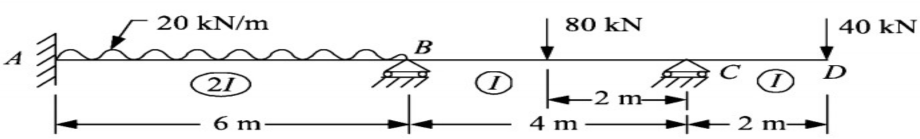
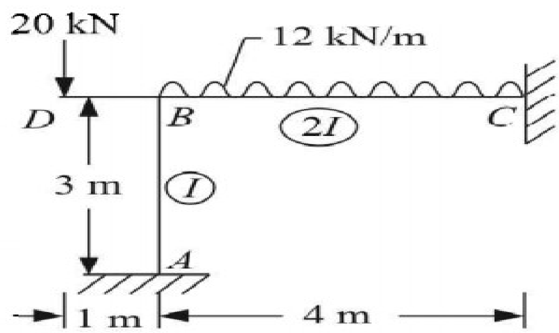
UNIT –II

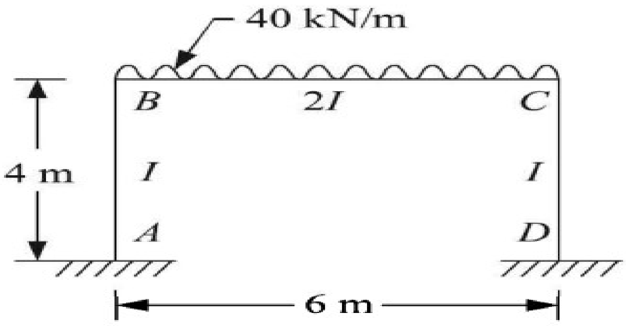
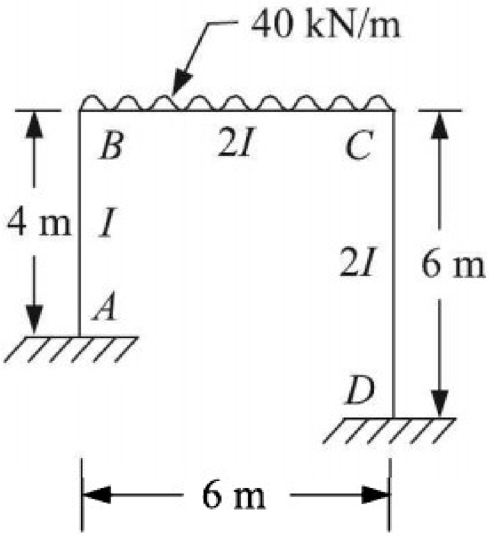
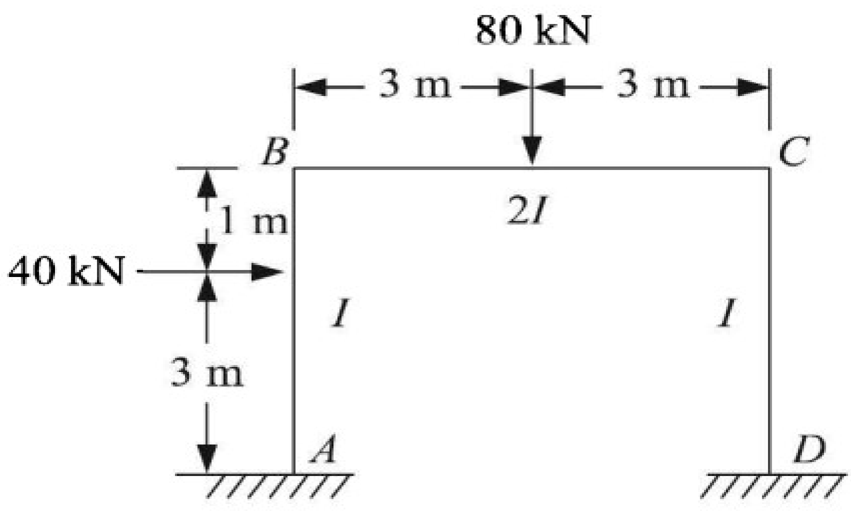
ENERGY METHODS

