SHRI ANGALAMMAN COLLEGE OF ENGINEERING & TECHNOLOGY
(An ISO 9001:2008 Certified Institution)
SIRUGANOOR,TRICHY-621105.

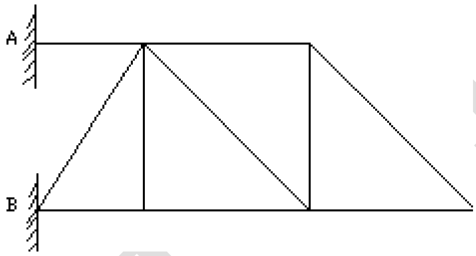
FS 81504

DEPARTMENT OF CIVIL ENGINEERING

CE 1303 & STRUCTURAL ANALYSIS - I

UNIT – I PART – A

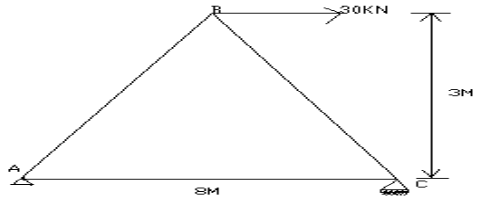
1. State Maxwell's Reciprocal theorem.
2. State the principle of virtual force.
3. Determine the static indeterminacy of the following beam shown in fig.



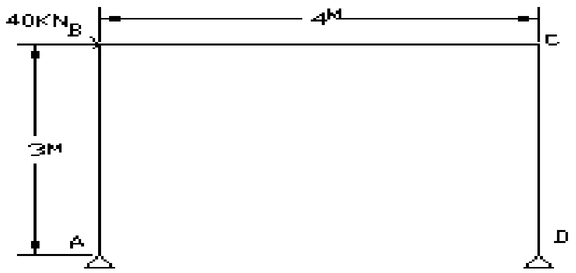
4. State the principle of virtual displacement.
5. What is the Mohr's correction?
6. Differentiate the perfect frame from deficient frame with an example.
7. Determine the free end slope of a cantilever beam having length 'L' due to an applied moment 'M' at frees end using the principle of virtual work.
8. Differentiate: determinate and indeterminate structures.
9. State the principle of virtual work.
10. Why is it necessary to compute deflections in structures?
11. Name any four methods used for computation of deflections in structures.
12. State the difference between strain energy method and unit load method in the determination of deflection of structures.
13. What are the assumptions made in the unit load method?
14. Give the equation that is used for the determination of deflection at a given point in beams and frames.
15. Define: Unit load method.

PART – B

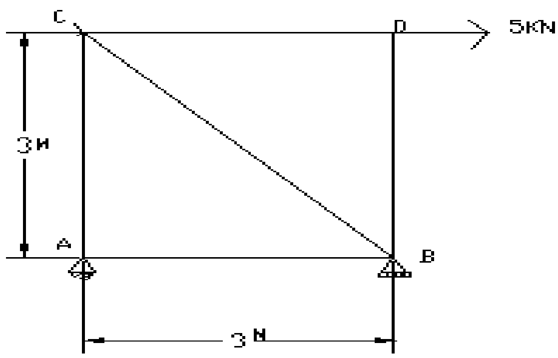
1. Determine the deflection at the centre of a simply supported beam carrying a udl of intensity w/m throughout the span 'L' EI is constant. Also determine the incremental deflection at the centre due to an additional point load 'P' at the centre use principle of virtual work.
2. Determine the vertical and horizontal displacement of the joint 'B' in a pin jointed Frame shown in fig.



