INSTITUTEOFAERONAUTICALENGINEERING

(Autonomous)
Dundigal, Hyderabad-500043

CIVIL ENGINEERING

TUTORIAL QUESTION BANK

Course Title	**STRUCTURAL ANALYSIS**				
Course Code	ACE008				
Programme	B.Tech				
Semester	V	CE			
Course Type	CORE				
Regulation	**IARE - R16**				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	4	-	4	-	-
Chief Coordinator	Mr. Suraj Baraik, Assistant Professor				
Course Faculty	Mr. Suraj Baraik, Assistant Professor Mr. S Ashok Kumar, Assistant Professor				

COURSE OBJECTIVES:

The course should enable the students to:	
I	Describe the processes of analysis of various structures such as beams, trusses, arches and frames.
II	Analyze statically indeterminate structures using force and displacement methods.
III	Draw the shear force, bending moment and influence line diagrams for various structures.
IV	Examine the various structures to calculate critical stresses and deformations.

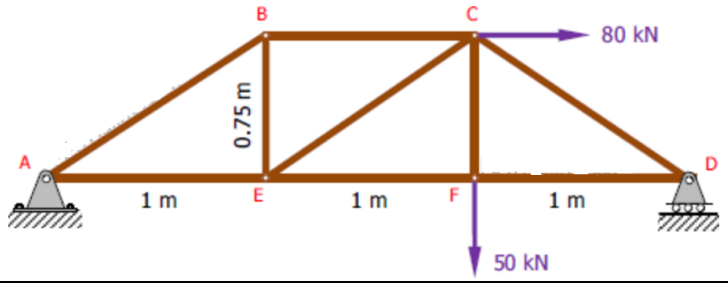
COURSE OUTCOMES (COs):

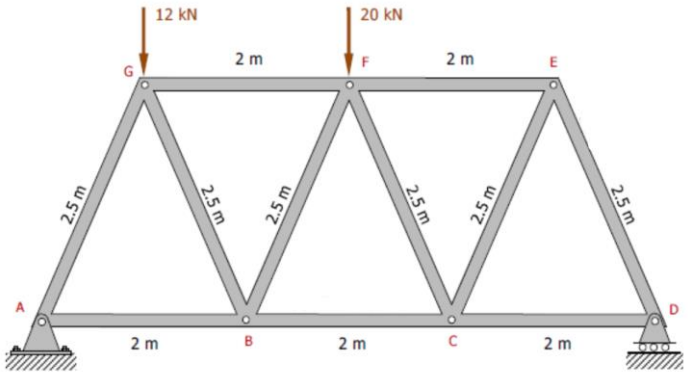
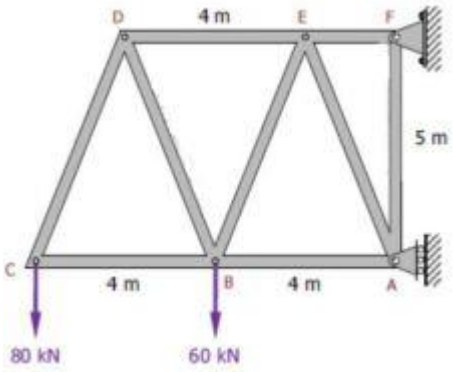
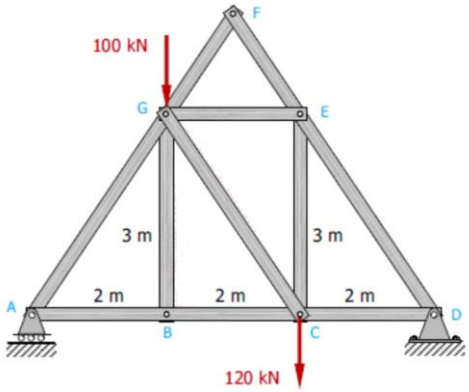
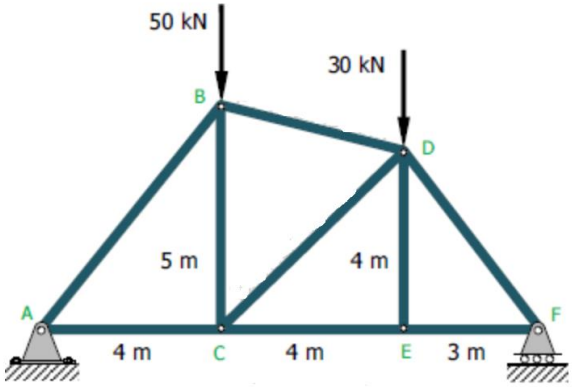
CO 1	Understand the concept of trusses and describe the analysis process of trusses by various methods.
CO 2	Determine stresses and analysis of two hinged and three hinged arches.
CO 3	Evaluate propped cantilever, fixed beam and continuous beam using various methods of analysis.
CO 4	Understand the concept of moment distribution method and its application to beams and frame structure.
CO 5	Comprehend the concept of moving loads and influence line diagram, its application to beams.

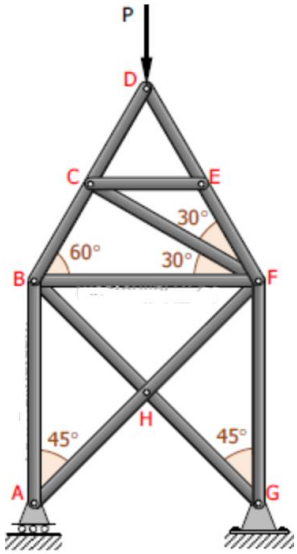
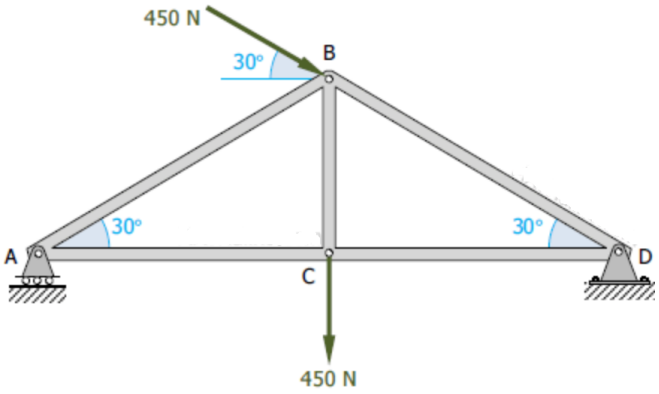
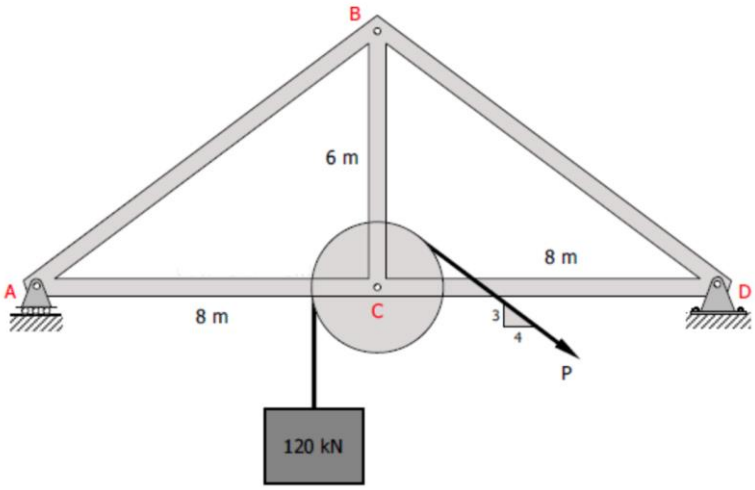
COURSE LEARNING OUTCOMES (CLOs):

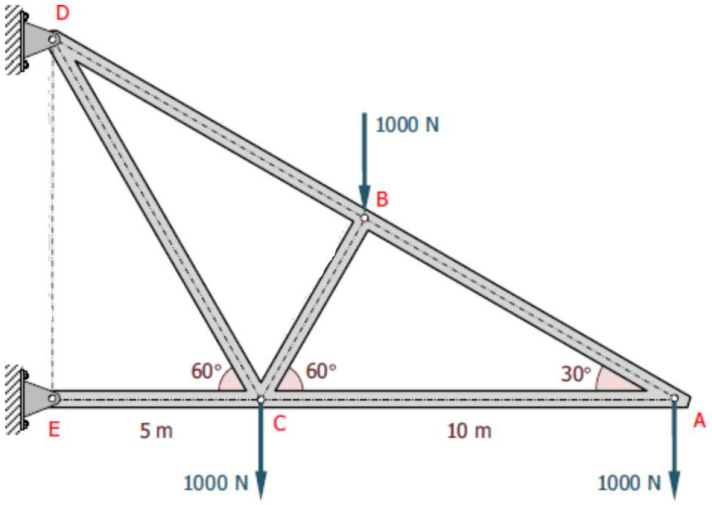
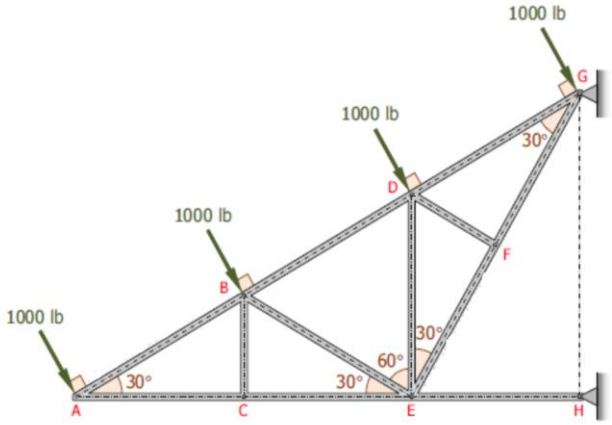
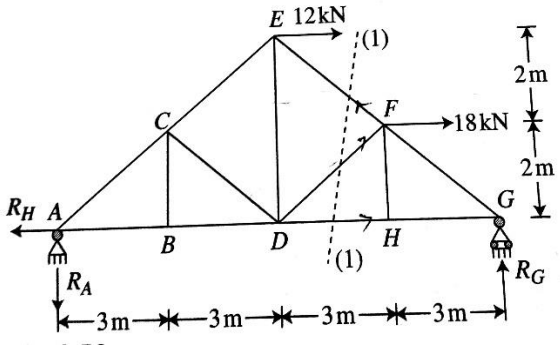
ACE008.01	Differentiate between the perfect, imperfect and redundant pin jointed frames.
ACE008.02	Identify the pin jointed frames and rigid joint structures.
ACE008.03	Understand the determinate and indeterminate structures for rigid jointed and pin jointed frames.
ACE008.04	Analysis of determinate pin jointed frames using method of joint, method of section for vertical load.
ACE008.05	Evaluate the determinate pin jointed frames by method of joint, method of section for horizontal and inclined load.
ACE008.06	Analysis of determinate pin jointed frames by tension coefficient method foe vertical, horizontal and inclined loads.
ACE008.07	Differentiate between three hinged and two hinged arches.
ACE008.08	Analysis of three hinged circular arches at different levels.
ACE008.09	Execute secondary stresses in two hinged arches due to temperature and elastic shortening of rib.
ACE008.10	Analyze the parabolic arches for the shear forces and bending moments.
ACE008.11	Evaluate the shear forces and bending moments in two-hinged arches using energy methods.
ACE008.12	Draw the shear forces and bending moments in three hinged arches using energy methods.
ACE008.13	Derive the moment equation for propped cantilever and fixed beams under various conditions
ACE008.14	Analysis of propped cantilever and fixed beam using the method of consistent deformation for different loading conditions.
ACE008.15	Evaluate of continuous beam using the method of clapeyron's equation of three moment.
ACE008.16	Analysis of continuous beam with sinking support using equation of three moments.
ACE008.17	Contrast between the concept of force and displacement methods of analysis of indeterminate structures.
ACE008.18	Analyze the methods of moment distribution to carry out structural analysis of 2D portal frames with various loads and boundary conditions.
ACE008.19	Apply the methods of slope deflection to carry out structural analysis of 2D portal frames with various loads and boundary conditions.
ACE008.20	Analysis of single storey frames with and without sway using slope deflection and moment distribution method.
ACE008.21	Comprehend the concept of moving loads, and its effect on shear force and bending moment on a beam.
ACE008.22	Evaluate the shear force and bending moment at a section of a determinate beam under moving load.
ACE008.23	Understand the concept of influence line diagram for shear force and bending moment.
ACE008.24	Construct the influence line diagram for shear force and bending movement for the entire beam.