1	Derive the expression for strain energy equation	[L4][CO3]	**[12M]**
2	Determine the deflection under 60 kN load in the beam shown in Figure by starin energy method.  .	[L4][CO3]	**[12M]**
3	Derive the expression for equation for unit load method	[L4][CO3]	**[12M]**
4	Determine the deflection at free end of the overhanging beam shown in Figure. Use unit load method. 	[L4][CO3]	**[12M]**
5	Determine the deflection and rotation at the free end of the cantilever beam shown in Figure. Use unit load method. Given E = 2 x 10^5 N/mm^2 and I = 12 * 10^6mm^4. 	[L4][CO3]	**[12M]**
6	Determine the deflection at the free end of the overhanging beam shown in Figure . Assume uniform flexural rigidity. 	[L4][CO3]	**[12M]**
7	Determine the vertical deflection at the free end and rotation at A in the overhanging beam shown in Figure . Assume constant El. Use Castigliano's method.	[L4][CO3]	**[12M]**

			
8	Derive Maxwell's theorem of reciprocal deflection.	[L4][CO3]	**[12M]**
9	a.Derivecastigliano's theorem; b. A simply supported beam of span L, carries a concentrated load P at a distance a from left hand side support as shown in Figure. Using castigliano's theorem determine thedeflection under the load. Assume uniform flexural rigidity. 	[L4][CO3]	**[12M]**
10	Find the vertical deflection of the joint B in the truss loaded as shown in Figure The cross-sectional area of the members in mm are shown in brackets. TakeE - 200 kN/mm^2. 	[L4][CO3]	**[12M]**

UNIT-III
SLOPE DEFLECTION METHOD

1	Formulate slope deflection equations and equilibrium equations for the continuous beam shown in Figure. Moment of inertia is same throughout. 	[L4][CO4]	**[12M]**
2	Formulate the required equilibrium equations for analysing continuous beam shown in figure givenbelow by slope deflection method. 	[L4][CO4]	**[12M]**
3	Analyse the continuous beam shown in Figure and draw bending momentdiagram. 	[L4][CO4]	**[12M]**
4	Analyse the continuous beam shown in Figure by slope deflection method, ifjoint B sinks by 10 mm. Given El = 4000 kNm2. Draw bending moment diagram. 	[L4][CO4]	**[12M]**
5	Analyse the continuous beam shown in Figure and draw bending momentdiagram. 	[L4][CO4]	**[12M]**
6	Analyse the continuous beam shown in Figure and draw bending momentdiagram. 	[L4][CO4]	**[12M]**
7	Analyse the frame shown in Figure by slope deflection method and drawbending moment diagram. 	[L4][CO4]	**[12M]**

8	Analyse the frame shown in Figure by slope deflection method and drawbending moment diagram.  	[L4][CO4]	**[12M]**
9	Analyse the frame shown in Figure and draw bending moment diagram.  	[L4][CO4]	**[12M]**
10	Analyse the frame shown in Figure by slope deflection method.  	[L4][CO4]	**[12M]**