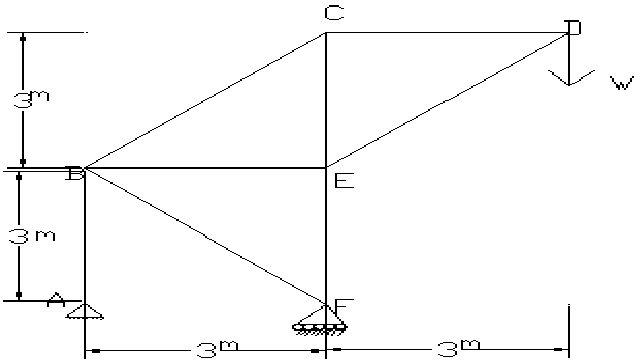
3. Using principle of virtual work. Find the deflection and slope at 'C' for the frame shown in fig. EI = 25000KN/$m^{2.}$



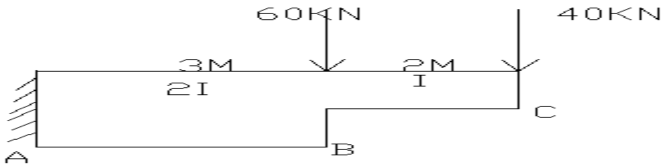
4. Find horizontal deflection at 'c' for the truss shown in fig. A = 1000mm^2 E = 200KN/MM^2 for all the members.



5. Find the vertical and horizontal deflection of joint 'D' of truss shown in fig. The sectional areas of the members are such that the stress in the tension member is 120N/mm^2 while the stress in the compression member is 70N/mm^2 Take E = 200KN/mm^2.

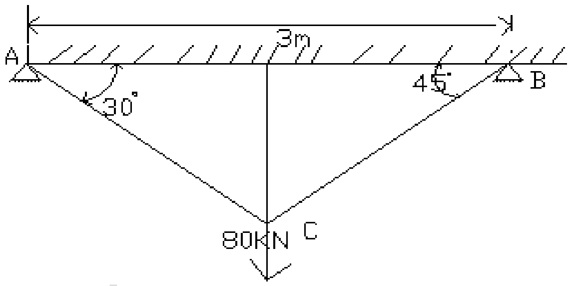


6. Find the deflection and rotation @ B. if EI = 8 x 10^4N/mm^2 refer fig.

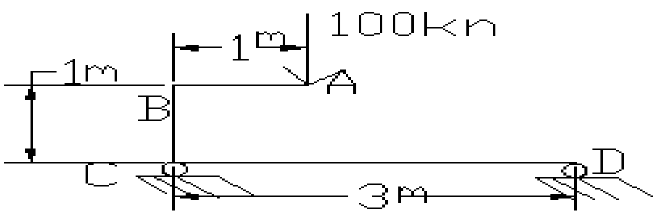


7. (i) What is the williot diagram? Describe it uses and importance.

   (ii) Two rods AC and BC are hinged at c is carrying a load of 80kn at c as shown in fig. find graphically the vertical and horizontal deflection of joint c. Take area of member AB as 900mm^2 and that of member BC as 1200mm^2. Take E = 2.02 x 10^5N/mm^2.

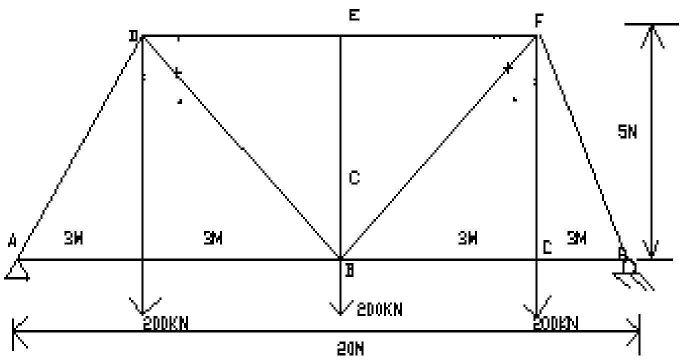


8. Find the vertical component of the deflection of point A on the bracket to the beam as shown in fig. apply the method of virtual work. Take E = 200 x 10^6M^4. And E and I are constant throughout.



9. A beam AB is simply supported over a span 5m in length. A concentrated load of 30kn is acting at a section 1.25m from support A. calculate the deflection under the load point. Take E = 200 x 10^6KN/M^2. And I = 13X$10^{-6}M^4$.
10. The truss shown in the fig. has four bays of 5m.each with a height of 5m.it carries a load of 200kn at each lower joint. The lower chord members are each 2500mm^2 in section while the upper chord

members are 4000mm^2 in section. The verticals have a sectional area of 2000mm^2 and the diagonals 4250 mm^2. Calculate the central deflection, taking E = 200KN/ mm^2.

