SRM VALLIAMMAI ENGINEERING COLLEGE

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF CIVIL ENGINEERING

QUESTION BANK

V SEMESTER

1903502 - STRUCTURAL ANALYSIS 1

Regulation: 2019

Academic Year: 2022 – 2023

Prepared by

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Department of Civil Engineering

Vision

To produce competent and quality engineers by imparting knowledge, excellence and global perspectives in Civil Engineering to our students and to make them ethically strong professional engineers to build our nation.

Mission

- To produce outstanding graduates with high technical knowledge to serve the nation.
- To impart value based education
- To provide solution to the challenges in the field of Civil Engineering.

Program Educational Objectives (PEOs)

1. To produce graduates who can understand their ethical, environmental as well as professional responsibilities so that they appreciate the impact of the engineering solutions which have sustainability over society and the nation.
2. To develop the graduates who will exhibit strong technical ability to create & synthesize data using relevant tools and concepts, for providing sustainable solutions to civil engineering problems and projects.

3. To equip the graduates with suitable skills making them industry ready when they leave the portals of the Institute and to become a competent distinguished Professional Civil Engineer.

4. To produce students who can exhibit attitude, professionalism, ability to communicate with team members and adapt to the latest technology by engaging themselves in life-long learning

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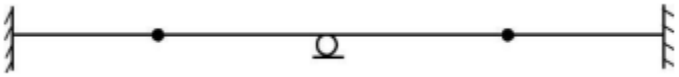
DEPARTMENT OF CIVIL ENGINEERING

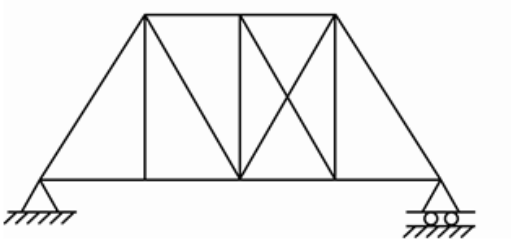
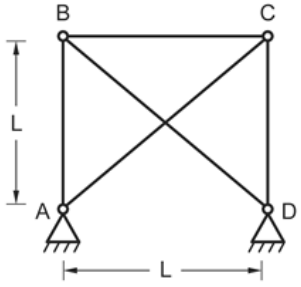
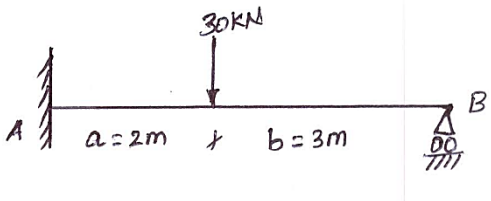
QUESTION BANK

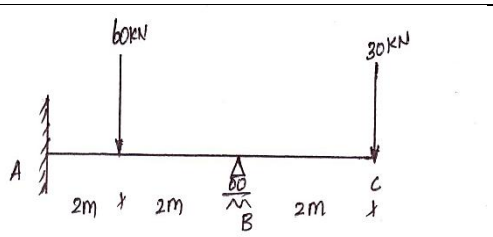
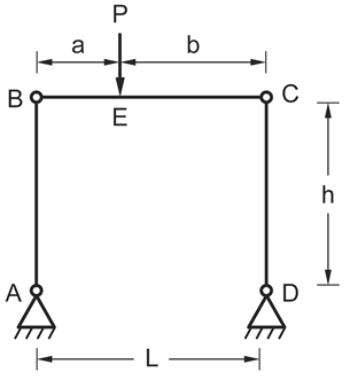
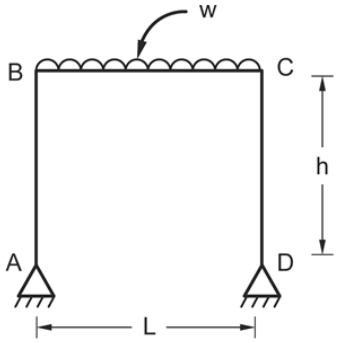
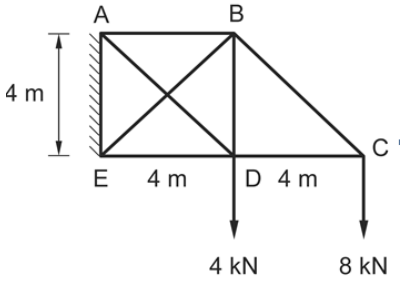
SUBJECT : STRUCTURAL ANALYSIS -1

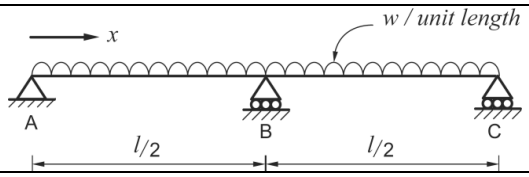
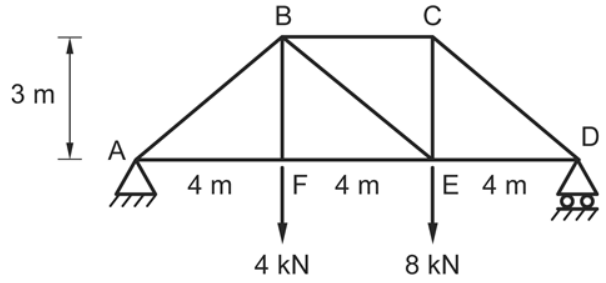
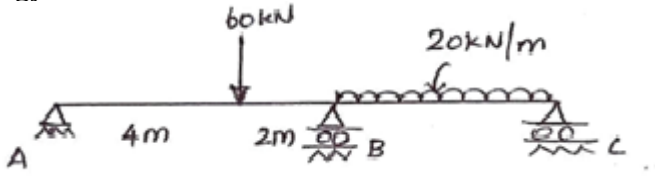
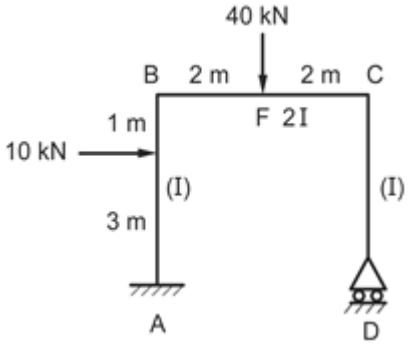
SEM / YEAR: V/ III

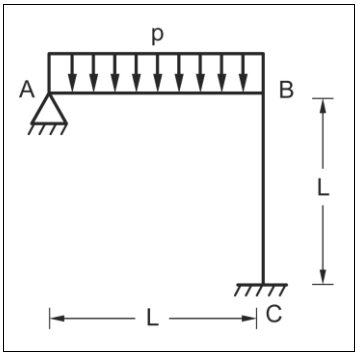
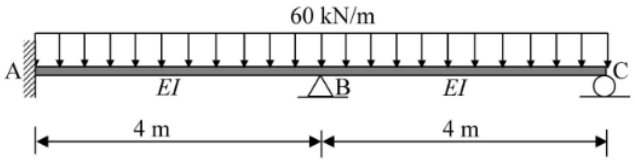
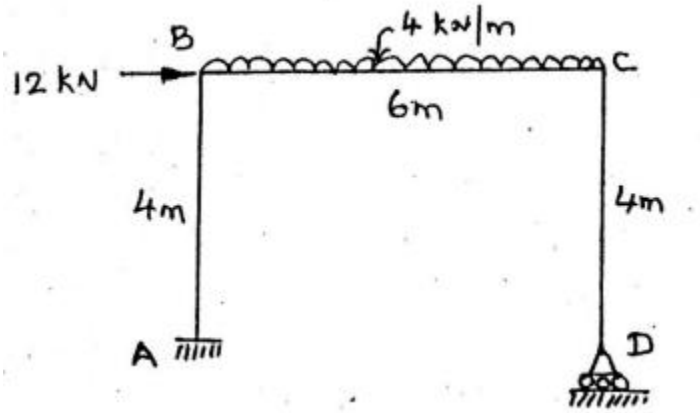
UNIT I INDETERMINATE FRAMES			
Degree of Static and Kinematic Indeterminacies – Analysis of continuous beams, plane frames and indeterminate plane trusses by strain energy method (up to two degree of redundancy).			
PART A			
Q.No.	**Questions**	**BT Level**	**Competence**
1.	Generate the expression for strain energy due to bending and shear force	BT-1	Remembering
2.	List out the equilibrium condition.	BT-1	Remembering
3.	Name any four methods used for computation of deflections in structures	BT-1	Remembering
4.	What are all type of frames?	BT-1	Remembering
5.	What are the assumptions made in the structural analysis?	BT-1	Remembering
6.	List out the general methods of analysis in structural analysis.	BT-1	Remembering
7.	Define Compatibility Condition	BT-1	Remembering
8.	Define strain energy	BT-1	Remembering
9.	Find the degree of indeterminacy of structures as given below 	BT-1	Remembering
10.	Find the degree of indeterminacy of structures as given below 	BT-1	Remembering
11.	Differentiate determinate and indeterminate of structure	BT-2	Understanding
12.	Differentiate static and kinematic indeterminacy of structure	BT-2	Understanding
13.	Compare the force and displacement methods of analysis.	BT-2	Understanding
14.	What is meant by perfect frame?	BT-2	Understanding
15.	Write short notes on internal static in determinacy of pin jointed frames.	BT-2	Understanding
16.	Discuss about the redundant force	BT-2	Understanding
17.	Differentiate external and internal indeterminacy of structures	BT-2	Understanding
18.	Define static indeterminacy of a structure.	BT-2	Understanding