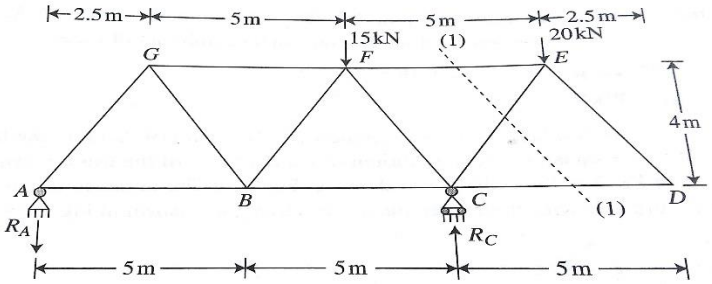
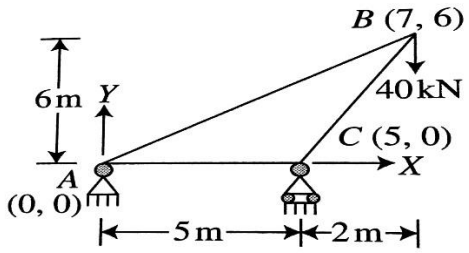
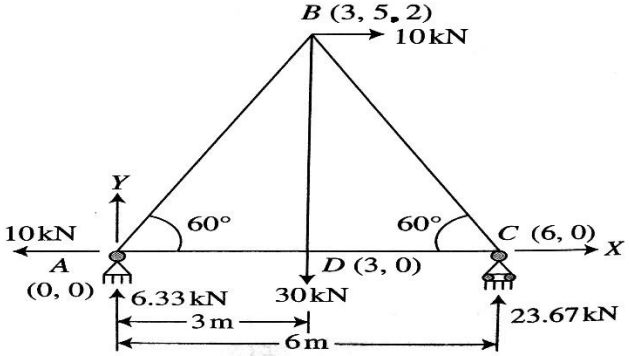
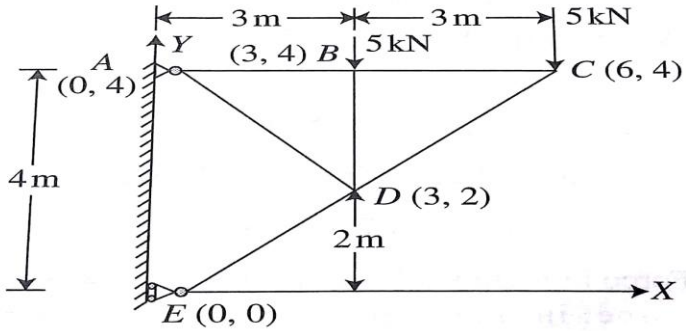
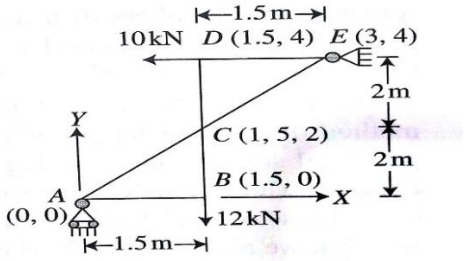
TUTORIAL QUESTION BANK

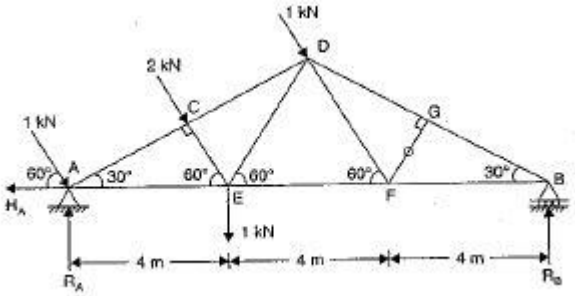
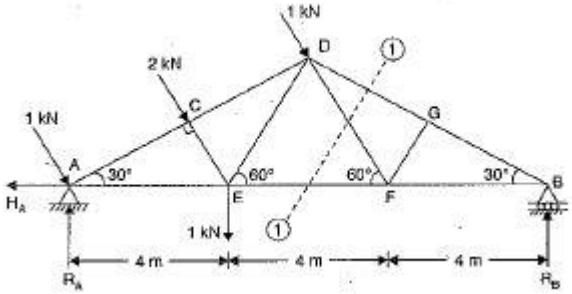
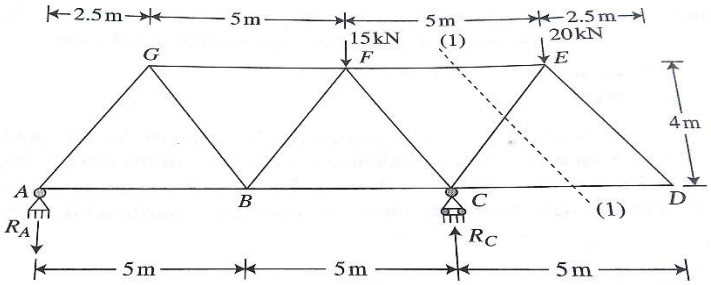
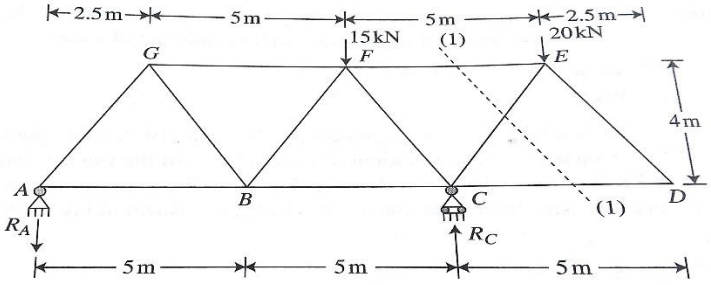
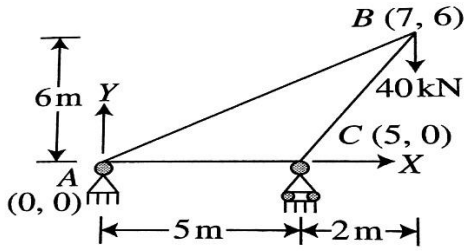
UNIT- I				
ANALYSIS OF PIN-JOINTED FRAMES (TRUSSES)				
Part - A (Short Answer Questions)				
S No	**QUESTIONS**	**Blooms Taxonomy Level**	**Course Outcomes**	**Course Learning Outcomes (CLOs)**
1	Explain briefly about trusses.	Remember	CO 1	ACE008.01
2	Define the following terms a) Plane truss b) Space truss	Remember	CO 1	ACE008.02
3	List out 2 different types of roof trusses with neat sketch	Understand	CO 1	ACE008.01
4	Classify trusses based on geometrical configuration and arrangements of bars.	Understand	CO 1	ACE008.02
5	Explain the term Simple truss.	Understand	CO 1	ACE008.02
6	Explain the term compound truss.	Understand	CO 1	ACE008.02
7	Explain the term complex truss	Remember	CO 1	ACE008.02
8	Classify trusses based on stability and determinacy concept.	Remember	CO 1	ACE008.02
9	Define the following term: a) Perfect frame b) Imperfect frame	Understand	CO 1	ACE008.01
10	Define the following term: a) Redundant frame b) Deficiency frame	Remember	CO 1	ACE008.01
11	Define warren trusses and parker trusses with neat sketch.	Remember	CO 1	ACE008.01
12	Sketch various types of bridge trusses.	Understand	CO 1	ACE008.01
13	What is determinacy of a truss?	Understand	CO 1	ACE008.02
14	Explain the stability of a truss.	Remember	CO 1	ACE008.05
15	Define the following term: a) Complex truss b) Simple truss	Remember	CO 1	ACE008.05
16	What are the assumptions used to determine the bar force in truss?	Understand	CO 1	ACE008.05
17	Explain zero force members.	Remember	CO 1	ACE008.05
18	Define and sketch the following trusses: a) Parker truss b) Baltimore truss	Remember	CO 1	ACE008.05
19	Define and sketch the following trusses: a) Pratt truss b) Warren truss	Remember	CO 1	ACE008.01
20	Define the following terms: a. Imperfect frame b. Compound frame	Remember	CO 1	ACE008.02
Part - B (Long Answer Questions)				
1	Find the force acting in all members of the truss shown in Figure. 	Understand	CO 1	ACE008.03

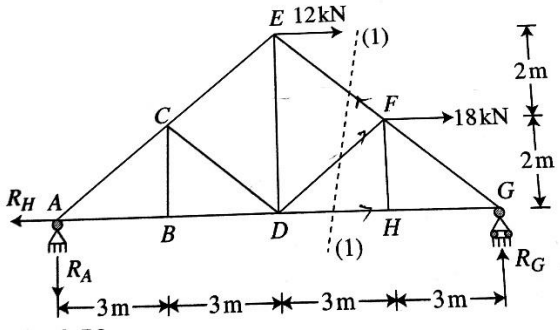
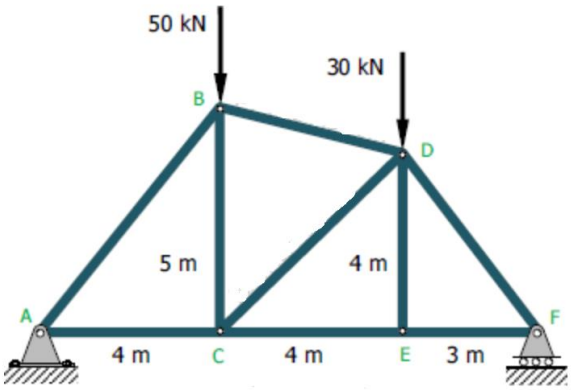
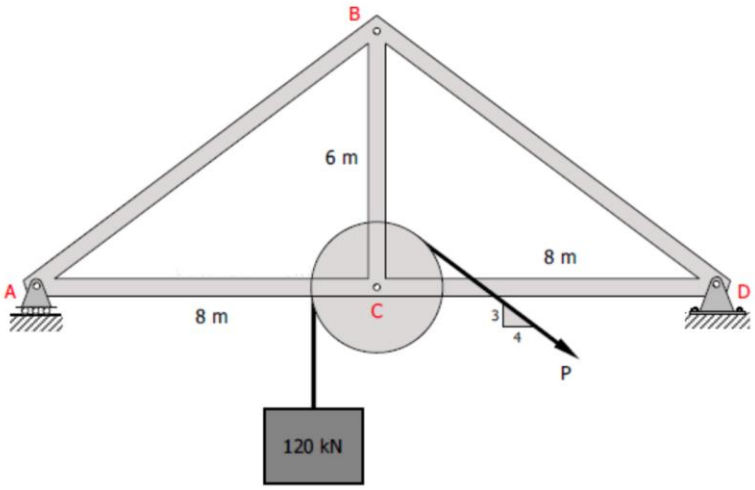
2	The structure in Fig. T-02 is a truss which is pinned to the floor at point A, and supported by a roller at point D. Determine the force to all members of the truss. 	Understand	CO 1	ACE008.02
3	Find the force in each member of the truss shown in Figure below. 	Understand	CO 1	ACE008.02
4	The truss pinned to the floor at D, and supported by a roller at point A is loaded as shown in Fig. T-06. Determine the force in member CG. 	Understand	CO 1	ACE008.03
5	Compute the force in all members of the truss shown in Fig. T-08. 	Understand	CO 1	ACE008.02