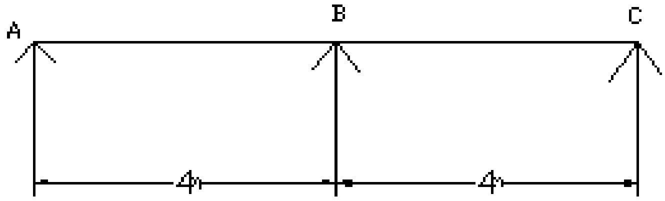


UNIT – II
PART – A

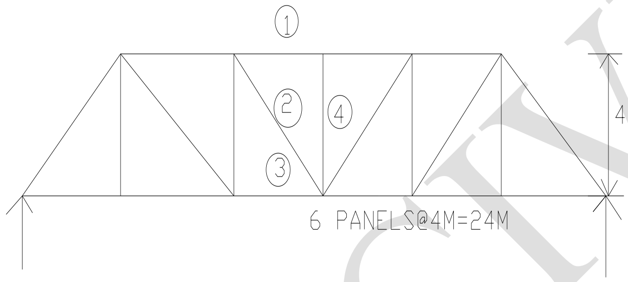
1. Draw ILD for the given fig.
2. State Muller Breslau's principle.
3. What are the types of connections possible in the model of begg's deformeter?
4. What is influence line diagram?
5. Draw influence lines for support reactions in a simply supported beam.
6. What do you understand by an influence line for bending moment?
7. When a series of wheel loads move along a girder, what is the condition for getting maximum bending moment under any one point load?
8. Draw the qualitative influence line diagrams for the support reactions of a simply supported beam of span L.
9. What is meant by absolute maximum bending moment in a beam?
10. What are the three types of connections possible with the model used with Begg's deformeter?
11. What is Begg's deformeter?
12. Where do you get rolling loads in practice?
13. Name the type of rolling loads for which the absolute maximum bending moment occurs at the midspan of a beam.
14. Define similitude.
15. What is the principle of dimensional similarity?

PART – B

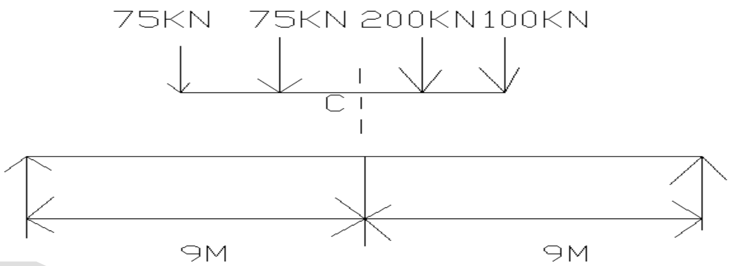
1. Draw the influence line diagram for the reaction at A for the beam shown in fig.



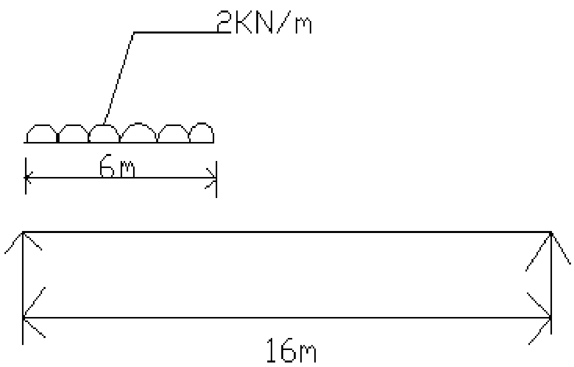
2. Draw the influence line diagram for the member 1, 2, 3 and 4 of the truss shown in the fig.