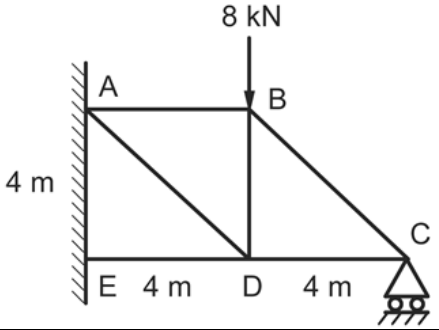
Prepared By: G.R.Iyappan, A.P/Civil Engg

19.	Calculate the static indeterminacy of given pin jointed frame 	BT-3	Applying
20.	Calculate degree of indeterminacy of propped cantilever beam?	BT-3	Applying
21.	Determine the free end slope of a cantilever due to applied moment M at free end using energy principle.	BT-3	Applying
22.	Explain a pin-jointed frame with a sketch	BT-3	Applying
23.	Explain about principle of least work	BT-3	Applying
24.	Calculate degree of indeterminacy of the following. Fixed support at both end and hinge at mid span.	BT-3	Applying
25.	A cantilever is subjected to a single concentrated load P at the middle of the span. Calculate the static indeterminacy of the beam	BT-3	Applying
	PART B		
1.	Derive the expression for Statically indeterminate structure by energy method.	BT-1	Remembering
2.	Determine the force in various members of the pin-jointed frame as shown in Fig. If the member BC is short by an amount of δ. All members of the frame have same axial rigidity as AE. 	BT-1	Remembering
3.	Estimate the reaction components as is shown in figure. i) Propped cantilever beam ii) Overhanging beam 	BT-2	Understanding

			
4.	Determine the horizontal reaction of the portal frame shown in Fig, by the energy method. 	BT-1	Remembering
5.	Determine the horizontal reaction of the portal frame shown in Fig, by the energy method. 	BT-1	Remembering
6.	Find the forces in the members of the truss shown in Fig.. The axial rigidities are same for all the members. 	BT-1	Remembering
7.	Determine the reaction components of the continuous beam ABC loaded as shown in figure. EI is constant throughout by using strain energy method.	BT-4	Analyzing

			
8.	Find the forces in the members of the truss shown in Fig.. The axial rigidities are same for all the members. 	BT-1	Remembering
9.	Determine the reaction components in the continuous beam in figure. Span BC is 5m length EI is constant throughout by using strain energy method. 	BT-1	Remembering
10.	Determine the deflection of the free end of cantilever of length L subjected to a point load ‘W/2’ at the free end. Use Strain energy method.	BT-2	Understanding
11.	Analyse the frame ABCD shown in Fig, by Strain energy method. 	BT-4	Analyzing
12.	Determine the deflection of the free end of cantilever of length L subjected to a point load ‘W’ at the free end. Use Strain Energy method	BT-2	Understanding
13.	Analyse the portal frame shown in figure by strain energy method.	BT-4	Analyzing

			
14.	Determine the reaction components in the continuous beam in figure. EI is constant throughout by using energy method. 	BT-1	Remembering
15.	Using consistent deformation method, determine the vertical reaction at the roller support (D) for the frame as shown in fig. flexural rigidity EI is constant for all the members. 	BT-3	Applying
16.	A continuous beam ABC of uniform section is simply supported at A,B and C. the span AB and BC are 6m and 4m respectively. the span AB carries a udl of 8kN/m and the span BC carries a central concentrated load of 12kN. Determine the support reactions using energy method and draw the bending moment diagram.	BT-3	Applying
17.	A fixed beam of span 6m carries udl load of 4kN/m over the left half span. analyze the beam using energy method and draw the bending moment diagram.	BT-3	Applying
PART C			
1.	List the force methods and explain in detail about any methods with an example.	BT-1	Remembering
2.	Write in detail about the Equilibrium, Compatibility and Force	BT-1	Remembering

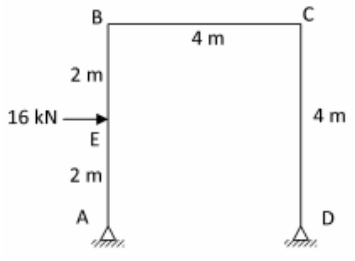
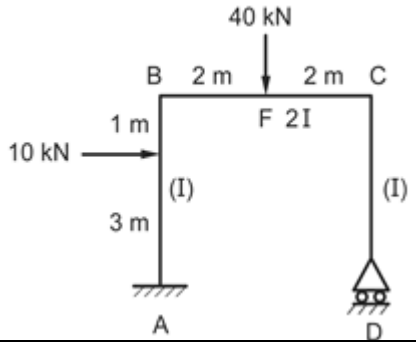
	displacement Relationships with an example.		
3.	Find the forces in the members of the truss shown in Fig.. The axial rigidities are same for all the members. Use Strain Energy method.  	BT-1	Remembering
4.	Find the slope and deflections of a propped cantilever beam with point load at midspan using strain energy method.	BT-1	Remembering
5.	A fixed beam of span 5m carries udl load of 3kN/m over the left half span. analyze the beam using energy method and draw the bending moment diagram.	BT-3	Applying

UNIT II SLOPE DEFLECTION METHOD

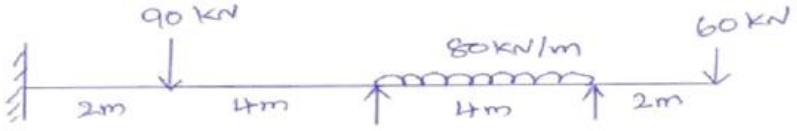
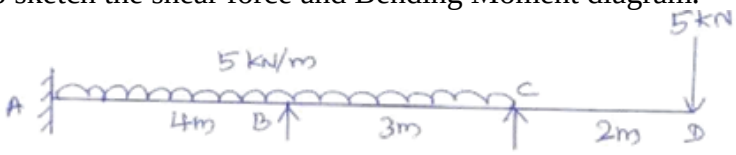
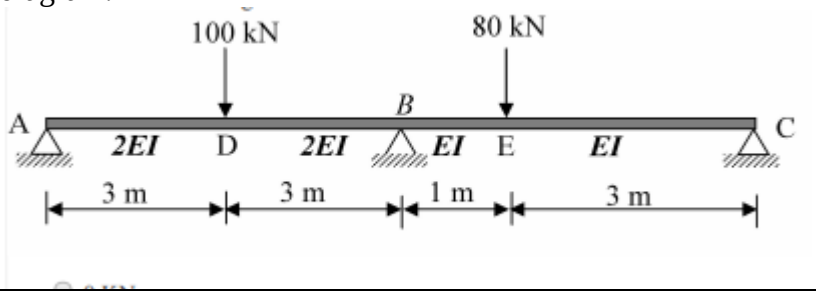
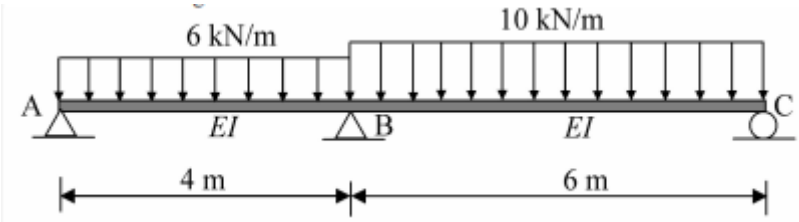
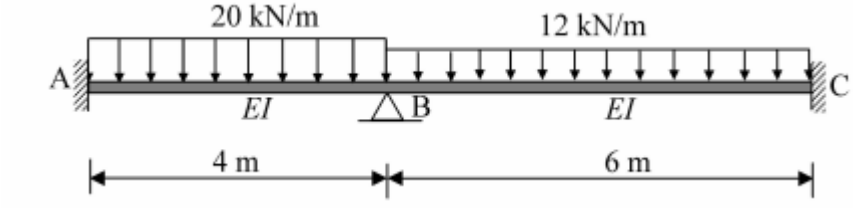
Slope deflection equations – Sign conventions -Equilibrium conditions - Analysis of continuous beams and rigid frames– Rigid frames with inclined members - Support settlements- symmetric frames with Symmetric and Skew-symmetric loadings.