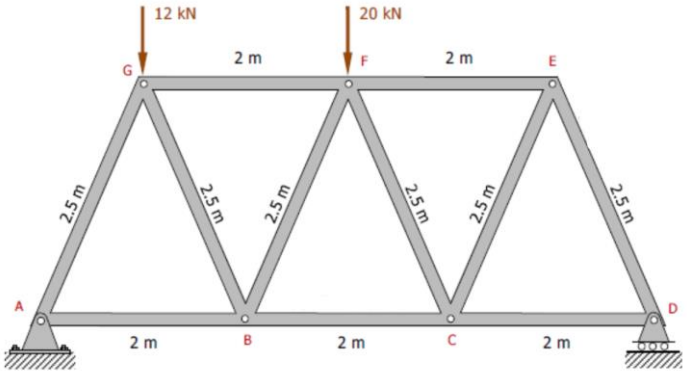
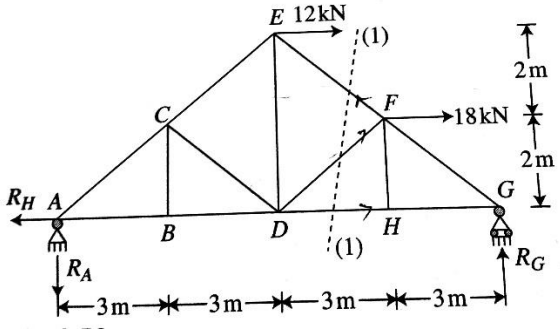
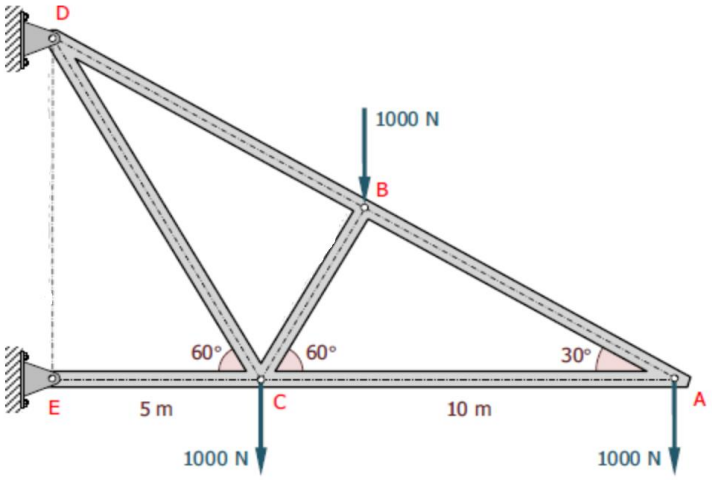
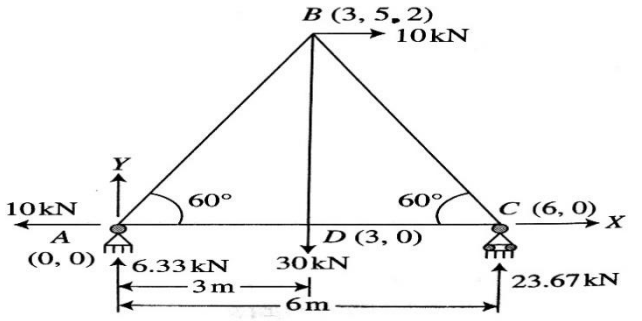
6	Determine the force in each bar of the truss shown in Fig. P-403. 	Understand	CO 1	ACE008.02
7	Determine the forces in the members of the roof truss shown in Fig. P-404. 	Understand	CO 1	ACE008.02
8	Determine the force in each bar of the truss shown in figure caused by lifting the 120 kN load at a constant velocity of 8 m per sec. What change in these forces, if any, results from placing the roller support at D and the hinge support at A? 	Understand	CO 1	ACE008.02

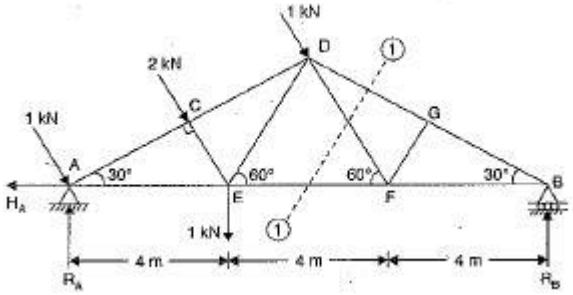
9	The cantilever truss in Figure is hinged at D and E. Find the force in each member 	Understand	CO 1	ACE008.02
10	In the cantilever truss shown in Fig. P-407, compute the force in members AB, BE, and DE. 	Understand	CO 1	ACE008.02
11	Explain briefly about truss, different types of trusses with neat sketches.	Understand	CO 1	ACE008.02
12	Determine the forces in the bars EF, DF and DH of the truss as shown in figure below by using method of sections. 	Understand	CO 1	ACE008.02

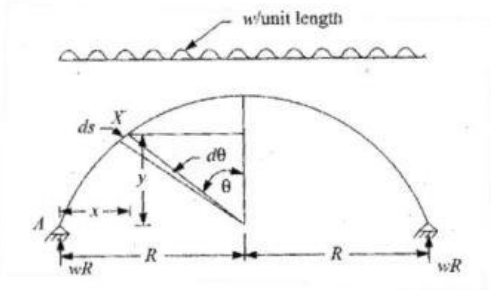
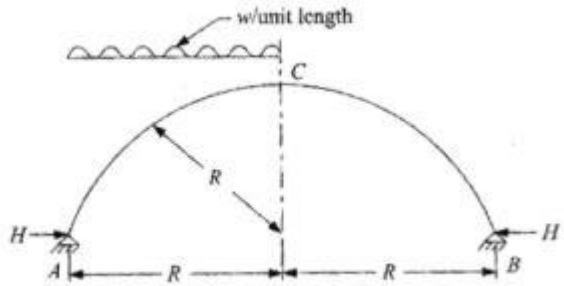
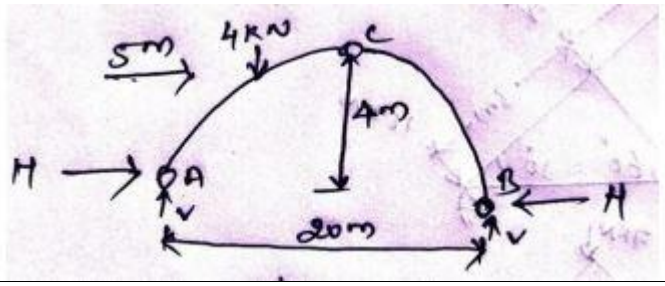
13	Evaluate the forces in members FE and CE of the truss as shown in the figure by using methods of section methods 	Understand	CO 1	ACE008.03
14	Evaluate the forces in all the bars of the truss as shown in the figure by using tension coefficient method. 	Understand	CO 1	ACE008.02
15	Analyze the frame shown in the figure by using method of tension coefficients. 	Understand	CO 1	ACE008.03
16	Determine the force in each member of the truss as shown in the figure by using tension coefficient method. 	Understand	CO 1	ACE008.02
17	Find the forces in all the bars of the frame shown in the figure using methods of joints. 	Understand	CO 1	ACE008.02

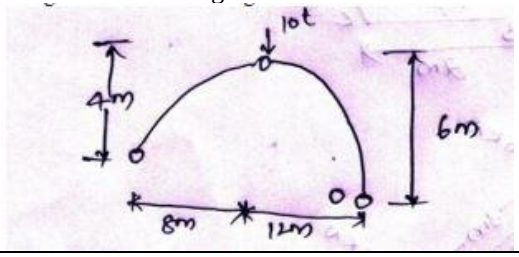
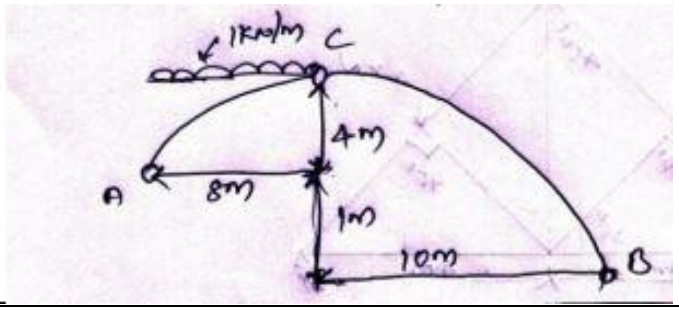
18	Determine the forces in truss as shown in the figure which is subjected to inclined loads by method of joints 	Understand	CO 1	ACE008.03
19	A truss of 12m span is loaded as shown in figure. Determine the forces in members DG, DF and EF using method of section. 	Understand	CO 1	ACE008.04
20	Evaluate the forces in members CE and CD of the truss as shown in the figure by using methods of section methods 	Understand	CO 1	ACE008.04
	Part - C (Problem Solving and Critical Thinking Questions)			
1	Evaluate the forces in members FE and CE of the truss as shown in the figure by using methods of section methods 	Understand	CO 1	ACE008.03
2	Evaluate the forces in all the bars of the truss as shown in the figure by using tension coefficient method. 	Understand	CO 1	ACE008.02

3	Determine the forces in the bars EF, DF and DH of the truss as shown in figure below by using method of sections. 	Understand	CO 1	ACE008.02
4	Compute the force in all members of the truss shown in Figure below. 	Understand	CO 1	ACE008.03
5	Determine the force in each bar of the truss shown in figure caused by lifting the 120 kN load at a constant velocity of 8 m per sec. What change in these forces, if any, results from placing the roller support at D and the hinge support at A? 	Understand	CO 1	ACE008.03

6	The structure in figure below is a truss which is pinned to the floor at point A, and supported by a roller at point D. Determine the force to all members of the truss. 	Understand	CO 1	ACE008.02
7	Determine the forces in the bars EF, DF and DH of the truss as shown in figure below by using method of sections. 	Understand	CO 1	ACE008.02
8	The cantilever truss in Figure is hinged at D and E. Find the force in each member 	Understand	CO 1	ACE008.03
9	Analyze the frame shown in the figure by using method of tension coefficients. 	Understand	CO 1	ACE008.02