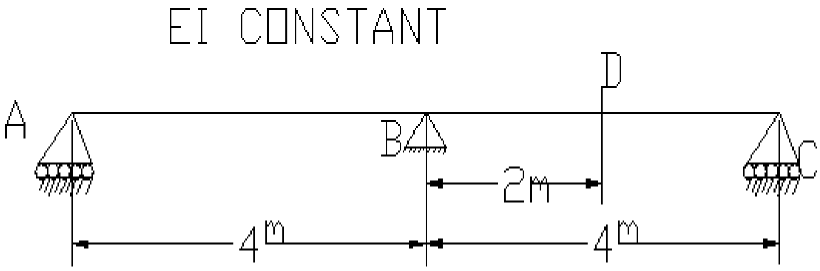
3. A girder having a span of 18m is simply supported at its ends it is traversed by a train of load as shown in fig 5 with 100kn load leading. Find the equivalent UDL.



4. An UDL of intensity 2kn/m over a length of 6m crosses a simply supported beam of span 16m. Construct the maximum shear force diagram and bending moment diagram. Also calculate the ordinates at 3m, 5m and 8m from both the ends. Refer the following fig.



5. Draw the influence lines for shearing force and BM at a section 3m from one end of a simply supported beam, 12m long. Use the diagrams to calculate the maximum shearing force and the maximum bending moment at this section due to a uniformly distributed rolling load, 5m long of 2kn/m intensity.
6. Determine the influence line for the shear force at D, the middle point of span BC, of a continuous beam shown in fig. compute the ordinates at 1m interval.



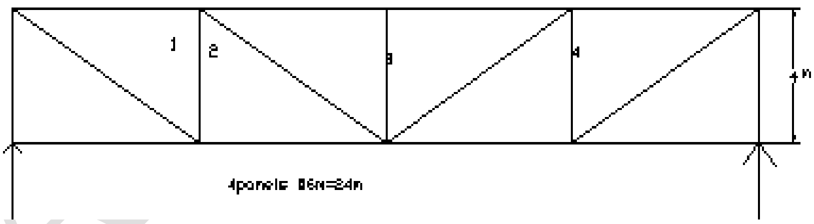
7. The following system of wheel loads crosses a span of 25m.

Wheel load (kn):	16	16	20	20	20
Distance between centre (m) of wheel	3	3			

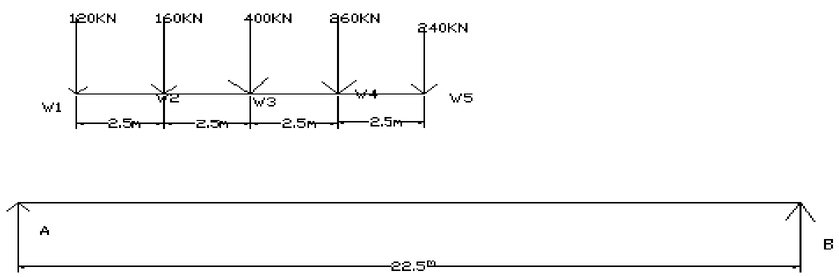
Wheel load (kn): 16 16 20 20 20

Distance between centre (m) of wheel.

8. Draw the influence line diagram for the members 1,2,3 and 4 as shown in fig.

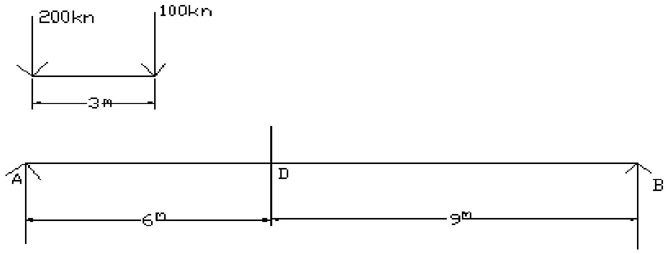


9. A train of 5 wheel loads crosses a simply supported beam of span 22.5m. Using influence lines, calculate the maximum positive and negative shear forces at mid span and absolute maximum bending moment anywhere in the span.



10. Two point loads of 100KN and 200KN spaced 3m apart cross a girder of span 15m from left to right with the 100KN load loading. Draw the influence line for shear force and bending moment and find

the value of maximum shear force and bending moment and find the value of maximum shear force and bending moment at a section D, 6m from the left hand support. Also, find the absolute maximum bending moment due to the given load system.