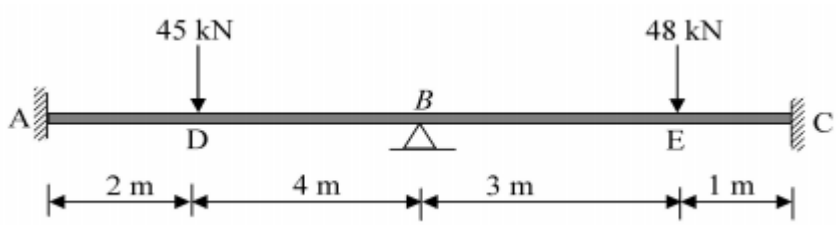
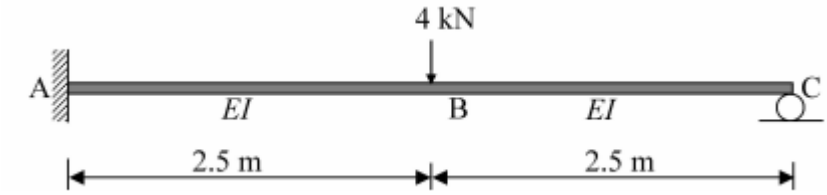
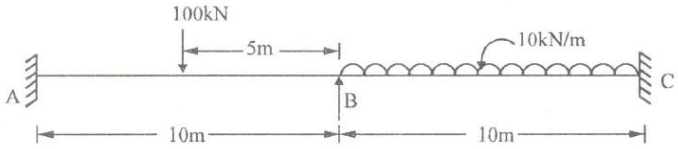
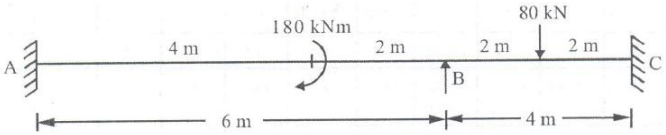
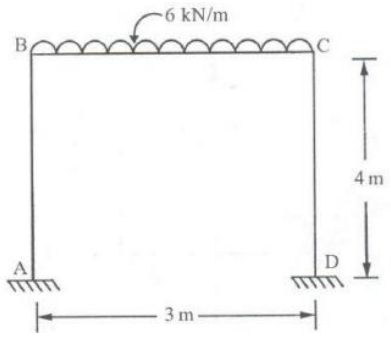
Part - A

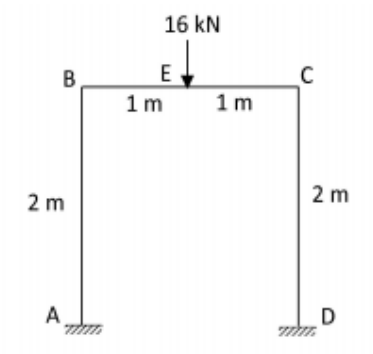
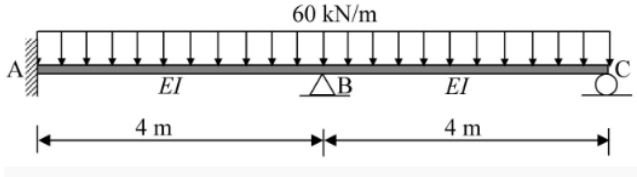
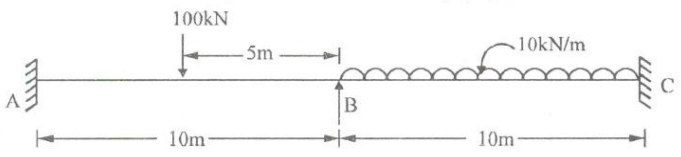
Q. No.	Questions	BT Level	Competence
1.	Who introduced Slope deflection method of analysis?	BT-1	Remembering
2.	What is the limitation of slope-deflection equations applied in structural analysis?	BT-1	Remembering
3.	What are the different support conditions?	BT-1	Remembering
4.	What are the quantities in terms of which the unknown moments are expressed in slope deflection method?	BT-1	Remembering
5.	Write the slope deflection equation for the fixed beam with right half of the span loaded with udl of intensity 'w' per meter run.	BT-1	Remembering
6.	What are the assumptions made in slope-deflection method?	BT-1	Remembering
7.	Write down the general slope deflection equations and state what each term represents.	BT-1	Remembering
8.	What are the conditions at which side sway don't occour?	BT-1	Remembering
9.	What are the sign conventions used in slope deflection method?	BT-1	Remembering
10.	How many slope deflection equations are available for a two span continuous beam?	BT-2	Understanding
11.	Write down the slope deflection equation for a beam AB fixed at A and B subjected to a settlement δ at B.	BT-2	Understanding
12.	Write the fixed end moment for a fixed beam with triangular loading	BT-2	Understanding

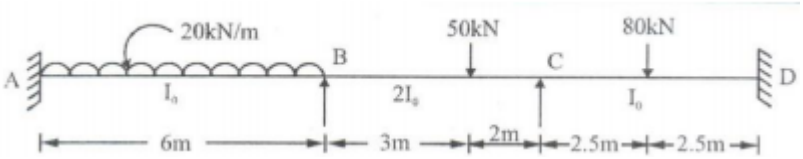
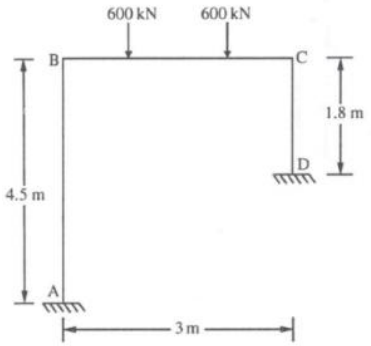
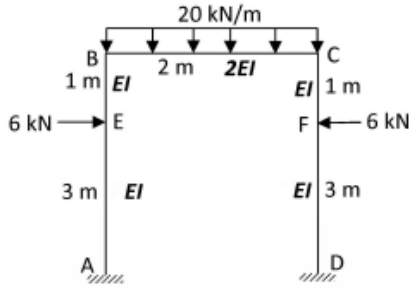
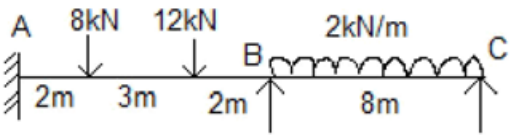
	with intensity zero at the supports.		
13.	State the limitations of Slope deflection method.	BT-2	Understanding
14.	Why is slope deflection method called as displacement method?	BT-2	Understanding
15.	Write the fixed end moment for a udl distributed for the full span.	BT-2	Understanding
16.	Write the fixed end moment for a point load located at mid span.	BT-2	Understanding
17.	Explain the use of slope deflection method.	BT-2	Understanding
18.	Mention the reasons due to which sway may occur in portal frames.	BT-3	Applying
19.	Write the shear condition for the following frame. 	BT-3	Applying
20.	Explain the principle involved in the slope deflection method of analysis.	BT-3	Applying
21.	A rectangular portal will have horizontal sway only when it is subjected to----------or----------.	BT-3	Applying
22.	Find the unknowns and equilibrium conditions of the continuous beam ABC with A, B and C are simply supported joints	BT-3	Applying
23.	Write the equation for sway correction for the portal frame shown in fig. 	BT-3	Applying
24.	How do account for sway in slope deflection method for portal frames?	BT-3	Applying
25.	A rigid frame is having totally 10 joints including support joints. Out of slope deflection and moment distribution methods, which method would you prefer for analysis? Why?	BT-3	Applying

Part – B			
Q. No.	**Questions**	**BT Level**	**Competence**
1	A continuous beam ABC consist of span AB=3m and BC=4m, the	BT - 1	Remembering

	ends A and C being fixed. AB and BC carry uniformly distributed loads of intensity 4kN/m and 5kN/m respectively. The beam is of uniform section throughout. What are its support moments? Draw the bending moment diagram for the beam		
2	Examine the given continuous beam and draw its BMD and SFD using slope deflection method. EI=Constant. 	BT-1	Remembering
3	Analyse the continuous beam ABCD shown in fig. by slope deflection method and summarize its results .Take EI=Constant. Also sketch the shear force and Bending Moment diagram. 	BT-2	Understanding
4	Analyse the continious beam and draw the bending moment diagram. 	BT-1	Remembering
5	Analyse the continious beam and draw the bending moment diagram. 	BT-1	Remembering
6	Calculate the bending moments at A, B, and C for the two-span continuous beam ABC. EI is constant. 	BT-2	Understanding