10	A truss of 12m span is loaded as shown in figure. Determine the forces in members DG, DF and EF using method of section.  	Understand	CO 1	ACE008.02
	UNIT-II			
	ARCHES			
	Part – A (Short Answer Questions)			
1	Define the term Arches.	Remember	CO 2	ACE008.06
2	What are the applications of arches?	Remember	CO 2	ACE008.07
3	What are the different types of arches?	Understand	CO 2	ACE008.06
4	Classify arches based on different structural forms.	Understand	CO 2	ACE008.07
5	Define and sketch the following trusses: a. Stilted arch b. Segmented arch	Remember	CO 2	ACE00.06
6	Classify arches based on the number of hinges(support condition) with sketch	Understand	CO 2	ACE008.07
7	Explain the term symmetrical arch and unsymmetrical arch.	Remember	CO 2	ACE008.06
8	Explain the term tied arch	Remember	CO 2	ACE008.07
9	Explain briefly about the following terms a. Three hinged arches b. Two hinged arches	Remember	CO 2	ACE00.08
10	Define an arch. How an arch differs from beam.	Remember	CO 2	ACE008.06
11	Distinguish between a true arch and a corbelled arch.	Remember	CO 2	ACE008.06
12	State the eddy's theorem in arch.	Remember	CO 2	ACE008.07
13	Define the term masonry arch	Remember	CO 2	ACE008.07
14	How three hinged arch is different from two hinged arch and explain it.	Remember	CO 2	ACE008.08
15	Define the term hinge less or fixed arches	Remember	CO 2	ACE008.08
16	What are the advantages of fixed or hinge less arches?	Remember	CO 2	ACE008.07
17	Define the term circular arches?	Remember	CO 2	ACE008.06
18	Explain three hinged arch with neat sketch	Remember	CO 2	ACE008.08
19	Explain two hinged arch with neat sketch	Remember	CO 2	ACE008.07
20	Explain the term symmetrical arch with neat sketch	Remember	CO 2	ACE008.07
	Part - B (Long Answer Questions)			
1	Write the expression for the horizontal thrust of a two-hinged arch under the effects of temperature, rib-shortening and support-yielding? Explain the effects of each on the horizontal thrust.	Understand	CO 2	ACE008.09
2	Derive the expression for horizontal thrust of a two hinged arch under a general case of loads, without any other effects.	Understand	CO 2	ACE008.10
3	Derive the expression for strain energy of an arch.	Remember	CO 2	ACE008.08
4	A three hinged arch parabolic arch ABC has a span of 20m and central rise of 4m. The arch has hinges at the ends and at the center. A train of two point loads of 20Kn and 10Kn, 5m apart, crosses this arch from left to right, with 20Kn load leading. Calculate maximum thrust induced at the support.	Understand	CO 2	ACE008.10
5	A three hinged semicircular arch of radius R carries a uniformly distributed load W per unit run over the whole span. What will be the horizontal thrust?	Understand	CO 2	ACE008.10

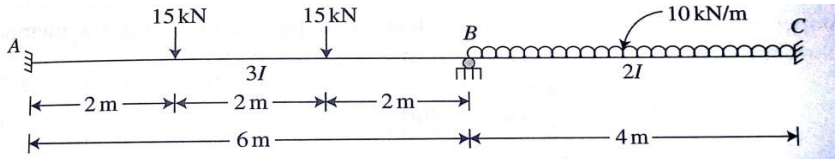
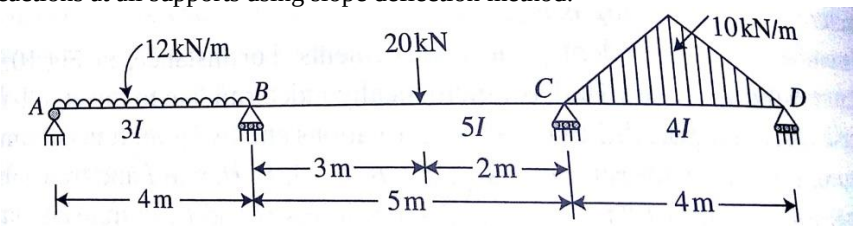
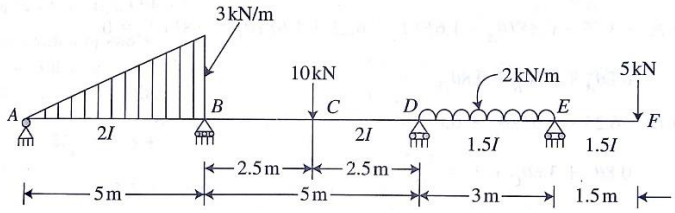
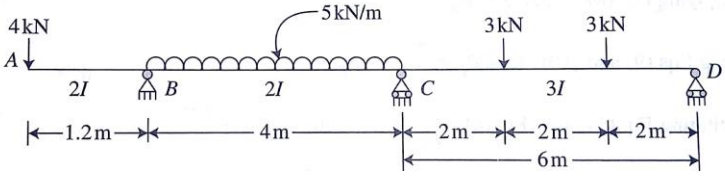
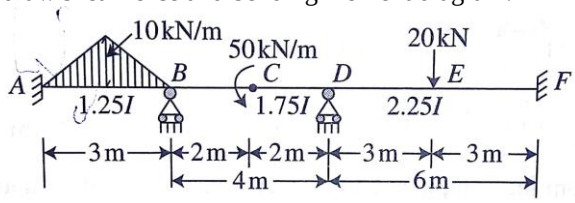
6	A semi-circular arch of radius R is subjected to a uniformly distributed load of w/unit length over the entire span. Assuming EI to be constant, determine the horizontal thrust. 	Remember	CO 2	ACE008.11
7	Determine the horizontal thrust developed in a two-hinged semi-circular arch subjected to a uniformly distributed load on only one-half of the arch. EI is constant throughout. 	Understand	CO 2	ACE008.11
8	A three hinged arch parabolic arch ABC has a span of 25m and central rise of 3m. The arch has hinges at the ends and at the center. A train of two point loads of 20Kn and 15Kn, 5m apart, crosses this arch from left to right, with 20Kn load leading. Calculate maximum thrust induced at the support.	Understand	CO 2	ACE008.08
9	For the three hinged parabolic arch shown in figure what is the value of horizontal thrust. 	Remember	CO 2	ACE008.08
10	A two-hinged parabola arches of span 30m and rise 6m carries two point loads, each 60kN, acting at 7.5 m and 15m from the left end, respectively. The moment of inertia varies as the secant of slope. Determine the horizontal thrust and maximum positive and negative moments in the arch rib.	Understand	CO 2	ACE008.11
11	Find out the thrust in a two-hinged parabolic arch of rise 10m ad span 60m subjected to a UDL of 25kN/m. the moment of inertia at the crown section is 1.14×10^{-3} m^4 and the area of the cross section is 6.75×10^{-2} m^2. Write the bending moment expression at any section at a distance x from the crown and determine the bending moment at the crown.	Understand	CO 2	ACE008.10
12	Determine the horizontal thrust developed in a two-hinged semi-circular arch of radius 20 m subjected to a uniformly distributed load of 3 kN/m on only one-half of the arch and a concentrated load of 20 kN at the crown. Take EI as constant.	Remember	CO 2	ACE008.08
13	Determine the horizontal thrust developed in a two-hinged semi-circular arch of radius 10 m subjected to a uniformly distributed load of 2 kN/m throughout the span and a concentrated load of 10 kN at the crown. Take EI as constant	Understand	CO 2	ACE008.11

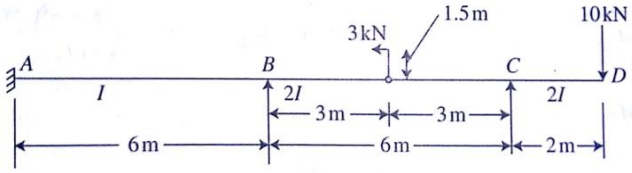
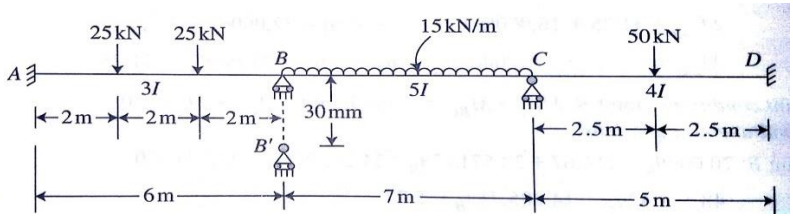
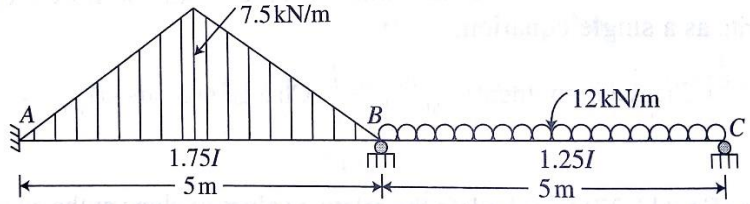
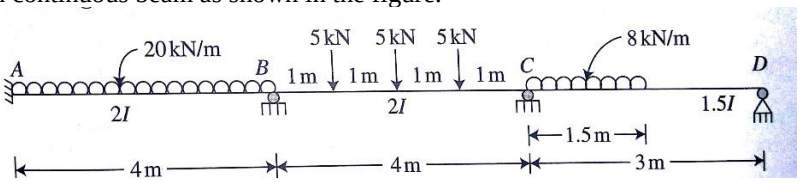
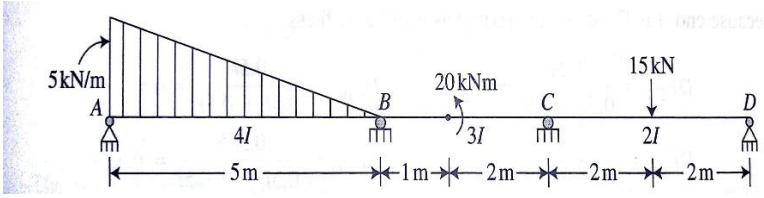
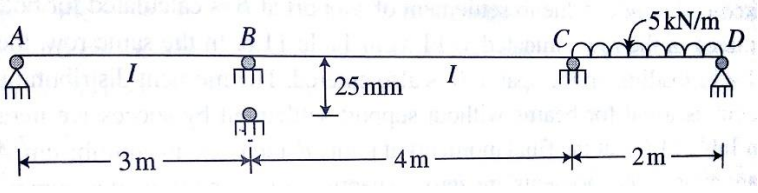
14	A three hinged arch is shown in fig. Calculate horizontal thrust. 	Understand	CO 2	ACE008.09
15	Calculate horizontal thrust at support „A" in a three hinged arch shown in fig. 	Remember	CO 2	ACE008.08
16	A three-hinged segmental arch has a span of 40m and a rise of 7m. It is subjected to a load of 80KN acting at 10m from the left support. Find a. The horizontal thrust and vertical reaction at supports. b. Normal thrust, radial shear and bending moment at 10m from the left support.	Understand	CO 2	ACE008.12
17	The span and rise of a three hinged arch are 40m and 10m, respectively. The equation of the arch is $y = x - (x^2/40)$ with origin at left abutment and X-axis directed towards right and Y-axis upwards. A UDL of 15kN/m is applied on the left of the arch. Find the reactions at abutments. Draw a moment diagram. Determine the locations of maximum moments.	Understand	CO 2	ACE008.08
18	Determine the horizontal thrust developed in a two-hinged semi-circular arch of radius 12 m subjected to a uniformly distributed load of 3 kN/m throughout the span and a concentrated load of 12 kN at the crown. Take EI as constant	Understand	CO 2	ACE008.09
19	Determine the horizontal thrust developed in a two-hinged semi-circular arch of radius 15 m subjected to a uniformly distributed load of 5 kN/m throughout the span and a concentrated load of 10 kN at the crown. Take EI as constant	Remember	CO 2	ACE008.11
20	Determine the horizontal thrust developed in a two-hinged semi-circular arch of radius 10 m subjected to a uniformly distributed load of 5 kN/m throughout the span and a concentrated load of 12 kN at the crown. Take EI as constant	Understand	CO 2	ACE008.10
	Part - C (Problem Solving and Critical Thinking Questions)			
1	A three hinged arch parabolic arch ABC has a span of 20m and central rise of 4m. The arch has hinges at the ends and at the center. A train of two point loads of 15KN and 10KN, 5m apart, crosses this arch from left to right, with 18KN load leading. Calculate maximum thrust induced at the support.	Understand	CO 2	ACE008.08
2	A two-hinged parabola arches of span 30m and rise 5m carries two point loads, each 50kN, acting at 7.5 m and 15m from the left end, respectively. The moment of inertia varies as the secant of slope. Determine the horizontal thrust and maximum positive and negative moments in the arch rib.	Understand	CO 2	ACE008.11
3	A three hinged arch parabolic arch ABC has a span of 20m and central rise of 6m. The arch has hinges at the ends and at the center. A train of two point loads of 15 KN and 16 KN, 5m apart, crosses this arch from left to right, with 20 KN load leading. Calculate maximum thrust induced at the support.	Understand	CO 2	ACE008.08
4	A two-hinged parabola arches of span 30m and rise 7m carries two point loads, each 40kN, acting at 7.5 m and 15m from the left end, respectively. The moment of inertia varies as the secant of slope. Determine the horizontal thrust and maximum positive and negative moments in the arch rib.	Understand	CO 2	ACE008.10