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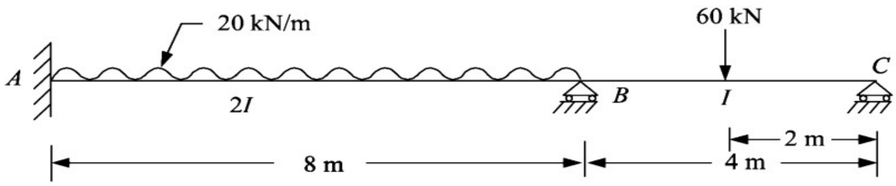
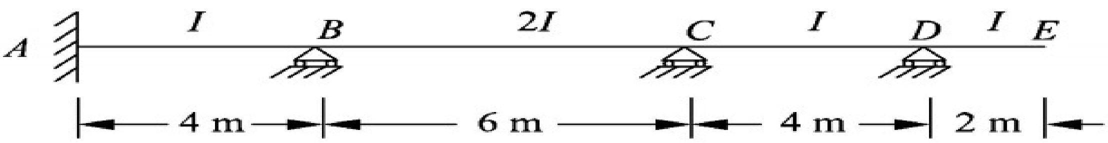
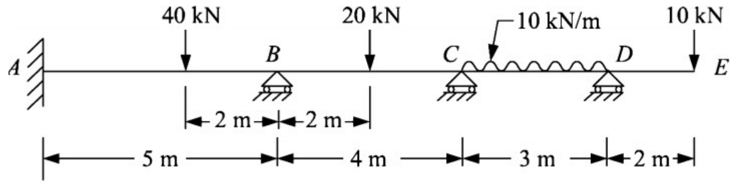
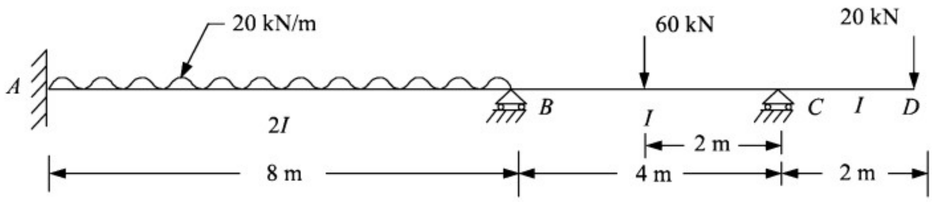
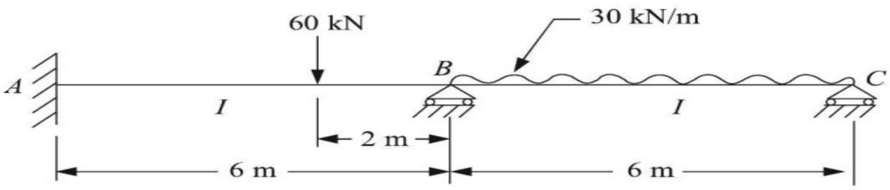
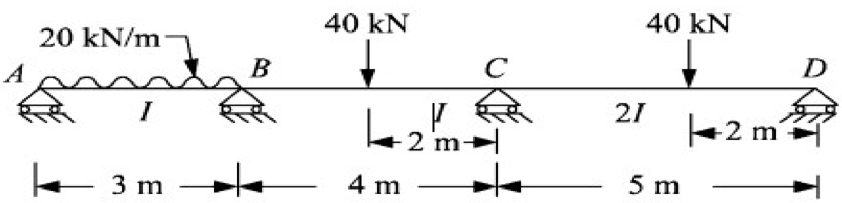
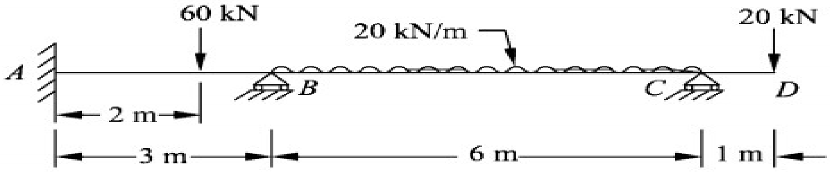
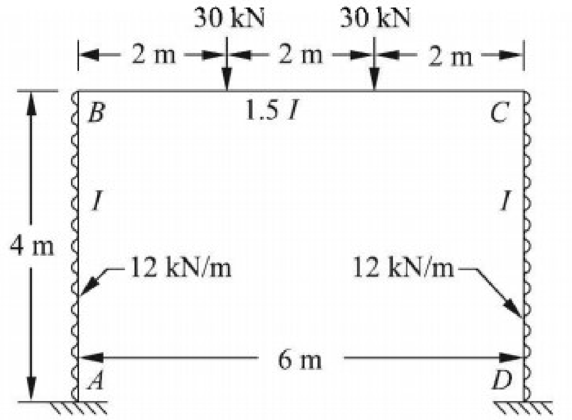
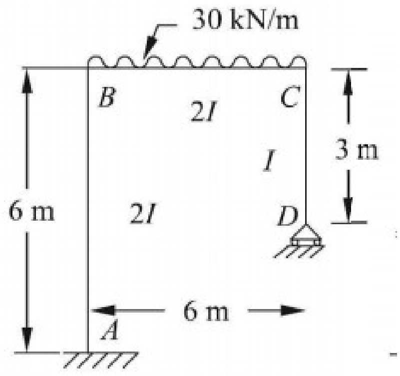