7	Calculate the bending moments at A, and C for the two-span continuous beam ABC by slope deflection method. EI is constant. 	BT-3	Applying
8	Calculate the bending moment at B of the beam shown. The vertical settlement at support C is 10 mm. EI = 300 kN-m2 is constant throughout the section. 	BT-3	Applying
9	Calculate the bending moments at A, and C for the two-span continuous beam ABC. EI is constant. 	BT-3	Applying
10	Calculate the bending moments at A, and C for the two-span continuous beam ABC. EI is constant. 	BT-3	Applying
11	Analyse the frame by moment distribution method and draw bending moment diagram 	BT-4	Analyzing

12	Calculate the bending moment at E for the frame shown in figure. EI is same for all the members 	BT-3	Applying
13	A continuous beam ABC consist of span AB=4m and BC=4m, the ends A and C being fixed. AB and BC carry uniformly distributed loads of intensity 5kN/m and 2kN/m respectively. The beam is of uniform section throughout. What are its support moments? Draw the bending moment diagram for the beam	BT-4	Analyzing
14	A continuous beam ABC consist of span AB=4m and BC=4m, the ends A simply support and C being fixed. AB and BC carry uniformly distributed loads of intensity 5kN/m and 2kN/m respectively. The beam is of uniform section throughout. What are its support moments? Draw the bending moment diagram for the beam	BT-3	Applying
15	A continuous beam ABC consist of span AB=4m and BC=4m, the ends A fixed and C simply supported. AB and BC carry uniformly distributed loads of intensity 2kN/m and 4kN/m respectively. The beam is of uniform section throughout. What are its support moments? Draw the bending moment diagram for the beam	BT-3	Applying
16	Calculate the moment at B for the two-span continuous beam ABC. EI is constant. 	BT-3	Applying
17	Calculate the moment at B for the two-span continuous beam ABC. EI is constant. 	BT-3	Applying

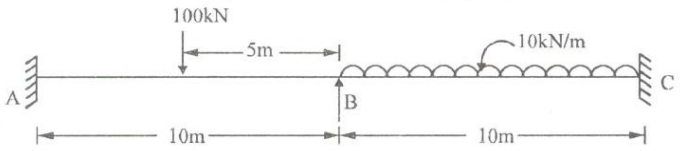
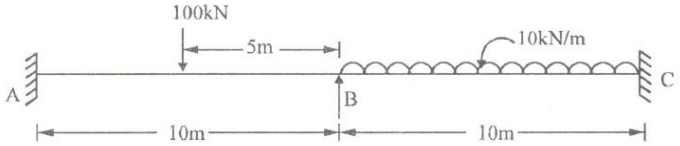
Part - C			
Q. No.	**Questions**	**BT Level**	**Competence**
1	A continuous beam ABCD consists of spans AB, BC, and CD of length 4m each. Both ends of the beam are fixed. The span CD carries a point load of 60 kN at its middle point. Find the moments and reactions at the supports.	BT - 1	Remembering
2	Draw the bending moment diagram for the given beam by slope deflection method 	BT-2	Understanding
3	Analyse the frame by slope deflection method and draw bending moment diagram 	BT-4	Analyzing
4	Analyse the frame by moment distribution method and draw bending moment diagram 	BT-4	Analyzing
5	Analyse the continious beam and draw the bending moment diagram. 	BT-4	Analyzing

UNIT III: MOMENT DISTRIBUTION METHOD

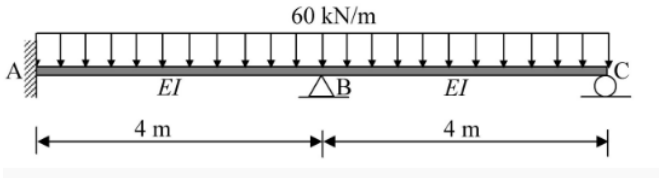
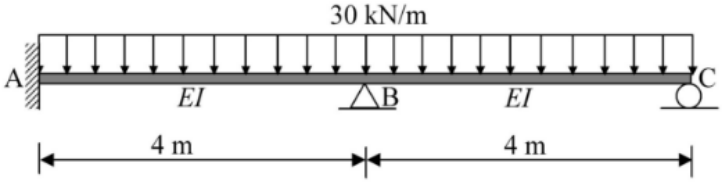
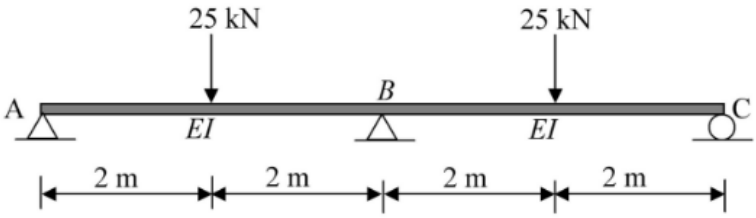
Stiffness and carry over factors – Distribution and carryover of moments - Analysis of continuous Beams- Plane rigid frames with and without sway – Support settlement - symmetric frames with symmetric and skew-symmetric loadings.

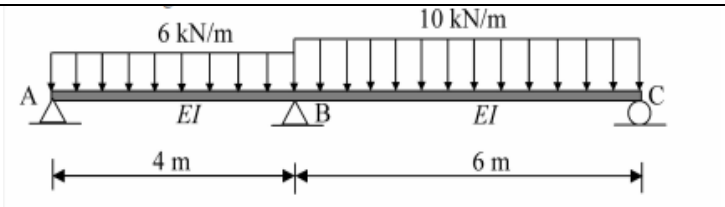
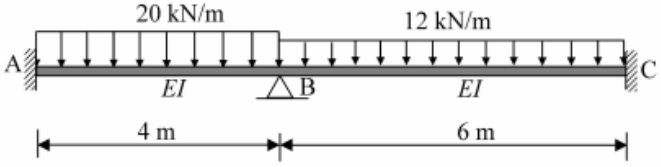
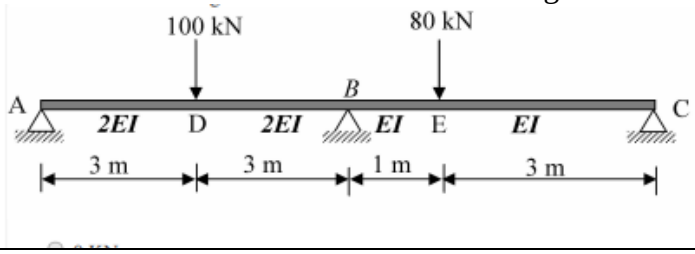
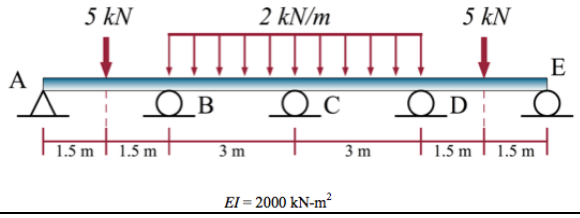
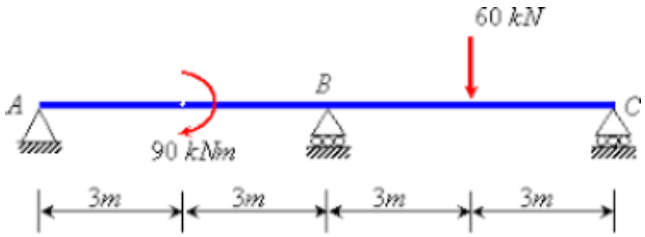
Part - A