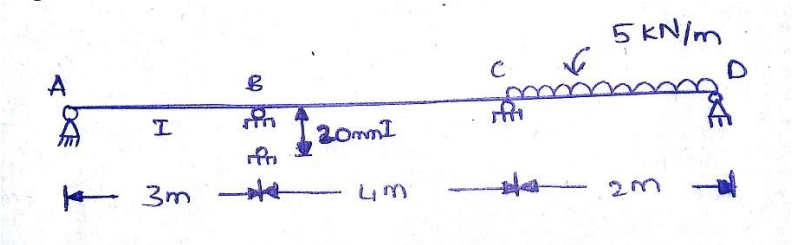
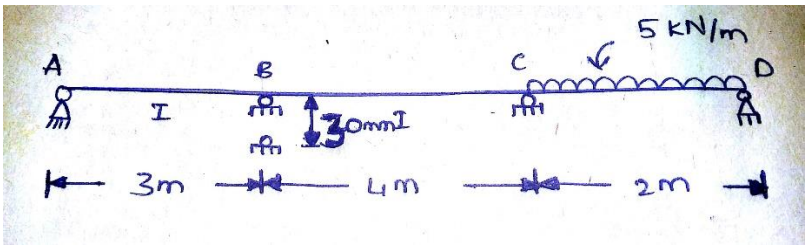
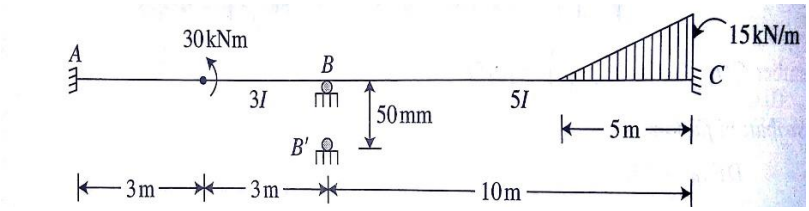
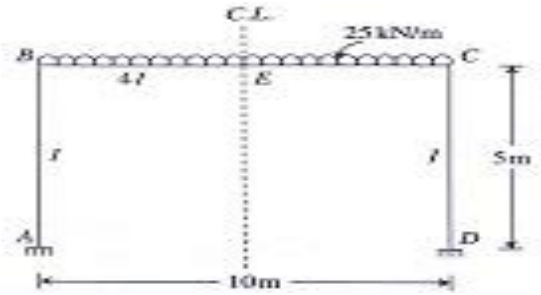
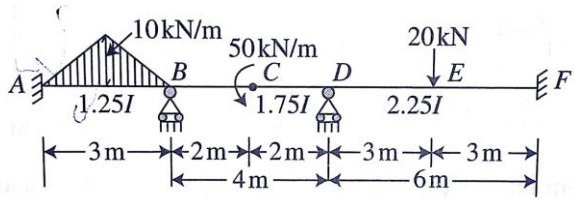
5	A three-hinged segmental arch has a span of 35m and a rise of 7m. It is subjected to a load of 90KN acting at 10m from the left support. Find a. The horizontal thrust and vertical reaction at supports. b. Normal thrust, radial shear and bending moment at 10m from the left support.	Understand	CO 2	ACE008.08
6	A three-hinged segmental arch has a span of 30m and a rise of 5m. It is subjected to a load of 100KN acting at 7m from the left support. Find a. The horizontal thrust and vertical reaction at supports. b. Normal thrust, radial shear and bending moment at 10m from the left support.	Understand	CO 2	ACE008.09
7	Determine the horizontal thrust developed in a two-hinged semi-circular arch of radius 10 m subjected to a uniformly distributed load of 4 kN/m throughout the span and a concentrated load of 15 kN at the crown. Take EI as constant	Understand	CO 2	ACE008.12
8	Find out the thrust in a two-hinged parabolic arch of rise 15m and span 60m subjected to a UDL of 15kN/m. the moment of inertia at the crown section is 1.14×10^{-3} m^4 and the area of the cross section is 6.75×10^{-2} m^2. Write the bending moment expression at any section at a distance x from the crown and determine the bending moment at the crown.	Understand	CO 2	ACE008.07
9	Write the expression for the horizontal thrust of a two-hinged arch under the effects of temperature, rib-shortening and support-yielding? Explain the effects of each on the horizontal thrust.	Understand	CO 2	ACE008.08
10	Determine the horizontal thrust developed in a two-hinged semi-circular arch of radius 10 m subjected to a uniformly distributed load of 2 kN/m throughout the span and a concentrated load of 10 kN at the crown. Take EI as constant.	Understand	CO 2	ACE008.09
	UNIT -III			
	FORCE METHOD OF ANALYSIS OF INDETERMINATE BEAMS			
	Part - A (Short Answer Questions)			
1	What are the reaction values for propped cantilever beam when it carries point load.	Remember	CO 3	ACE008.13
2	What are the reaction values for propped cantilever beam when it carries uniformly distributed load.	Remember	CO 3	ACE008.14
3	Difference between cantilever beam and propped cantilever beam	Understand	CO 3	ACE008.13
4	What is the effect of sinking of support for fixed beam	Remember	CO 3	ACE008.14
5	What is effect of rotation?	Remember	CO 3	ACE008.13
6	Explain the term moment of inertia.	Understand	CO 3	ACE008.14
7	Difference between propped cantilever beam and fixed beam	Understand	CO 3	ACE008.13
8	What is meant by propped cantilever	Remember	CO 3	ACE008.14
9	Draw Shear force diagram for a fixed beam carrying an eccentric load	Understand	CO 3	ACE008.14
10	Define fixed beam.	Understand	CO 3	ACE008.13
11	List out the various loading conditions.	Understand	CO 3	ACE008.14
12	Write short notes on continuous beam with overhang.	Remember	CO 3	ACE008.13
13	Draw bending moment diagram for a fixed beam carrying an eccentric load.	Remember	CO 3	ACE008.14
14	Define Deflection.	Remember	CO 3	ACE008.13
15	Explain the term maximum deflection.	Remember	CO 3	ACE008.14
16	Define clapeyron's theorem.	Remember	CO 3	ACE008.14
17	Explain the term continuous beams	Remember	CO 3	ACE008.14
18	Write the expression for bending moment for continuous beam under udl.	Remember	CO 3	ACE008.13
19	List out the applications of three moments?	Remember	CO 3	ACE008.14
20	Write about effects of sinking of supports	Understand	CO 3	ACE008.13
	Part – B (Long Answer Questions)			
1	A cantilever of length 10 m carries UDL of 800N/m length over the whole length. The free end of the cantilever is supported on a prop. The prop sinks by 5mm. If $E=3X10^5$N/mm2 and $I=10^8$ mm^4, then the prop reaction.	Understand	CO 3	ACE008.14
2	A cantilever of length 8m carries UDL of 2kN/m run over the whole length. The cantilever is propped rigidly at the free end. If $E=1X10^5N/mm^2$ and $I=10^8$ mm^4, then determine reaction at the rigid prop and deflection at the center.	Understand	CO 3	ACE008.15

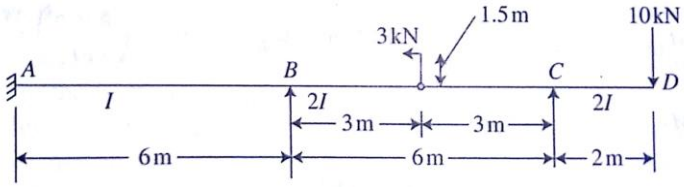
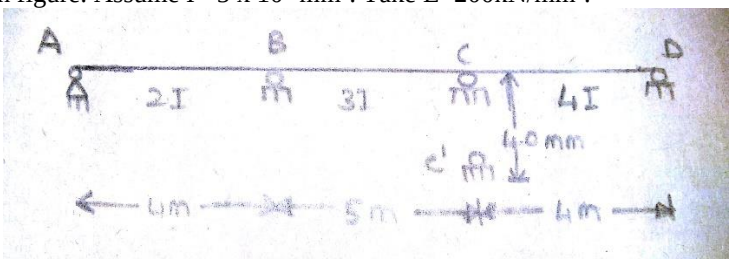
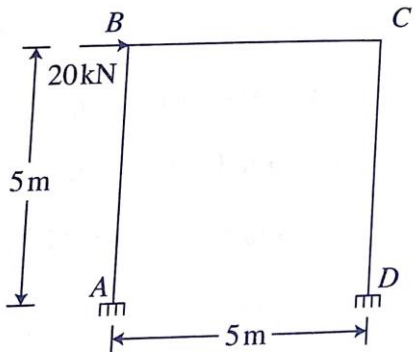
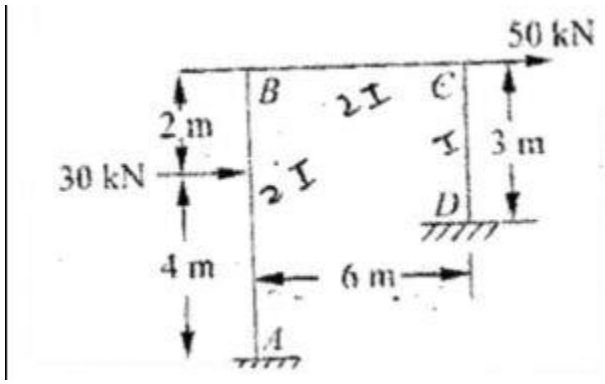
3	A cantilever of length 5m carries a point load of 24kN at its center. The cantilever is propped rigidly at the free end. Determine the reaction at the rigid prop.	Understand	CO 3	ACE008.14
4	A cantilever of length 4m carries a UDL of 1kN/m run over the whole span length. The cantilever is propped rigidly at the free end. If the value of If $E=2X10^5 N/mm^2$ and $I=10^8$ mm^4, Determine the reaction at the rigid prop and deflection at the center.	Understand	CO 3	ACE008.14
5	A fixed beam AB, 5m long, carries a point load of 48kn at its center. the moment of inertia of the beam is 5x107 mm^4 and value of E for the beam materials is $2x10^5$ N/mm^2. Determine Fixed end moments at A and B, and Deflection under the load.	Understand	CO 3	ACE008.15
6	A fixed beam of length 5m carries a point load of 20kN at a distance of 2m from A. Determine the fixed end moments and deflection under the load, if the flexural rigidity of the beam is $1x10^4$ kN/m^2	Understand	CO 3	ACE008.14
7	A fixed beam of length 6m carries point loads of 20 kN and 15kN at distance 2m and 4m from the left end A. Find the fixed end moments and the reactions at the supports. Draw B.M and S.F diagrams.	Understand	CO 3	ACE008.15
8	A fixed beam of length 3m carries tow point loads of 30 kN each at a distance of 1m from both ends. Determine the fixing moments and draw B.M diagram.	Understand	CO 3	ACE008.14
9	A fixed beam AB of length 6m carries a uniformly distributed load 3 kN /m over the left half of the span together with a point load of 4 kN at a distance of 4.5m from the left end. Determine the fixing end moments and support reactions.	Understand	CO 3	ACE008.15
10	A cantilever of length 8 m carries UDL of 0.8 kN /m length over the length. The free end of the cantilever is supported on a prop. The prop sinks by 5mm. If $E=2X10^5 N/mm^2$ and $I=10^8$ mm^4, then the prop reaction length.	Understand	CO 3	ACE008.15
11	Explain in detail clapeyron's theorem of three moments	Understand	CO 3	ACE008.14
12	A beam ABC of length of 16 m consists of spans AB and BC each 8 m long and is simply supported at A, B and C. The beam carries a UDL of 4 kN/m on the whole length. Find the reaction at the supports and the support moments.	Understand	CO 3	ACE008.15
13	A beam ABC of length of 16 m consists of spans AB and BC each 10 m long and is simply supported at A, B and C. The beam carries a UDL of 6 kN/m on the whole length. Find the reaction at the supports and the support moments.	Understand	CO 3	ACE008.15
14	A continuous beam ABC covers two consecutive spans AB and BC of lengths 4 m and 6 m, carrying uniformly distributed loads of 6 kN/m and 10 kN/m respectively. If the ends A and C are simply supported find the support moments at A, B and C. Draw bending moment diagram.	Understand	CO 3	ACE008.15
15	A continuous beam ABC covers two consecutive spans AB and BC of lengths 8 m and 10m, carrying uniformly distributed loads of 80 kN/m and 120kN/m respectively. If the ends A and C are simply supported find the support moments at A, B and C. Draw Bending moment diagram.	Understand	CO 3	ACE008.14
16	A continuous beam ABC of length 3L consists of spans AB and BC of lengths 2L and L respectively. The beam carries UDL of W per metre run on the whole beam. Determine the bending moments and reactions. Draw B. M. diagram.	Understand	CO 3	ACE008.15
17	A continuous beam consists of three successive span of 8 m, 10 m, 6 m, and carries loads of 6 kN/m, 4 kN/m, 8 kN/m respectively on the span. Determine the reactions at supports and bending moments.	Understand	CO 3	ACE008.15
18	A continuous beam ABC of length 5L consists of spans AB and BC of lengths 3L and 2L respectively. The beam carries UDL of W per unit run on the whole beam. Determine the bending moments and reactions and draw BMD.	Understand	CO 3	ACE008.15
19	A continuous beam consists of three successive span of 6 m, 8 m, 4 m, and carries loads of 6 kN/m, 4 kN/m, 8 kN/m respectively on the span. Determine the reactions at supports and bending moments.	Understand	CO 3	ACE008.14
20	A continuous beam consists of three successive span of 6 m, 8 m, 4 m, and carries loads of 3 kN/m ^{2}, kN/m, 5 kN/m respectively on the span . Determine the reactions at supports and bending moments.	Understand	CO 3	ACE008.15