UNIT – III

PART – A

1. What are the methods used for analysis of fixed arches?
2. Give the equation for a parabolic arch whose springing is at different levels.
3. State Eddy's theorem as applicable to arches.
4. Explain the effect of temperature on the horizontal thrust of a two hinged arch subjected to a system of vertical loads.
5. Write down the expressions for radial shear and normal trust in a three hinged parabolic arch.
6. Define radial shear and normal thrust.
7. Mention the examples where arch action is usually encountered.
8. What is a linear arch?
9. What is the degree of static indeterminacy of a three hinged parabolic arch?
10. Under what conditions will the bending moment in an arch be zero throughout?
11. Distinguish between two hinged and three hinged arches.
12. In a parabolic arch with two hinges how will you calculate the slope of the arch at any point?
13. How will you calculate the horizontal thrust in a two hinged parabolic arch if there is a rise in temperature?
14. What are the types of arches according to their shapes?
15. What are the types of arches according to the support conditions?

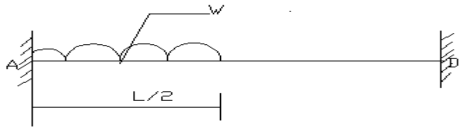
PART – B

16. Derive an expression for the horizontal thrust of a two hinged parabolic arch. Assume I = Isec.
17. A three hinged parabolic arch of span 20m and rise 4m carries a udl of 20kn/m over the left half of the span. Draw the BMD.
18. A three hinged parabolic arch has 20m span and 3m rise and carries a point load of 10kn at 7.5m from the left hand hinge. Calculate the horizontal thrust and the bending moment at a section 7.5m from the right-hand hinge. What is the value of the greatest bending moment in the arch, and where does it occur?

19. A steel two hinged circular arch rib has a span of 30m and a rise of 3m. The rib section is uniform throughout with an overall depth of 0.7m neglecting all effects except due to bending, find the bending stress at the crown due to a temperature change of 30°K. Take E=2x10^5N/mm2 and §=11x10^{-8} per degree Kelvin.
20. A circular arch hinged at springing and crown of span 20m and rise 4m is subjected to a point load of 80kn at a distance of 5m from the left support. Find the reactions at the support and also the bending moment.
21. A two hinged parabolic arch of span 32m and a rise 5m carries on UDL of a 10kn/m for a span of 8m from the left support. Find the reactions at the support and the maximum BM. Also find the radial shear and normal thrust from the ends.
22. A three hinged parabolic arch of span 40m and rise 4m carries a udl of 30kn/m. Over the left half of the span. Draw the BMD.
23. Derive an expression for the horizontal thrust of a two hinged semi circular Arch with a point load at the crown.
24. A parabolic arch hinged at ends has a span of 60m and a rise of 12m. A concentrated load of 8kn acts at 15m from the left hinge. The second moment of area varies as a secant of the inclination of the arch axis. Calculate the horizontal thrust and reactions at the hinges. Also calculate the maximum negative BM.
25. A symmetrical three hinged parabolic arch of span 40m and rise 8m caries a udl of 30kn/m over the left half of the span. The hinges are provided at the supports and at the centre of the arch. Calculate the reaction at the support. Also calculate the B.M, radial shear& normal thrust at a distance of 10m from the left support.

UNIT – IV
PART – A

1. Write down the equilibrium equations used in slope deflection method?
2. What is the basic assumption made in slope deflection method?
3. Give the fixed end moment for the beam shown in fig.

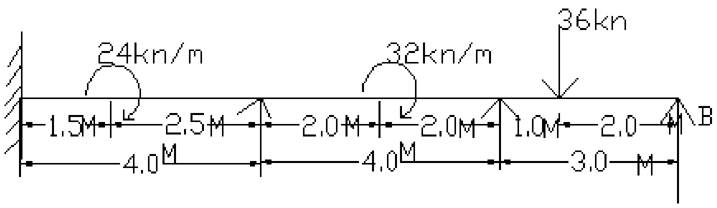


4. Write the general equations for finding out the moment in a beam AB by using slope deflection equation.
5. What is meant by distribution factor?
6. Say true or false and if false, justify your answer “slope deflection method is a force method”.
7. What are the reasons for sway in portal frames?