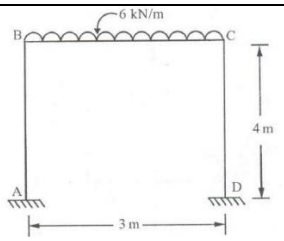
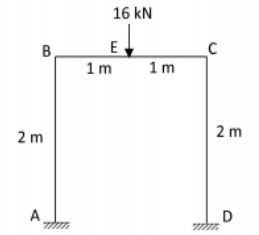
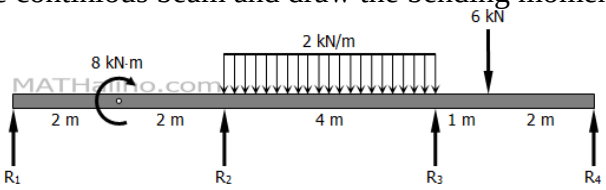
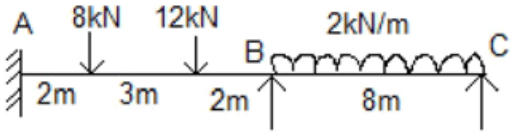
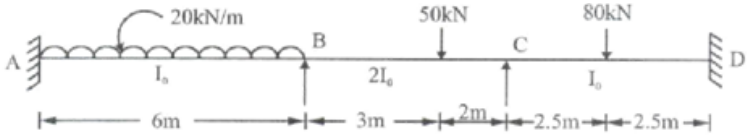
Q. No.	Questions	BT Level	Competence
1.	What is distribution factor?	BT-1	Remembering
2.	Explain about Stiffness factor	BT-1	Remembering
3.	Define sway.	BT-1	Remembering
4.	Define Stiffness	BT-1	Remembering
5.	Define: Moment distribution method (Hardy Cross method)	BT-1	Remembering
6.	What is carry over moment?	BT-1	Remembering
7.	In a member AB, if a moment of –10 KNm is applied at A, what is the moment carried over to B?	BT-1	Remembering
8.	What are symmetric and anti-symmetric quantities in structural behaviour?	BT-1	Remembering
9.	What are the situations where in sway will occur in portal frames?	BT-1	Remembering
10.	What is the sum of distribution factors at a joint?	BT-1	Remembering
11.	Explain about carry over factor	BT-2	Understanding
12.	What do you understand by constant strength beam?	BT-2	Understanding
13.	A rigid frame is having totally 10 joints including support joints. Out of slope-deflection and moment distribution methods, which method would you prefer for analysis? Why?	BT-2	Understanding
14.	Mention any three reasons due to which sway may occur in portal frames.	BT-2	Understanding
15.	What is sway correction?	BT-2	Understanding
16.	Give the relative stiffness when the far end is (a) Simply supported and (b) Fixed.	BT-2	Understanding
17.	State how the redundancy of a rigid frame is calculated	BT-2	Understanding
18.	What is the difference between absolute and relative stiffness?	BT-2	Understanding
19.	Explain Naylor simplification	BT-3	Applying
20.	Explain Flexural Rigidity of Beams.	BT-3	Applying
21.	What are the advantages of Continuous beam over simply supported beam?	BT-3	Applying
22.	Explain the concepts involved in the Moment distribution method (Hardy Cross method).	BT-3	Applying
23.	In a member AB, if moment of -10kNm is applied at A, What is the moment carried over to B?	BT-3	Applying
24.	Write the Stiffness of the members for the joint A,B and Cof given beam?	BT-3	Applying

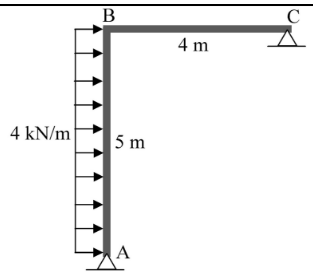
			
25.	Write the distribution factor for the joint B of given beam? 	BT-3	Applying

PART – B

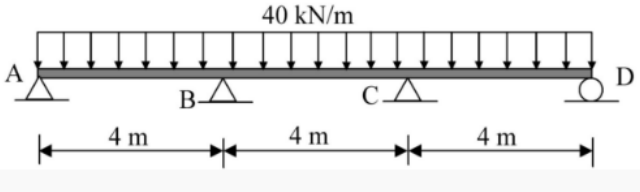
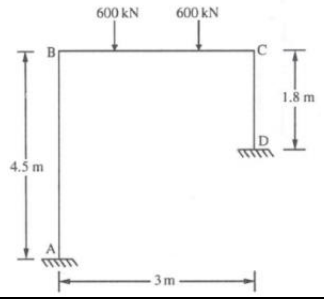
Q. No.	Questions	BT Level	Competence
1.	Calculate the moment at B for the two-span continuous beam ABC. EI is constant. 	BT-1	Remembering
2.	Calculate the mid-span moment for span AB and BC of the continuous beam ABC given below. EI is constant. 	BT-1	Remembering
3.	Calculate the moment at B for the two-span continuous beam ABC. EI is constant. (Moment distribution method) 	BT-1	Remembering
4.	Analyse the continious beam and draw the bending moment diagram. (Moment distribution method)	BT-3	Applying

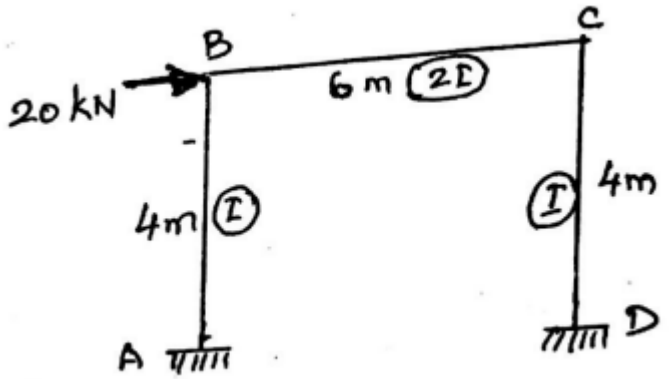
			
5.	Calculate the bending moments at A, B, and C for the two-span continuous beam ABC. EI is constant.(Moment distribution method) 	BT-3	Applying
6.	Analyse the continious beam and draw the bending moment diagram. 	BT-4	Analyzing
7.	Analyse the continious beam and draw the bending moment diagram. 	BT-4	Analyzing
8.	Analyse the continious beam and draw the bending moment diagram. 	BT-4	Analyzing
9.	Analyse the frame by moment distribution method and draw bending moment diagram	BT-4	Analyzing

			
10.	Calculate the bending moment at E for the frame shown in figure. EI is same for all the members 	BT-3	Applying
11.	Analyse the continious beam and draw the bending moment diagram. 	BT-4	Analyzing
12.	Analyse the continious beam and draw the bending moment diagram. 	BT-4	Analyzing
13.	Draw the bending moment diagram for the given beam by moment distribution method 	BT-4	Analyzing
14.	Calculate the bending moment for the segment given below. take EI is constant	BT-1	Remembering

			
15.	A continuous beam ABC consist of span AB=4m and BC=4m, the ends A and C being fixed. AB and BC carry uniformly distributed loads of intensity 5kN/m and 2kN/m respectively. The beam is of uniform section throughout. What are its support moments? Draw the bending moment diagram for the beam	BT-3	Applying
16.	A continuous beam ABC consist of span AB=4m and BC=4m, the ends A simply support and C being fixed. AB and BC carry uniformly distributed loads of intensity 5kN/m and 2kN/m respectively. The beam is of uniform section throughout. What are its support moments? Draw the bending moment diagram for the beam	BT-3	Applying
17.	A continuous beam ABC consist of span AB=4m and BC=4m, the ends A fixed and C simply supported. AB and BC carry uniformly distributed loads of intensity 2kN/m and 4kN/m respectively. The beam is of uniform section throughout. What are its support moments? Draw the bending moment diagram for the beam	BT-3	Applying

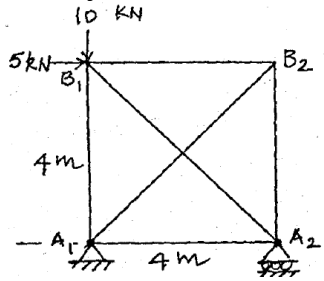
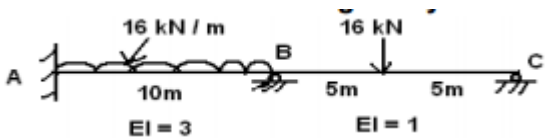
PART – C

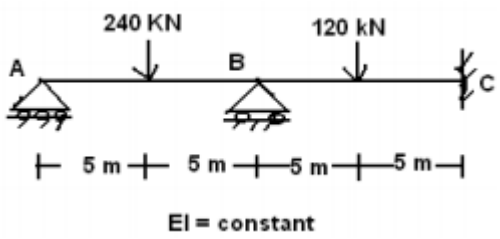
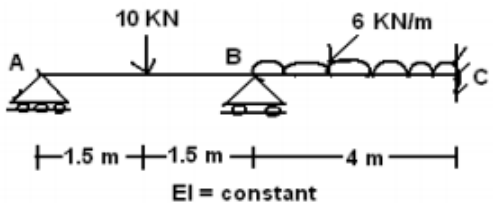
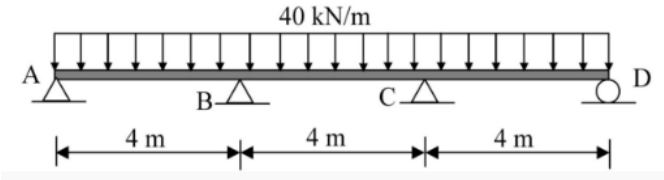
Q. No.	Questions	BT Level	Competence
1.	Draw the bending moment diagram for the given beam by moment distribution method 	BT-1	Remembering
2.	Analyse the frame by moment distribution method and draw bending moment diagram 	BT-1	Remembering