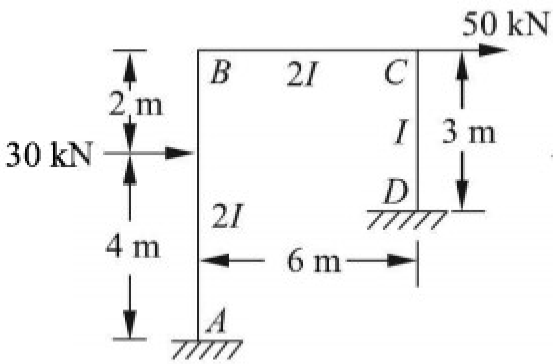
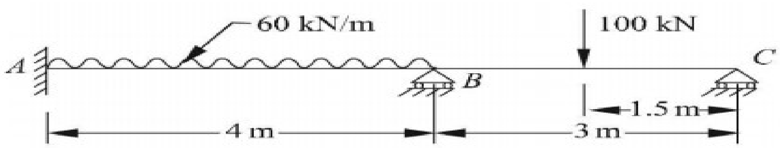
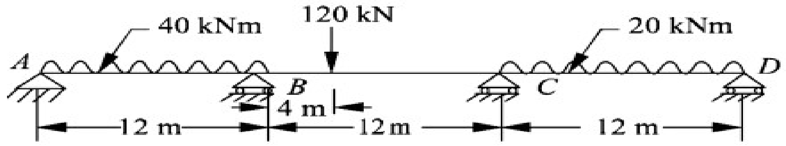
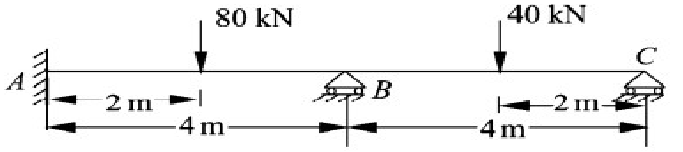
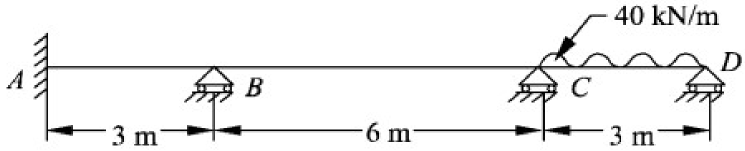
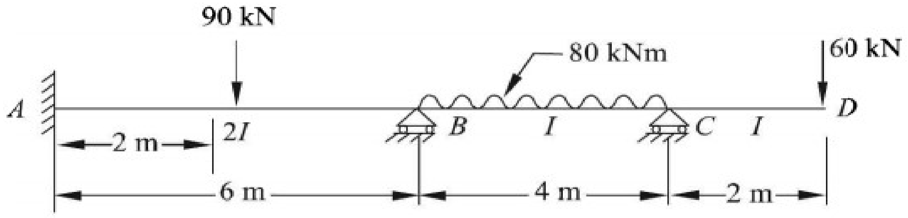
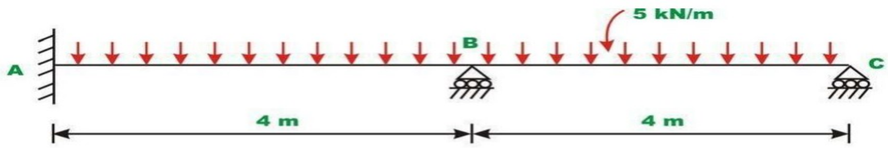
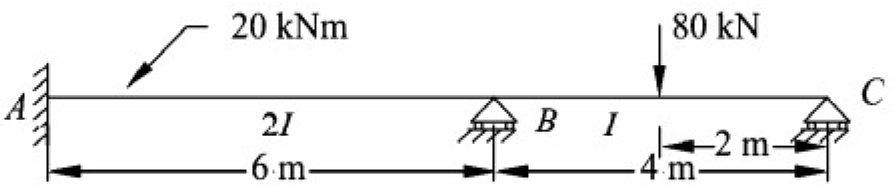
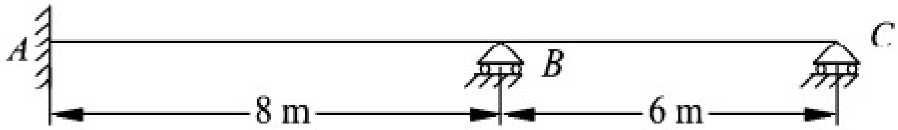
UNIT-IV
MOMENT DISTRIBUTION METHOD