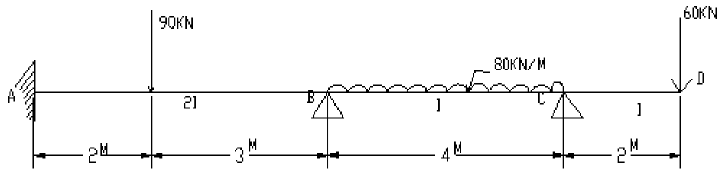
8. What are the sign conventions used in slope deflection method?
9. Why slope-deflection method is called a ‘displacement method’?
10. Mention any three reasons due to which sway may occur in portal frames.
11. State the limitations of slope deflection method.
12. Who introduced slope-deflection method of analysis?
13. Write the fixed end moments for a beam carrying a central clockwise moment.
14. What is the basis on which the sway equation is formed for a structure?
15. How many slope-deflection equations are available for each span?

PART – B

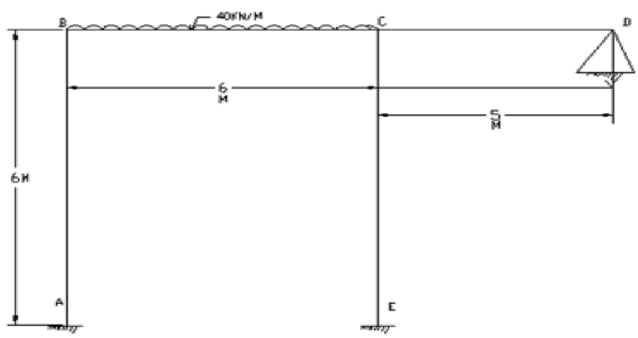
1. Analysis the continuous beam shown in the fig. all the members have the same flexural rigidity.



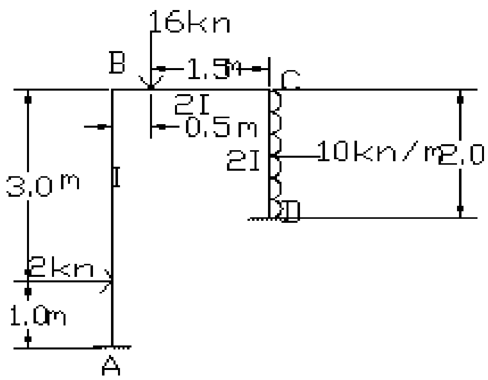
2. Analyze the beam shown in the fig by slope deflection method and draw the SFD and BMD. EI = constant.



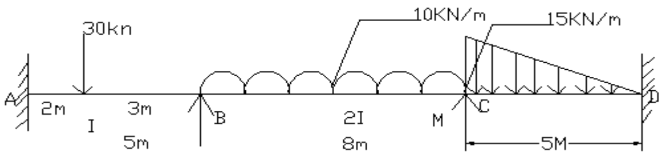
3. Analyze the frame shown in the fig by slope deflection method and draw the SFD and BMD. EI=constant.



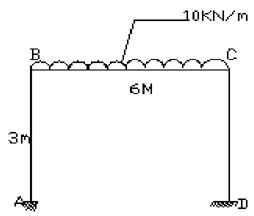
4. Find the moments at A,B,C and D for the portal frame shown in the fig. also draw BMD for the frame.



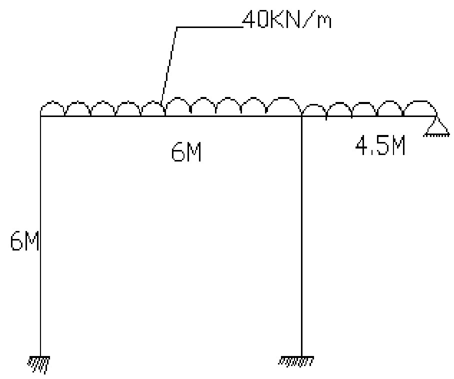
5. Analyze the continuous beam shown in the fig by slope deflection method and draw the BMD.