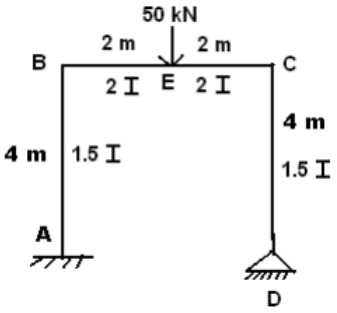
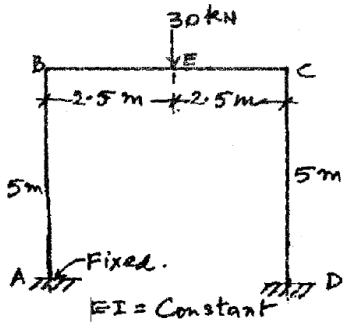
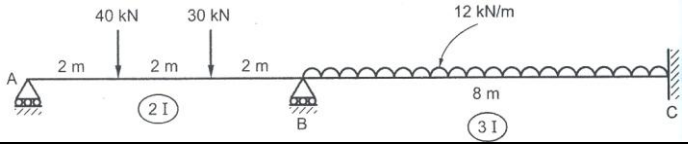
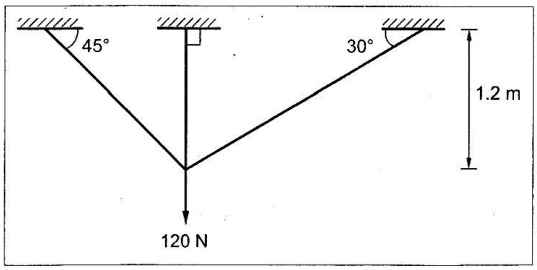
3.	Analyse the portal frame ABCD by moment distribution method. BC is loaded with central point load of 50 kN at centre. AB= BC=CD=5m in length.	BT-3	Applying
4.	A Continuous beam ABCD fixed at A and D and continuous over supports B and C. The span AB=5m carries a central concentrated load of 10kN. The span BC=4m carries a uniformly distributed load of 4 kN/m over the entire span of BC. The span CD=6m carries a non-central concentrated load of 8 kN acting at a distance of 2m from the end D. Analyse the beam and draw bending moment diagram using moment distribution method and tabulate the results	BT-3	Applying
5.	Draw the bending moment diagram for the given beam by moment distribution method 	BT-4	Analyzing

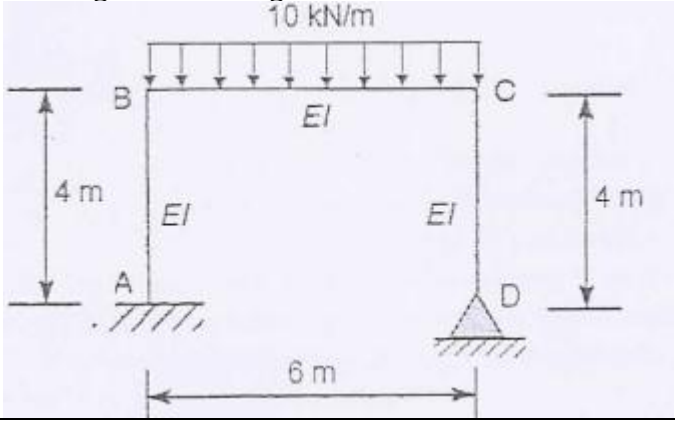
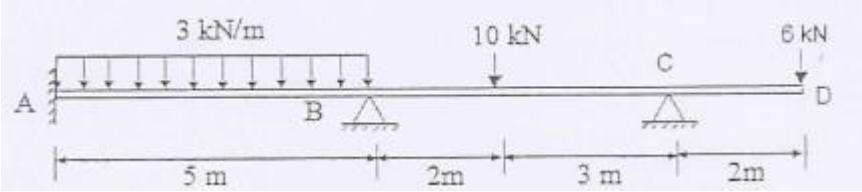
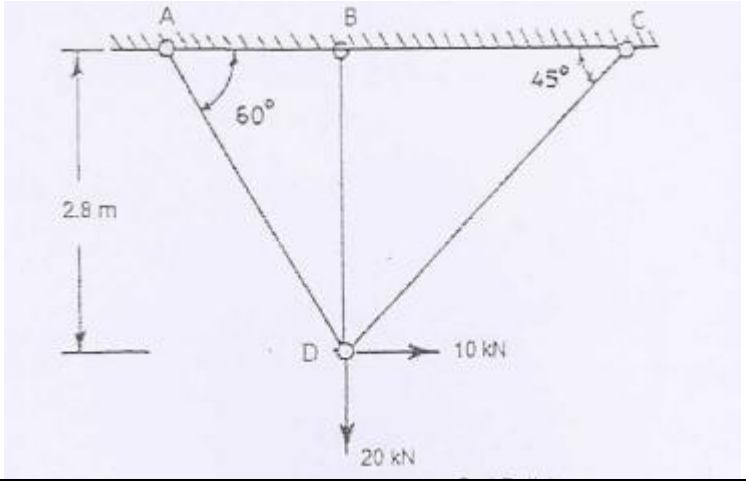
UNIT IV : FLEXIBILITY METHOD			
Equilibrium Vs Compatibility -Primary structures - Compatibility conditions – Formation flexibility matrices - Analysis of Indeterminate pin- jointed plane frames, continuous beams and rigid jointed plane frames by direct flexibility approach.			
Q.No	**PART-A**	**BT Level**	**Competence**
1.	What are the conditions to be satisfied for determinate structures and how are indeterminate structures identified?	BT-1	Remembering
2.	Write down the equation for the degree of static indeterminacy of the pin jointed Plane frames, explain the notations used.	BT-1	Remembering
3.	Give the mathematical expression for the degree of static indeterminacy of rigid jointed plane frames.	BT-1	Remembering
4.	What are the properties which characterize if the structure response by means of force-displacement relationship?	BT-1	Remembering
5.	List the classical methods of structural analysis.	BT-1	Remembering
6.	What is meant by flexibility?	BT-1	Remembering
7.	In flexibility method unknown quantities are ----------and	BT-1	Remembering

	final equations are----------		
8.	Write about the indeterminate structures.	BT-1	Remembering
9.	List the variables in the force method.	BT-1	Remembering
10.	Briefly mention the two types of matrix methods of analysis of indeterminate structures.	BT-1	Remembering
11.	Define a primary structure.	BT-1	Remembering
12.	What is a primary structure?	BT-2	Understanding
13.	What are equilibrium equations?	BT-2	Understanding
14.	What are the different methods of analysis of indeterminate structures?	BT-2	Understanding
15.	Differentiate Stiffness method from flexibility method.	BT-2	Understanding
16.	What are the basic requirements of structural analysis?	BT-2	Understanding
17.	Write the equation for degree of indeterminacy of 2D trusses.	BT-2	Understanding
18.	What is meant by compatibility condition?	BT-2	Understanding
19.	Write the element Flexibility matrix for a beam member and truss member.	BT-2	Understanding
20.	Define External and Internal indeterminacy.	BT-2	Understanding
21.	Explain the term flexibility coefficient.	BT-3	Applying
22.	Choose the correct answer. The flexibility method is best suited when the static indeterminacy is --------the kinematic indeterminacy. (a) Less than (b) Equal to (C) Greater than .	BT-3	Applying
23.	What is meant by generalized coordinates?	BT-3	Applying
24.	Explain the compatibility condition used in the flexibility method?	BT-3	Applying
25.	What is the displacement transformation matrix?	BT-3	Applying

Q.No	PART - B	BT Level	Competence
1.	Analyse the pin-jointed plane frame shown in Fig below by flexibility matrix method. The flexibility for each member is 0.0025 mm/KN. 	BT-4	Analyzing
2.	Analyse the continuous beam ABC shown in Fig below by flexibility matrix method and draw the bending moment diagram. R_B and R_C are redundant 	BT-4	Analyzing