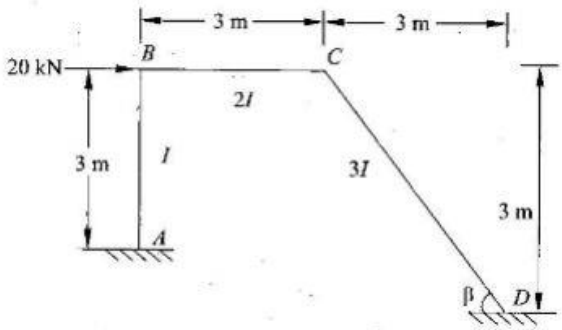
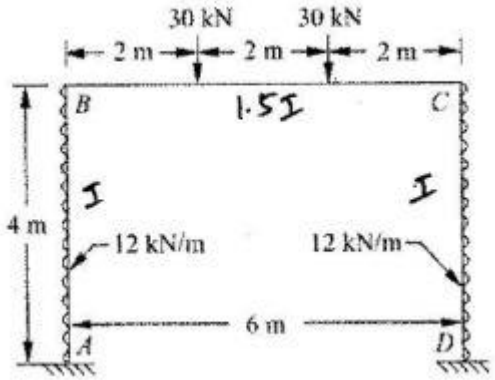
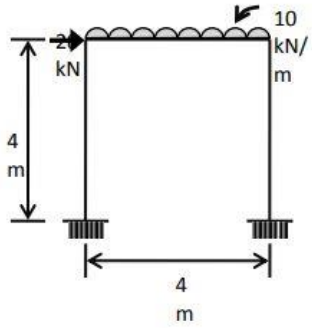
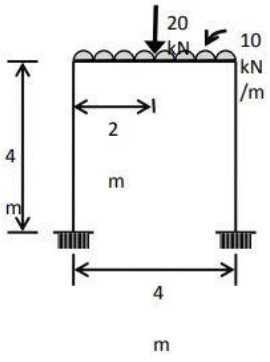
Part – C (Problem Solving and Critical Thinking)				
1	For a rigidly fixed beam AB of 5m span carrying UDL of 10kN/m, over the entire span, locate the points of contraflexure and draw BMD.	Understand	CO 3	ACE008.14
2	A beam built in at both the ends is loaded with a triangular loading on its one half of the span, the other load half carries no load. The load gradually increases from zero at the fixed end to 15Kn/m at mid span.The span of the beam is 5m. Determine the bending moments.	Understand	CO 3	ACE008.15
3	A beam of uniform cross section and 5m length, is built in at each end. It carries a udl of 10Kn/m extending from 3m from one end and a concentrated load of 20Kn, 1m from the other end. Sketch the B.M diagram giving principal numerical values.	Understand	CO 3	ACE008.15
4	A beam fixed at both ends is prismatic. It carries a load of varying intensity zero at the end to w/unit length at the center. Determine the fixed moments.	Understand	CO 3	ACE008.14
5	A cantilever of length 10 m carries UDL of 1 kN/m length over the length. The free end of the cantilever is supported on a prop. The prop sinks by 5mm. If $E=2X10^5 N/mm^2$ and $I=10^8 mm^4$, then the prop reaction length.	Understand	CO 3	ACE008.15
06	A beam ABC of length of 10 m consists of spans AB and BC each 8 m long and is simply supported at A, B and C. The beam carries a UDL of 24 kN/m on the whole length. Find the support moments.	Understand	CO 3	ACE008.14
07	A beam ABC of length of 8 m consists of spans AB and BC each 4 m long and is simply supported at A, B and C. The beam carries a UDL of 20 kN/m on the whole length. Find the support moments.	Understand	CO 3	ACE008.15
08	A continuous beam ABC covers two consecutive spans AB and BC of lengths 4 m and 6 m, carrying uniformly distributed loads of 60 kN/m and 90 kN/m respectively. If the ends A and C are simply supported find the support moments at A, B and C. Draw bending moment diagram.	Understand	CO 3	ACE008.15
09	A continuous beam ABC covers two consecutive spans AB and BC of lengths 8 m and 10 m, carrying uniformly distributed loads of 60 kN/m and 120 kN/m respectively. If the ends A and C are simply supported find the support moments at A, B and C and draw bending moment diagram.	Understand	CO 3	ACE008.14
10	A beam ABC of length of 1 m consists of spans AB and BC each 0.5 m long and is simply supported at A, B and C. The beam carries a UDL of 4 KN/m on the whole length. Find the reaction at the supports and the support moments.	Understand	CO 3	ACE008.15
UNIT -IV				
DISPLACEMENT METHOD OF ANALYSIS: SLOPE DEFLECTION AND MOMENT DISTRIBUTION				
Part – A (Short Answer Questions)				
1	Define continuous beam with neat sketch	Remember	CO 4	ACE008.16
2	Explain the term degree of kinematic indeterminacy.	Understand	CO 4	ACE008.16
3	Explain the term degree of freedom.	Understand	CO 4	ACE008.16
4	What are the sign conventions for analyzing slope deflection method.	Remember	CO 4	ACE008.17
5	Define sway in a frame.	Understand	CO 4	ACE008.18
6	What are the equilibrium equation for a space structure?	Understand	CO 4	ACE008.17
7	What are the equilibrium equations for a continuous beam?	Understand	CO 4	ACE008.16
8	Find the degree of freedom for a continuous beam AC with point loads acting at mid span of each support. The length of the each span is 5m with three hinged supports.	Understand	CO 4	ACE008.16
9	Define the term stiffness.	Understand	CO 4	ACE008.16
10	Define the following terms: Hinge Joint	Understand	CO 4	ACE008.16
11	What is stiffness factor?	Understand	CO 4	ACE008.17
12	What is sinking of support	Understand	CO 4	ACE008.16
13	Define the term non sway	Remember	CO 4	ACE008.16
14	What is the effect of sinking of support in Three moment theorem?	Remember	CO 4	ACE008.17
15	Define the term distribution factor.	Remember	CO 4	ACE008.16
16	Define the term carry over factor.	Remember	CO 4	ACE008.16

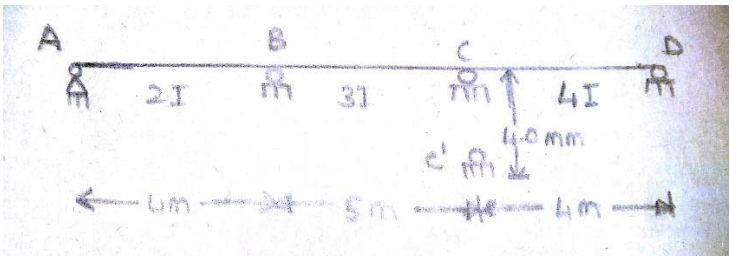
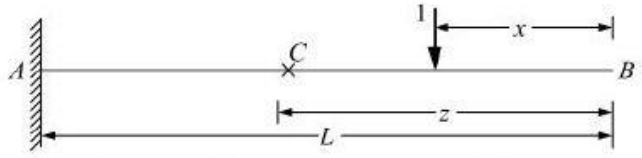
17	What is effect of rotation?	Remember	CO 4	ACE008.17
18	What is modified stiffness factor?	Remember	CO 4	ACE008.16
19	What are the end moments?	Remember	CO 4	ACE008.16
20	Explain the term Space structure with suitable example	Remember	CO 4	ACE008.16
	Part – B (Long Answer Questions)			
1	Analyse the two span continuous beam shown in figure by moment distribution method. 	Understand	CO 4	ACE008.17
2	A continuous beam hinged at left end carries the load as shown in figure. The supports are all at the same level. Determine the bending moments and reactions at all supports using slope deflection method. 	Understand	CO 4	ACE008.18
3	Analyse the continuous beam shown in figure by slope deflection 	Understand	CO 4	ACE008.17
4	Analyse the continuous beam shown in figure by slope deflection method. 	Understand	CO 4	ACE008.18
5	A continuous beam with left end fixed with an overhang on the right is shown in the figure below. Determine the end moments by slope-deflection method. Also draw shear force and bending moment diagram. 	Understand	CO 4	ACE008.17