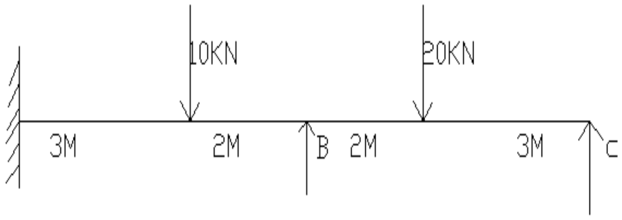
6. Analysis the portal frame shown in the fig. by slope deflection method and sketch the SFD and BMD. EI is constant.



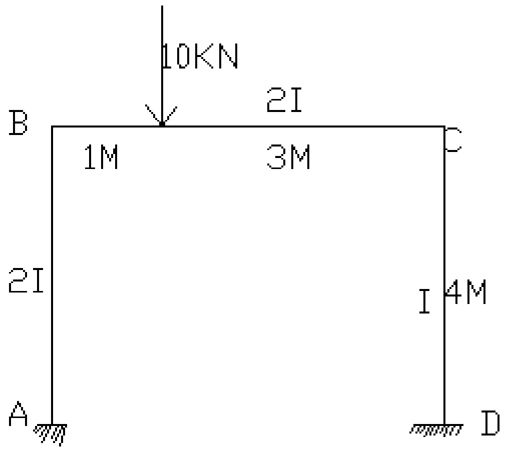
7. Analyze the frame shown in the fig by slope deflection method and draw the SFD and BMD. EI = constant.



8. Analyze the beam shown in the fig by slope deflection method and draw the SFD and BMD. EI = constant.



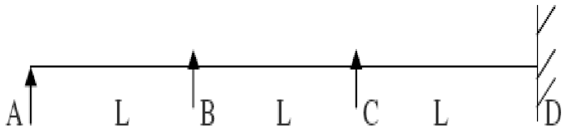
9. A beam ABC 12m long fixed at A and C and continuous over support B, is loaded with UDL of 2kn /m in span AB and a central point load of 12kn in span BC. Calculate the end moments and plot the SFD. Use slope deflection method.
10. Draw the BMD and sketch the deflected shapes of the frame shown in fig. all members are of the same material. Use slope deflection method.



UNIT – V
PART – A

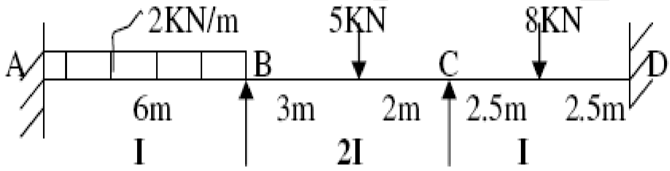
1. Define: stiffness
2. State how the redundancy of a rigid frame is calculated.
3. Explain carry over factor and distribution factor.
4. What is carry over moment?
5. Give the relative stiffness when the far end is (a) Simply supported and (b) Fixed.
6. What is sway correction?
7. How is the moment induced at a fixed end calculated when a moment M is applied at the end of prismatic beam without translation?
8. What is the difference between absolute and relative stiffness?
9. What are the advantages of Continuous beam over simply supported beam?
10. Define: Moment distribution method. (Hardy Cross method).

11. Define: Distribution factor.
12. Define Flexural Rigidity of Beams.
13. Define the term ‘sway’.
14. What are the situations where in sway will occur in portal frames?
15. Find the distribution factor for the given beam.