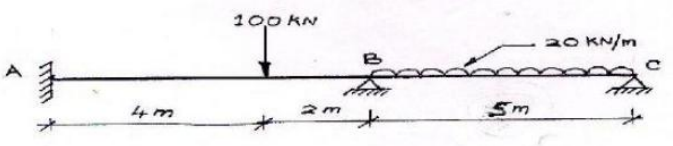
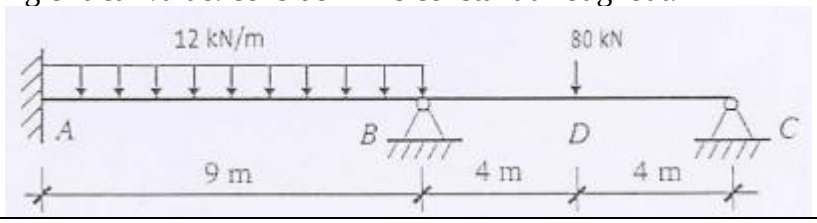
3.	Generate the flexibility matrix of beam ABC as shown in figure, below by flexibility matrix method and sketch the bending moment diagram 	BT-4	Analyzing
4.	A two span continuous beam ABCD is fixed at A and hinged at support B and C. span of AB =Span of BC =9m. Arrange the flexibility influence co-efficient matrix assuming vertical reaction at B and C as redundant.	BT-4	Analyzing
5.	Calculate the deflection and moments of continuous beam shown in Fig below using force method. 	BT-4	Analyzing
6.	A cantilever is subjected to a single concentrated load P at the middle of the span. Calculate the deflection at the free end using flexibility matrix method. EI is uniform throughout.	BT-4	Analyzing
7.	Analyze the continuous beam ABCD shown in Fig below by flexibility matrix method and draw the bending moment diagram. M_B and M_C are redundant 	BT-4	Analyzing
8.	A portal frame ABCD with supports A and D are fixed at same level carries a uniformly distributed load of 80kN/m on the span AB. Span AB=BC=CD=9m. EI is constant throughout. Analyze the frame by stiffness matrix method.	BT-4	Analyzing
9.	Solve the portal frame ABCD shown in Fig below by flexibility matrix method and sketch the bending moment diagram.	BT-4	Analyzing

			
10.	Solve the portal frame ABCD shown in Fig below by flexibility matrix method and sketch the bending moment diagram. 	BT-4	Analyzing
11.	A portal frame ABCD with supports A and D are fixed at same level carries a concentrated load of 100kN at centre of the span AB. Span AB=BC=CD=10 m. EI is constant throughout. Analyze the frame by stiffness matrix method.	BT-4	Analyzing
12.	Examine the moment of the continuous beam shown in Fig below by flexibility method. 	BT-4	Analyzing
13.	Estimate the forces in all the members of the pin-jointed frames shown in Fig below by flexibility method, AE = constant. 	BT-4	Analyzing
14.	A cantilever beam is subjected to an udl of ‘w’kN/m throughout the entire span. Calculate the deflection at the free end using flexibility matrix method. EI is uniform throughout.	BT-4	Analyzing

15.	Analyze the portal frame as shown in fig. by flexibility method and draw the bending moment diagram. 	BT-3	Applying
16.	Using flexibility matrix method, analyse and draw the bending moment diagram continuous beam as shown in fig, consider EI constant throughout. 	BT-3	Applying
17.	Analyse the pin jointed plane frame show in fig. by flexibility method. 	BT-3	Applying

Q.No	PART - C	BT Level	Competence
1.	Analyze the continuous beam shown in figure using stiffness matrix method. EI is constant.	BT-3	Applying

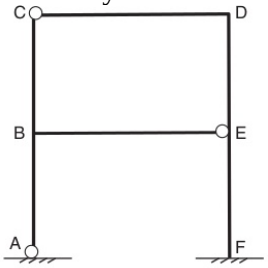
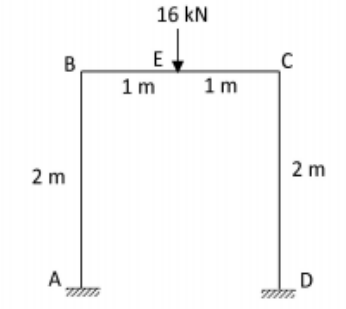
Prepared By: G.R.Iyappan, A.P/Civil Engg

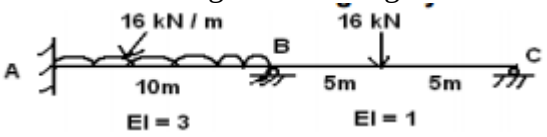
			
2.	A cantilever of length 15m is subjected to a single concentrated load of 15kN at the middle of the span. Find the deflection at the free end using flexibility matrix method. EI is uniform throughout.	BT-3	Applying
3.	A two span continuous beam ABC is fixed at A and hinged at support B and C. Span AB=BC=9m. Set up flexibility influence coefficient matrix assuming vertical reaction at B and C as redundant.	BT-3	Applying
4.	A portal frame ABCD with supports A and D are fixed at same level carries a uniformly distributed load of 50kN/m on the span AB. Span AB=CD=6m and Span BC=4m. EI is constant throughout. Analyze the frame by flexibility matrix method.	BT-3	Applying
5.	Analyze the continuous beam shown in fig. by using flexibility method and draw the shearing force and bending moment diagram giving critical value. consider EI is constant throughout. 	BT-4	Analyzing

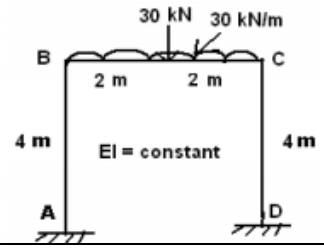
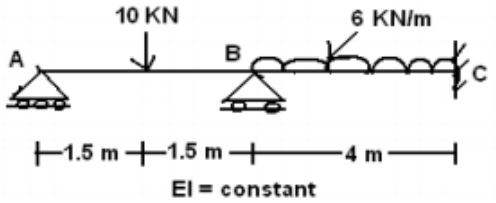
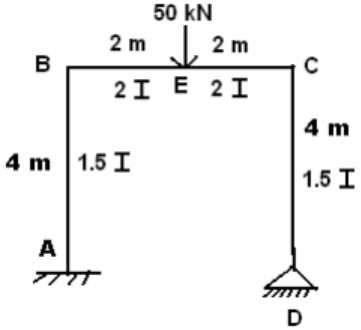
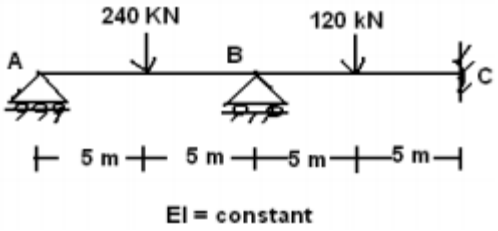
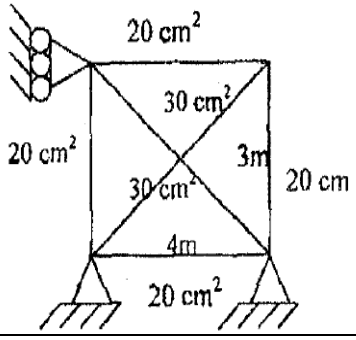
UNIT V: STIFFNESS MATRIX METHOD

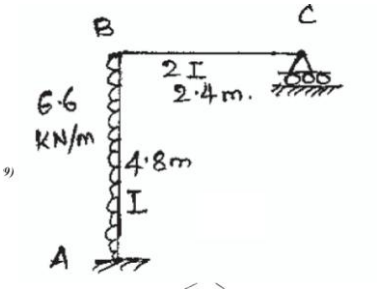
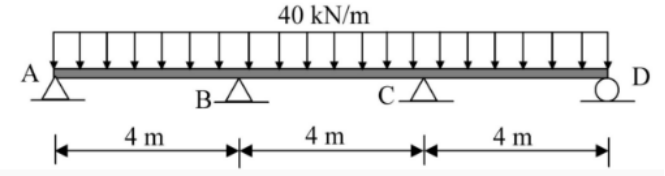
Restrained structure –Formation of stiffness matrices – Rotation matrix – Transformation of Stiffness matrices -Analysis of Continuous Beams, Pin-jointed plane frames and rigid frames by direct stiffness method.