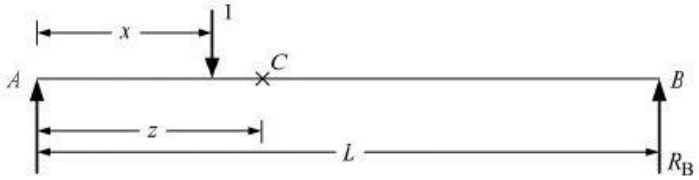
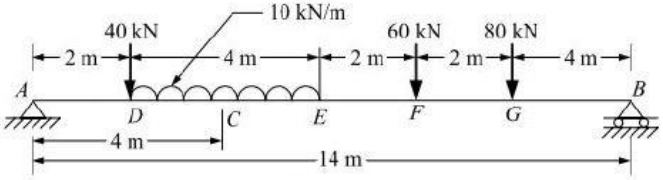
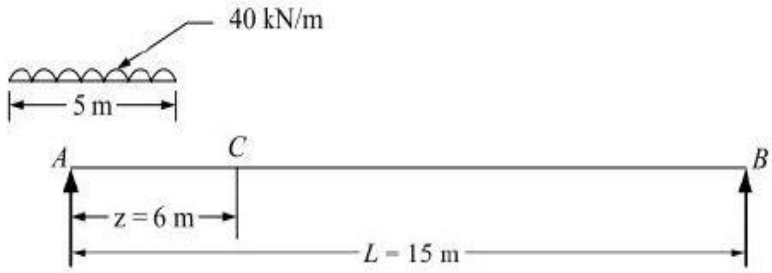
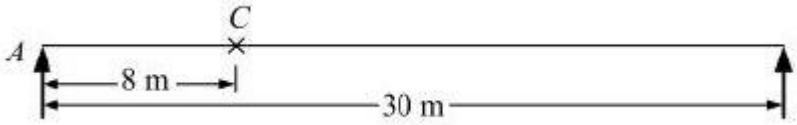
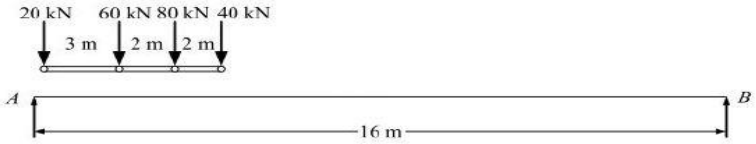
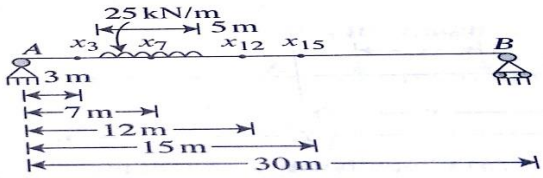
6	Analyse the continuous beam shown in the figure below owing to effect of 30mm settlement at support B by slope-deflection method. 	Understand	CO 4	ACE008.17
7	Analyse the two-span continuous beam shown in figure using moment distribution method 	Understand	CO 4	ACE008.18
8	Using moment distribution methods, determine the end moments in the continuous beam as shown in the figure. 	Understand	CO 4	ACE008.17
9	Using moment distribution methods, determine the end moments in the three span continuous beam as shown in the figure. 	Understand	CO 4	ACE008.18
10	Analyse the continuous beam shown in figure using moment distribution method 	Understand	CO 4	ACE008.17
11	Analyse the continuous beam with sinking of support at B by 25mm as shown in figure. Assume I= 6 x 10^6 mm^4. Take E=200kN/mm^2. 	Understand	CO 4	ACE008.18

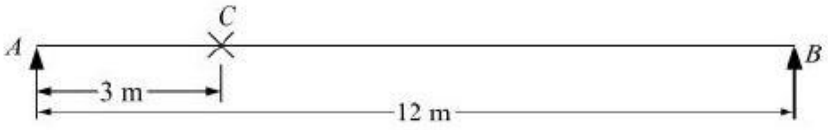
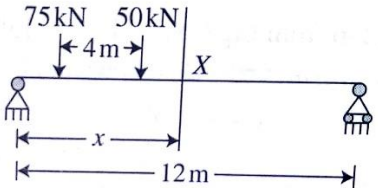
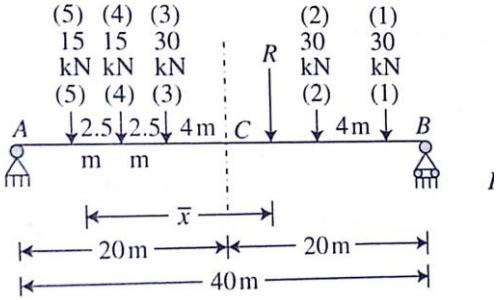
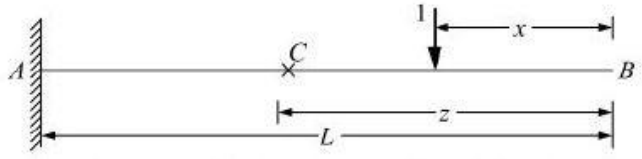
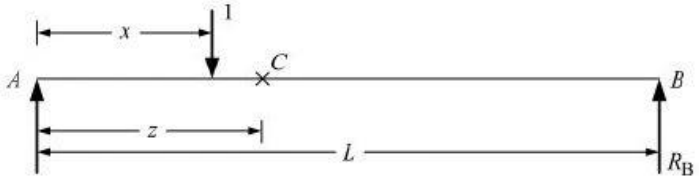
12	Analyse the continuous beam with sinking of support at B by 20 mm as shown in figure. Assume I= 6.5 x 10^6 mm^4. Take E=200kN/mm^2. 	Understand	CO 4	ACE008.17
13	Analyse the continuous beam with sinking of support at B by 30mm as shown in figure. Assume I= 7 x 10^6 mm^4. Take E=200kN/mm^2. 	Understand	CO 4	ACE008.18
14	Analyse the continuous beam with sinking of support at B by 50mm as shown in figure. Assume I= 5 x 10^6 mm^4. Take E=200kN/mm^2. 	Understand	CO 4	ACE008.17
15	Using symmetry the final moments in the symmetrical portal frame shown in the figure below by moment distribution method. 	Understand	CO 4	ACE008.18
	Part – C (Problem Solving and Critical Thinking)			
1	Determine the end moments in a continuous beam shown in figure using slope deflection method. Draw shear force and bending moment diagrams. 	Understand	CO 4	ACE008.18

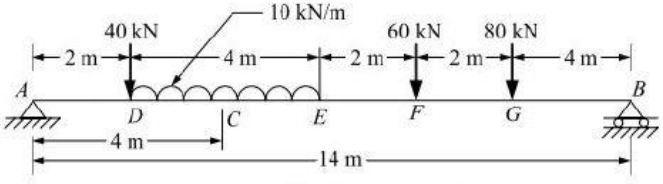
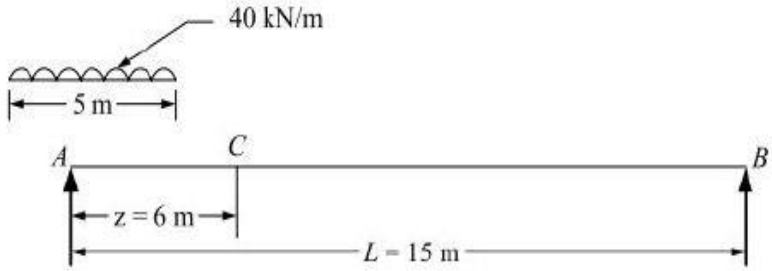
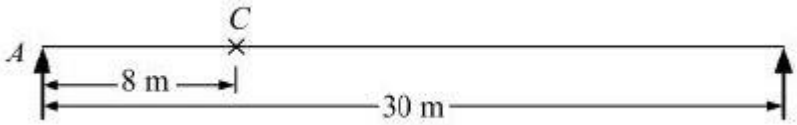
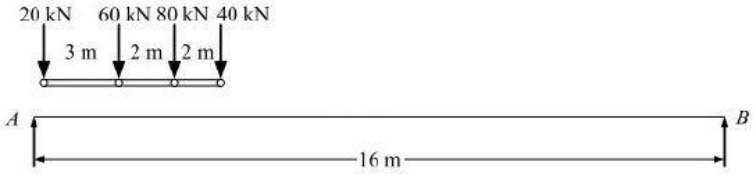
2	A continuous beam with left end fixed with an overhang on the right is shown in the figure below. Determine the end moments by slope-deflection method. Also draw shear force and bending moment diagram. 	Understand	CO 4	ACE008.17
3	Analyse the continuous beam with sinking of support at B by 40mm as shown in figure. Assume I= 5 x 10^6 mm^4. Take E=200kN/mm^2. 	Understand	CO 4	ACE008.18
4	Analyse the frame shown in figure by slope deflection equations assume EI to be constant. Draw SFD and BMD 	Understand	CO 4	ACE008.17
5	Analyze the symmetric frame shown in figure given below by moment distribution method. 	Understand	CO 4	ACE008.18

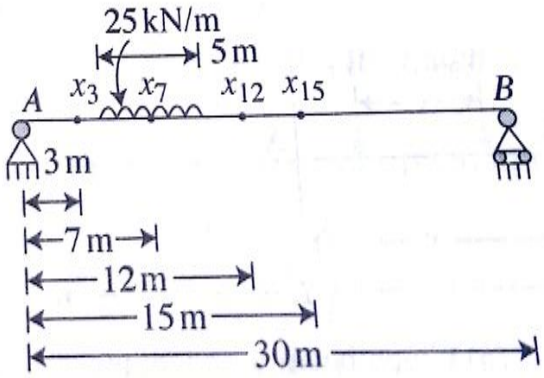
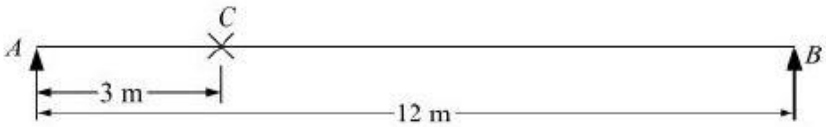
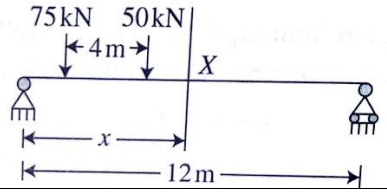
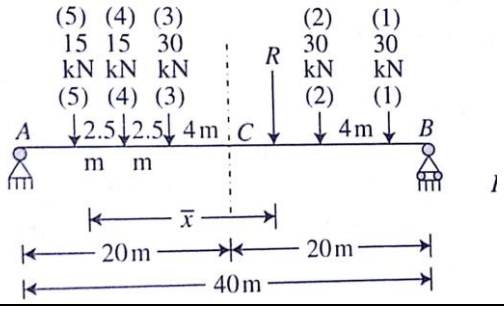
6	Analyze the frame shown in the below figure by moment distribution method and sketch bending moment diagram. 	Understand	CO 4	ACE008.17
7	Analyze the frame shown below by moment distribution method. 	Understand	CO 4	ACE008.18
8	Carry out the non-sway analysis for the following frame by Moment Distribution Method, and draw the bending moment diagram. Assume constant EI for all members. 	Understand	CO 4	ACE008.17
9	Carry out the sway analysis for the following frame by Moment Distribution Method, and draw the bending moment diagram. Assume constant EI for all members. 	Understand	CO 4	ACE008.18