<table>
<tr><td>1</td><td>Analyse the continuous beam shown in Figure by moment distributionmethod and draw bending moment diagram.

</td><td>[L4][CO5]</td><td>[12M]</td></tr>
<tr><td>2</td><td>Analyse the continuous beam shown in Figure by moment distribution method,if support B sinks by 12 mm. Given E = 200 kN/mm2 and I = 20 x 106 mm4

</td><td>[L4][CO5]</td><td>[12M]</td></tr>
<tr><td>3</td><td>Analysethe continuous beam shown in Figure by moment distribution method

</td><td>[L4][CO5]</td><td>[12M]</td></tr>
<tr><td>4</td><td>Analysethe beam ABCD shown in Figure by moment distribution method.

</td><td>[L4][CO5]</td><td>[12M]</td></tr>
<tr><td>5</td><td>Formulate slope deflection equations and equilibrium equations for the continuous beam shown in Figure . Moment of inertia is same throughout.

</td><td>[L4][CO5]</td><td>[12M]</td></tr>
<tr><td>6</td><td>Analysethe continuous beam ABCD shown in Figure by moment distribution procedure.

</td><td>[L4][CO5]</td><td>[12M]</td></tr>
<tr><td>7</td><td>Analyse the continuous beam shown in Figure by moment distribution method,</td><td>[L4][CO5]</td><td>[12M]</td></tr>
</table>

	if support B yields by 9 mm. Take El = 1 x 10*12 Nmm^2 throughout. Draw bending moment diagram. 		
8	a. Analyse the symmetric portal frame shown in Figure by moment distribution method. 	[L4][CO5]	**[06M]** **[06M]**
9	Analyse the rigid jointed frame shown in Figure by moment distribution method and draw bending moment diagram. 	[L4][CO5]	**[12M]**
10	Analyse the rigid jointed frame shown in Figure by moment distribution method and draw bending moment diagram. 	[L4][CO5]	**[12M]**

UNIT-V
STIFFNESS AND FLEXBILITY MATRIX

<table>
<tr><td>1</td><td>Analyse the continuous beam shown in Figure by flexibility matrix method

</td><td>[L4][CO6]</td><td>[12M]</td></tr>
<tr><td>2</td><td>Analyse the continuous beam shown in Figure by flexibility matrix method.Take El constant throughout.

</td><td>[L4][CO6]</td><td>[12M]</td></tr>
<tr><td>3</td><td>Analyse the continuous beam shown in Figure, if the downward settlementof supports B and C are 10 mm and 5 mm, respectively. Take El = 184 x 1011 Nmm2. Use flexibilitymatrix method.

</td><td>[L4][CO6]</td><td>[12M]</td></tr>
<tr><td>4</td><td>Support B of the continuous beam shown in Figure has a downwardsettlement of 30 mm. Calculate the support reactions at D by the flexibility matrix method.Take El = 5600 kN m^2

</td><td>[L4][CO6]</td><td>[12M]</td></tr>
<tr><td>5</td><td>Analyse the beam shown in Figure by stiffness matrix method

</td><td>[L4][CO6]</td><td>[12M]</td></tr>
<tr><td>6</td><td>Analyse the continuous beam shown in Fig. Assume that the supports are unyielding. Assume EI to be constant for all members by stiffness matrix method.

</td><td>[L4][CO6]</td><td>[12M]</td></tr>
<tr><td>7</td><td>Analyse the continuous beam shown in figure given below by flexibility matrix method

</td><td>[L4][CO6]</td><td>[12M]</td></tr>
</table>

8	Analyse the continuous beam *ABC* shown in figure given below, if support *B* sinks by 10 mm. Take*El* = 6000 kNm2. Use flexibility matrix method.  	[L4][CO6]	**[12M]**
9	Briefly explain the steps involved in: a) Flexibility matrix method of analysis b) Stiffness matrix method of analysis	[L4][CO6] [L4][CO6]	**[06M]** **[06M]**
10	Explain the following: a) Degree of static and kinematic indeterminacy b) Relationship between flexibility and stiffness matrices	[L4][CO6] [L4][CO6]	**[06M]** **[06M]**

Prepared by:
V.VENKATESH
AsstProfessor/CE