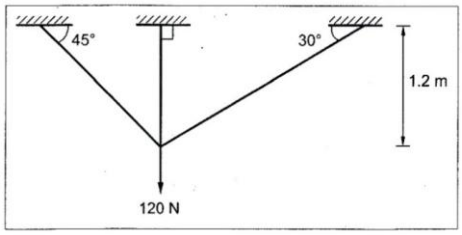
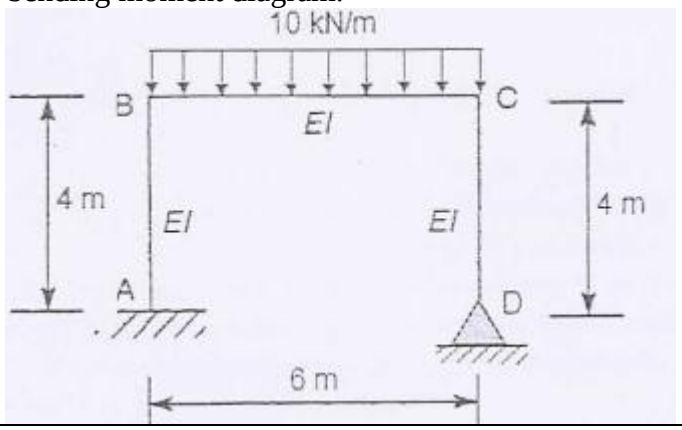
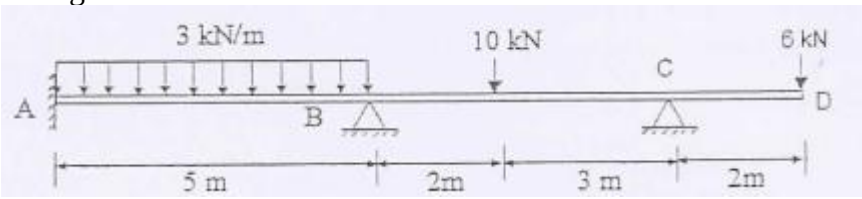
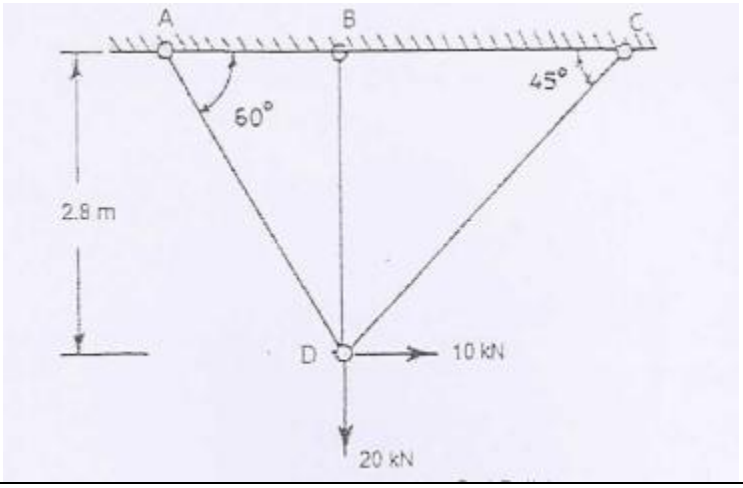
Q.No	PART-A	BT Level	Competence
1.	What are the basic unknowns in stiffness matrix method?	BT-1	Remembering
2.	Define degree of freedom of the structure with an example.	BT-1	Remembering
3.	Define Local and Global coordinates.	BT-1	Remembering
4.	Write down the rotation matrix for 2D beam element.	BT-1	Remembering
5.	Define Stiffness coefficient kij.	BT-1	Remembering
6.	Is it possible to develop the flexibility matrix for an unstable structure?	BT-1	Remembering
7.	What is transformation matrix?	BT-1	Remembering
8.	Explain about the properties of stiffness matrix.	BT-2	Understanding
9.	Explain the global stiffness matrices.	BT-2	Understanding
10.	Explain the steps involved in stiffness matrix method of analysis.	BT-2	Understanding
11.	Differentiate between flexibility and stiffness.	BT-2	Understanding
12.	Derive the stiffness matrix of a typical pin-jointed two-dimensional frame element.	BT-2	Understanding
13.	Write the properties of stiffness matrix.	BT-2	Understanding

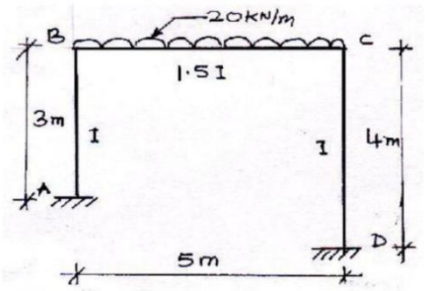
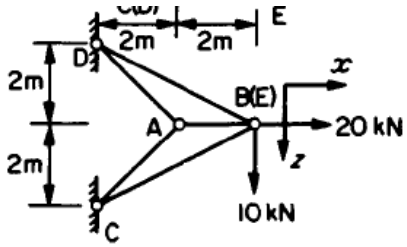
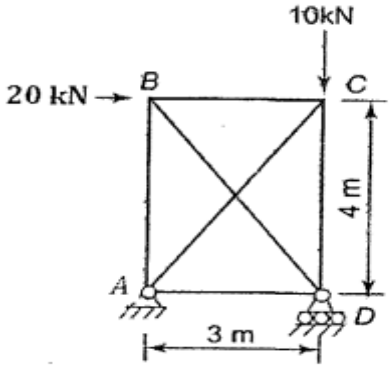
14.	Write a short note on element stiffness matrix.	BT-2	Understanding
15.	Which property of a structure determines the size of its stiffness matrix?	BT-2	Understanding
16.	What is meant by relative stiffness of a member?	BT-2	Understanding
17.	Explain the terms stiffness matrix and flexibility matrix. Show that these are inverse of each other.	BT-3	Applying
18.	Create the stiffness matrix for a 2D beam element	BT-3	Applying
19.	How are the basic equations of stiffness matrix obtained?	BT-3	Applying
20.	Explain about generalized coordinates.	BT-3	Applying
21.	What is the relationship between the flexibility and stiffness matrix?	BT-3	Applying
22.	Types of Boundary Condition	BT-3	Applying
23.	Explain formation of load Vector	BT-3	Applying
24.	Determine the statically inderminacy of the frame . 	BT-3	Applying
25.	Determine the statically inderminacy of the frame . 	BT-3	Applying

Q.No	PART-B	BT Level	Competence
1.	Analyse the continuous beam ABC shown in Fig below by stiffness method and also sketch the bending moment diagram. 	BT-3	Applying
2.	Analyse the portal frame ABCD shown in Fig below by stiffness method and also sketch the bending moment diagram.	BT-3	Applying

			
3.	Examine the continuous beam ABC shown in Fig below by stiffness method and also draw the shear force diagram. 	BT-3	Applying
4.	Analyze the portal frame ABCD shown in Fig below by stiffness method and also estimate the bending moment. 	BT-3	Applying
5.	Compute the final forces of continuous beam shown in Fig below using displacement method. 	BT-2	Understanding
6.	Analyse the truss shown in Fig below using displacement method. 	BT-3	Applying

7.	Solve the portal frame shown in Fig below by matrix stiffness method and sketch the SFD and BMD. Given El is constant. 	BT-3	Applying
8.	A two span continuous beam ABC is fixed at A and simply supported over the supports B and C. AB=6m and BC = 4m. Moment of inertia is constant throughout. A uniformly distributed load of 20kN/m acts over AB and a single concentrated load of 6 tons acts on BC. Estimate BM by stiffness matrix method.	BT-3	Applying
9.	A portal frame ABCD with A and D are fixed at same level carries a uniformly distributed load of 20kN/m. EI is constant throughout. Assess the final forces by stiffness matrix method. Take Span AB=BC=CD=6m.	BT-3	Applying
10.	A continuous beam ABC is fixed at A and simply supported over the supports B and C. AB = 11m and BC = 9m. Moment of inertia is constant throughout. A single concentrated central load of 120 kN acts on AB and a uniformly distributed load of 10 kN/m acts over BC, examine the final forces by stiffness matrix method and draw BMD.	BT-3	Applying
11.	A continuous beam ABCB is simply supported over the supports A, B, C and D. AB = 10m , BC = 8m and CD=10m. Moment of inertia is constant throughout. A single concentrated central load of 12 tons acts on AB and a uniformly distributed load of 10Tons/m acts over BC, examine the final forces by stiffness matrix method and draw BMD.	BT-3	Applying
12.	Analyze the continuous beam shown in fig. by stiffness matrix method 	BT-3	Applying
13.	A portal frame ABCD with A and D are fixed at same level Span AB carries a uniformly distributed load of 20kN /meters. EI is constant throughout. Assess the final forces by stiffness matrix method. Span	BT-3	Applying
14.	Estimate the forces in all the members of the pin-jointed frames shown in Fig below by Stiffness matrix method, AE = constant.	BT-3	Applying

			
15.	Analyze the portal frame as shown in fig. by stiffness method and draw the bending moment diagram. 		
16.	Using stiffness method, analyse and draw the bending moment diagram continuous beam as shown in fig, consider EI constant throughout. 		
17.	Analyse the pin jointed plane frame show in fig. by stiffness method. 		

Q.No	PART-C	BT Level	Competence
1.	Solve the portal frame ABCD shown in Fig below by stiffness matrix method . 	BT-3	Applying
2.	A portal frame ABCD with A and D are fixed at same level span AB=6m carries a uniformly distributed load of 20kN /meters. Span BC = CD=5m carries uniformly distributed load of 5kN/m EI is constant throughout. Assess the final forces by stiffness matrix method.	BT-3	Applying
3.	Estimate the forces in all the members of the pin-jointed frame as shown in Fig below by Stiffness matrix method, AE is constant for all members. 	BT-3	Applying
4.	A three span continuous beam ABCD is fixed at A and D and hinged at support B and C. Span AB=BC=CD=5m carries uniformly distributed load of 8kN/m throughout the beam. Analyze by Stiffness Matrix method	BT-3	Applying
5.	Using the stiffness method, analyse the pin-jointed frame in figure. the cross sectional areas A and E are same for all the members. 	BT-3	Applying