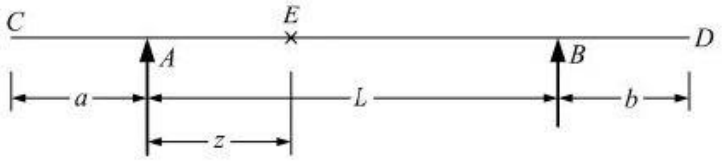
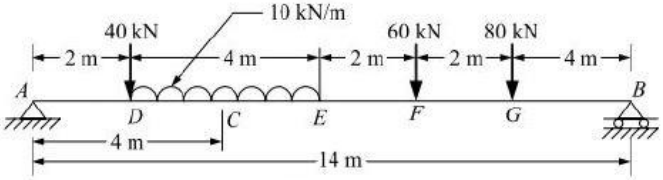
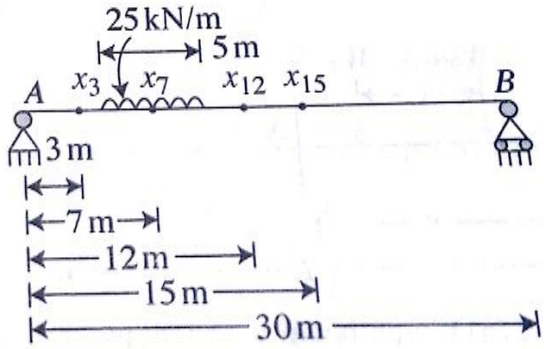
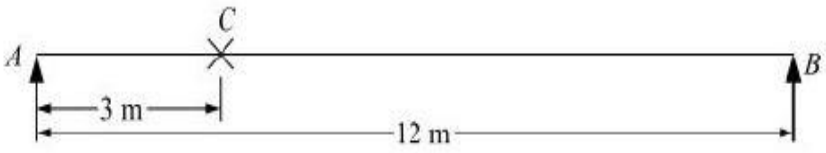
10	Analyse the continuous beam as shown in figure by moment distribution method. Assume E= 200kN/mm^2. Support C sinks by 40mm and I = 6.5 x 10^6 mm^4. 	Understand	CO 4	ACE008.17
	UNIT-V			
	INFLUENCE LINES			
	Part - A (Short Answer Questions)			
1	What is moving load or rolling load?	Understand	CO 5	ACE008.20
2	What are the examples for moving load or rolling loads?	Remember	CO 5	ACE008.19
3	How is the maximum shear force determined in case of rolling loads?	Understand	CO 5	ACE008.19
4	How is the maximum bending moment determined in case of rolling loads?	Remember	CO 5	ACE008.18
5	Define the term absolute maximum shear force.	Remember	CO 5	ACE008.20
6	Define the term absolute maximum bending moment.	Remember	CO 5	ACE008.20
7	Explain equivalent UDL in case of beam.	Understand	CO 5	ACE008.20
8	Explain briefly about the focal length in beam with neat sketch.	Understand	CO 5	ACE008.19
9	What is influence line diagram?	Understand	CO 5	ACE008.19
10	Draw the influence line diagram for a simply supported beam AB for left support reaction, with a point load at a distance of x from right support B. The length of the beam is L.	Understand	CO 5	ACE008.20
11	Define the term statically determinate structure.	Remember	CO 5	ACE008.20
12	Define the term statically indeterminate structure.	Understand	CO 5	ACE008.19
13	What is the difference between shear or moment diagram and influence line diagram?	Remember	CO 5	ACE008.19
14	Draw the influence line diagram for shear at mid span C of a simple supported beam AB with point load acting at mid span of intensity 1N/mm2. The length of the beam is L.	Understand	CO 5	ACE008.19
15	Explain the term live loads with suitable examples.	Remember	CO 5	ACE008.20
16	Explain the term dead loads with suitable examples.	Understand	CO 5	ACE008.20
17	What is the difference between live load and dead load.	Remember	CO 5	ACE008.20
18	List out any two characteristic of influence line diagram	Understand	CO 5	ACE008.19
19	What are the application of influence line diagram	Remember	CO 5	ACE008.19
20	Draw the influence line diagram for an overhang beam ABC with distance AB of 5m and BC of 1.5m. A concentrated load of intensity 1kN/m2 is applied at C.	Understand	CO 5	ACE008.20
	Part - B (Long Answer Questions)			
1	Draw the influence line diagram for shear force and bending moment for a cantilever beam at point A which is fixed and at a section C along the span length. Let the unit load acts at a distance x from the free end B. 	Understand	CO 5	ACE008.19

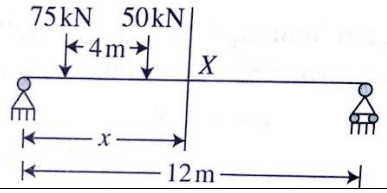
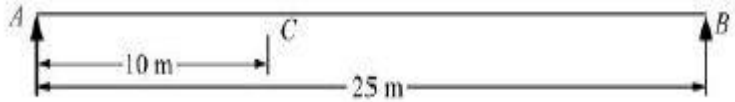
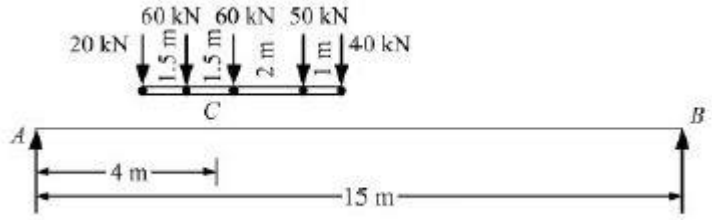
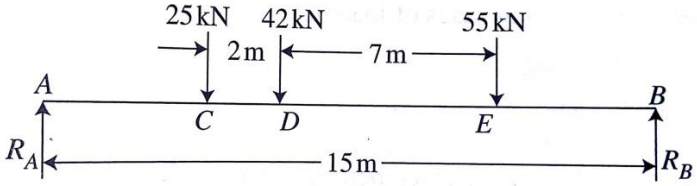
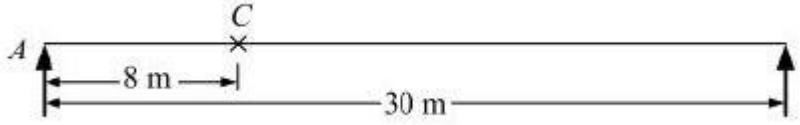
2	Draw the influence line diagram for a Simply supported beam AB with span length L, and carries a unit load at a distance x from left support A. 	Understand	CO 5	ACE008.20
3	Using influence line diagram determine the shear force and bending moment at section C in the simply supported beam as shown in the figure. 	Understand	CO 5	ACE008.20
4	A simply supported beam has a span of 15m. uniformly distributed load of 40kN/m and 5m long crosses the girder from left to right. Draw the influence line diagram for shear force and bending moment at a section 6m from the left end. Use this diagrams to calculate maximum bending moment and shear force at this section. 	Understand	CO 5	ACE008.19
5	Four points load 8kN, 15kN, 15kN and 10kN have a center to center spacing of 2m between consecutive loads and they traverse a girder of 	Understand	CO 5	ACE008.19
6	A train of concentrated loads as shown in figure moves from left to right on a simply supported girder of span of 16m. determine the absolute maximum shear force and bending moment developed in the beam. 	Understand	CO 5	ACE008.20
7	A UDL of length 5m and intensity 25kN/m moves across a simple beam of span 30m. Determine the maximum negative and positive SF and maximum BM at sections 3m, 7m, 12m from the left support and also the absolute maximum shear force and bending moment. Draw the maximum SFD and BMD. 	Understand	CO 5	ACE008.20

8	Determine the maximum shear force and bending moment at quarter span from left end when a uniformly distributed load longer than the span of intensity 20kN/m, accompanied by a 100kN concentrated load crosses the span of 12m. Use influence line. The concentrated load can occupy in any position. 	Understand	CO 5	ACE008.19
9	Two concentrated loads of 50kN and 75 kN separated by 4m across a beam of 12m span from left to right with 50kN load lending the train. Draw the maximum SFD and BMD. Also, locate the position and calculate the magnitude of the absolute maximum BM. 	Understand	CO 5	ACE008.20
10	Determine the maximum shear force and bending moment in the span of a simple beam with a system of moving loads shown in the figure. 	Understand	CO 5	ACE008.20
11	Draw the influence line diagram for shear force and bending moment for a cantilever beam at point A which is fixed and at a section C along the span length. Let the unit load acts at a distance x from the free end B. 	Understand	CO 5	ACE008.19
12	Draw the influence line diagram for a Simply supported beam AB with span length L, and carries a unit load at a distance x from left support A. 	Understand	CO 5	ACE008.20

13	Using influence line diagram determine the shear force and bending moment at section C in the simply supported beam as shown in the figure. 	Understand	CO 5	ACE008.19
14	A simply supported beam has a span of 15m. uniformly distributed load of 40kN/m and 5m long crosses the girder from left to right. Draw the influence line diagram for shear force and bending moment at a section 6m from the left end. Use this diagram to calculate maximum bending moment and shear force at this section. 	Understand	CO 5	ACE008.19
15	Four points load 8kN, 15kN, 15kN and 10kN have a center to center spacing of 2m between consecutive loads and they traverse a girder of 30m span from left to right with 10kN load lending. Calculate the maximum bending moment and shear force at 8m from the left support. 	Understand	CO 5	ACE008.20
16	A train of concentrated loads as shown in figure moves from left to right on a simply supported girder of span of 16m. determine the absolute maximum shear force and bending moment developed in the beam. 	Understand	CO 5	ACE008.20

17	A UDL of length 5m and intensity 25kN/m moves across a simple beam of span 30m. Determine the maximum negative and positive SF and maximum BM at sections 3m, 7m, 12m from the left support and also the absolute maximum shear force and bending moment. Draw the maximum SFD and BMD. 	Understand	CO 5	ACE008.20
18	Determine the maximum shear force and bending moment at quarter span from left end when a uniformly distributed load longer than the span of intensity 20kN/m, accompanied by a 100kN concentrated load crosses the span of 12m. Use influence line. The concentrated load can occupy in any position. 	Understand	CO 5	ACE008.20
19	Two concentrated loads of 50kN and 75 kN separated by 4m across a beam of 12m span from left to right with 50kN load lending the train. Draw the maximum SFD and BMD. Also, locate the position and calculate the magnitude of the absolute maximum BM. 	Understand	CO 5	ACE008.19
20	Determine the maximum shear force and bending moment in the span of a simple beam with a system of moving loads shown in the figure. 	Understand	CO 5	ACE008.20

Part – C (Problem Solving and Critical Thinking				
1	Draw the influence line diagram for the given over hanging beam. 	Understand	CO 5	ACE008.19
2	Draw the influence line diagram for the given double overhanging beam. 	Understand	CO 5	ACE008.19
3	Using influence line diagram determine the shear force and bending moment at section C in the simply supported beam as shown in the figure. 	Understand	CO 5	ACE008.20
4	A UDL of length 5m and intensity 25kN/m moves across a simple beam of span 30m. Determine the maximum negative and positive SF and maximum BM at sections 3m, 7m, 12m from the left support and also the absolute maximum shear force and bending moment. Draw the maximum SFD and BMD. 	Understand	CO 5	ACE008.20
5	Determine the maximum shear force and bending moment at quarter span from left end when a uniformly distributed load longer than the span of intensity 20kN/m, accompanied by a 100kN concentrated load crosses the span of 12m. Use influence line. The concentrated load can occupy in any position. 	Understand	CO 5	ACE008.20

6	Two concentrated loads of 50kN and 75 kN separated by 4m across a beam of 12m span from left to right with 50kN load lending the train. Draw the maximum SFD and BMD. Also, locate the position and calculate the magnitude of the absolute maximum BM. Determine the equivalent UDL of the two point load case. 	Understand	CO 5	ACE008.20
7	Draw the influence line diagram for bending moment at a point 10m distant from the left-hand abutment on a bridge girder of span 25m as shown in the figure. Find the maximum bending moment at a point due to a series of wheel loads 100kN, 200kN, 200kN, 200kN, 200kN at center to center distance of 4m, 2.5m, 2.5m, and 2.5m. the loads can cross in either direction, 100kN load lending in each case. 	Understand	CO 5	ACE008.19
8	The system of concentrated loads as shown in the figure below rolls from left to right on the girder span 15m, 40kN load lending. For a section 4m from left support, determine a. Maximum bending moment b. Maximum shear force 	Understand	CO 5	ACE008.19
9	A simple beam with a system of moving concentrated loads is shown in the figure, calculate the absolute maximum bending moment and shear force. 	Understand	CO 5	ACE008.19
10	Four points load 8kN, 15kN, 15kN and 10kN have a center to center spacing of 2m between consecutive loads and they traverse a girder of 30m span from left to right with 10kN load lending. Calculate the maximum bending moment and shear force at 8m from the left support. 	Understand	CO 5	ACE008.20

Prepared by:
Mr. Suraj Baraik, Assistant Professor

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