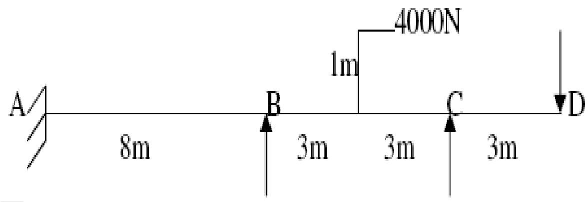


PART – B

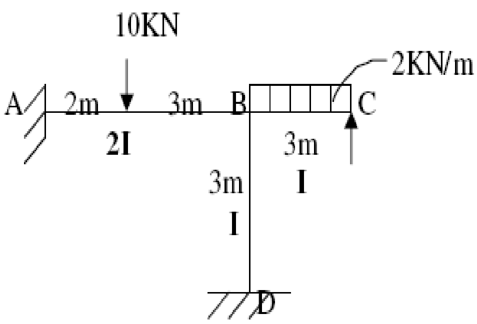
1. Analyze the continuous beam shown in Fig. by moment distribution method and draw the bending moment diagram.



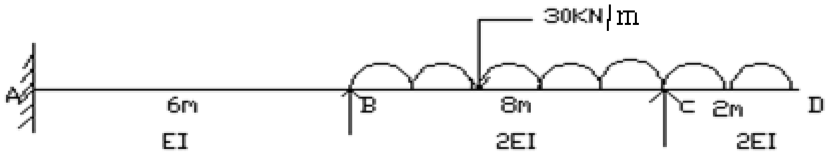
2. A continuous beam loaded as shown in Fig. Find the support moments and draw bending moment diagram.



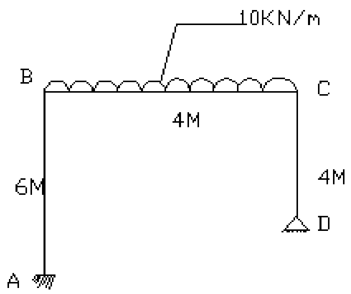
3. Analyze the frame shown in Fig. by moment distribution method and draw BMD.



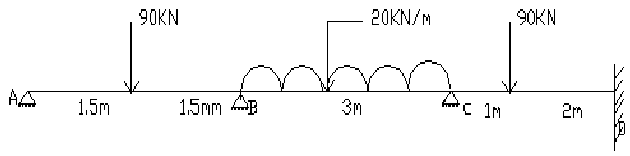
4. Draw the SFD and BMD for the beam shown in fig. by a moment distribution.



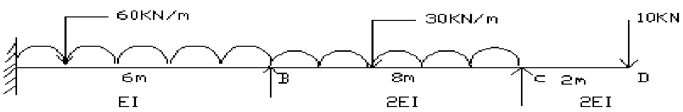
5. Draw the SFD and BMD for the frame shown in the fig. by moment distribution method. EI = constant.



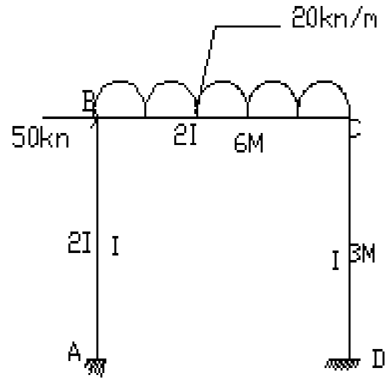
6. Solve by moment distribution method. Support a settles by 10mm downwards. Support B settles by 30mm downwards. Support C settles by 20mm downwards. Take EI = 4800kn-m^2. Refer the following fig.



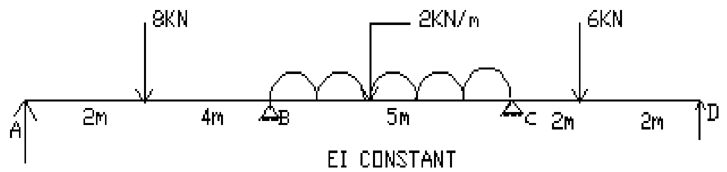
7. Draw the SFD and BMD for the beam shown in fig. by a moment distribution.



8. Draw the SFD and BMD for the frame shown in the fig. by moment distribution method. EI = constant.



9. Beams ABCD 16m long is continuous over three spans and is loaded as shown in fig. use moment distribution method and calculate the end moments and plot the BMD. Also plot SFD.



10. Analyze the continuous beam shown in Fig. by moment distribution method and draw the bending moment diagram.