SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
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(AUTONOMOUS)

QUESTION BANK (DESCRIPTIVE)

Subject with Code : Structural Analysis-II (16CE125) **Course & Branch**: B.Tech – CE

Year & Sem: III-B.Tech & II-Sem **Regulation:** R16

UNIT-I

ARCHES

1. A three hinged parabolic arch of span 20 m and rise 4m carries an uniformly distributed load of 2 KN/m on the left 8 m length. Calculate
   a) The direction & magnitude of reactions at the hinge
   b) The bending moment, normal thrust and radial shear at 4m from left support.
2. Two hinged parabola arch of span 30 m and rise 6 m carries two point loads each 60 KN, acting at 7.5 m and 15 m from left support. The moment of inertia varies as the secant at slope. Determine the horizontal thrust and max positive and negative moments in the arch rib.
3. A three hinged parabolic arch of span 20 m and rise 5 m carries concentrated loads of 20 KN and 30 KN at distances of 3 m and 7 m from left end and an uniformly distributed load of 25 KN/m on the right half of the span. Determine the horizontal thrust. Also calculate the radial shear, normal thrust and bending moment at a distance of 5 m from left end.
4. A three hinged parabolic arch has a span of 60 m and central rise of 8 m. It is subjected to a point load of 40 KN at a distance of 10 m from left support and an uniformly distributed load of 10 KN/m over right half span. Calculate the location and magnitude of maximum bending moment. Also calculate the radial shear, normal thrust and bending moment under 40 KN load.
5. Determine the horizontal thrust developed in a semi circular arch of radius R subjected to a concentrated load W at the crown.
6. Find the horizontal thrust for two-hinged parabolic arch has a span of 24 m and central rise of 4 m. It is subjected to a point load of 15 KN at a distance of 6 m from left support. The moment of inertia at any section is I_C SecΘ and also find bending moment under the load.

7. A two hinged parabolic arch of span 36 m and central rise 8 m carries an uniformly distributed load of 40 KN/m over left half of span. Determine the position and magnitude of maximum bending moment and also find the normal thrust and radial shear at 9 m from the left support. Assume that the moment of inertia at a section various as a secant of the inclination at the section.
8. A 3-hinged arch is circular, 25 m in span with a central rise of 5m. It is loaded with a concentrated load of 10 KN at 7.5m from the left hand hinge. Find the
   i) Horizontal thrust
   ii) Reaction at each end hinge
   iii) Bending moment under the load
9. A two hinged parabolic arch of span 40 m and rise 6 m is loaded with a uniformly Distributed load of 30 KN/m over the left half of the span and a concentrated load of 120 KN at 5 m from the right end. Find the
   a) Horizontal thrust
   b) Maximum positive and negative bending moment
   c) Normal and radial shear at 10 m from the right support. The moment of inertia at any section is I_C SecΘ
10. A three-hinged circular arch of span of 16 m and rise of 4 m is subjected to two point loads of 100 KN and 80 KN at the left and right quarter span points respectively. Find the reactions at the supports, normal thrust and shear at a section 6 m from left support.

UNIT-II

APPROXIMATE METHODS OF ANALYSIS OF FRAMES

1. In a multistoried building, the frame shown in Figure 2.1 are spaced at 4 m intervals. Dead load from the slab is 3 KN/m^2 and the live load is 5 KN/m^2.Analyse the beam BC for mid span positive bending moment. Self weight of the beams may be ignored. Use Substitute Frame method

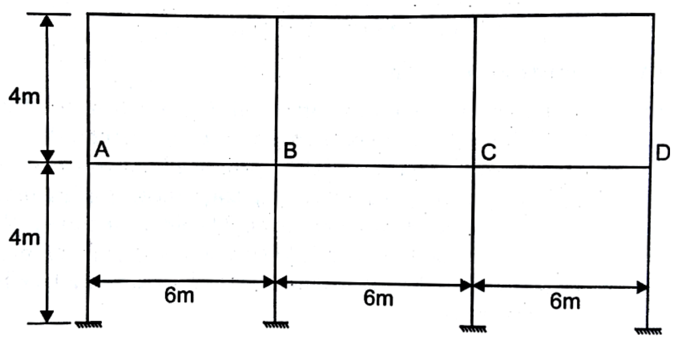

Figure 2.1

2. In a multistoried building, the frame shown in Figure 2.2 are spaced at 3.5 m intervals. Dead load from the slab is 3 KN/m^2 and the live load is 5 KN/m^2.Analyse the beam BC for mid span negative bending moment. Self weight of the beams of 4 m span may be taken as 4 KN/m and that of 6m span may be taken as 5 KN/m. Use Substitute Frame method. The Stiffness of the members are indicated against each member

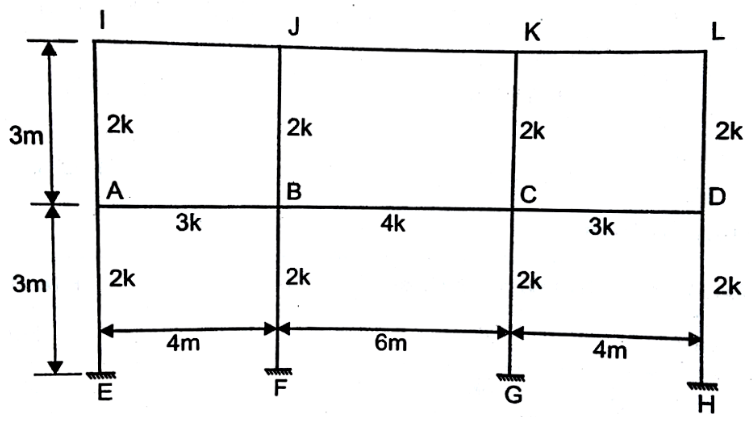

Figure 2.2

3. In a multistoried building consists of 4 Storeyed 3 bay frames spaced at 3 m c/c. Live load on floor slab is 3 KN/m^2 and dead load is 3.5 KN/m^2. The spans of the beams from left to right are 6 m, 4 m and 4 m respectively. Storey height is 3.5 m. Moment of inertia of the beams is 1.5 times that of columns. Self weight of the beams is 3.5 KN/m. Determine the maximum moment in the beam at the junction of first span and second span of an intermediate floor Use Substitute Frame method.

4. Using the portal method, analyses the building frame subjected to horizontal force (due to wind) as shown in Figure 2.3.Sketch the bending moment diagram.

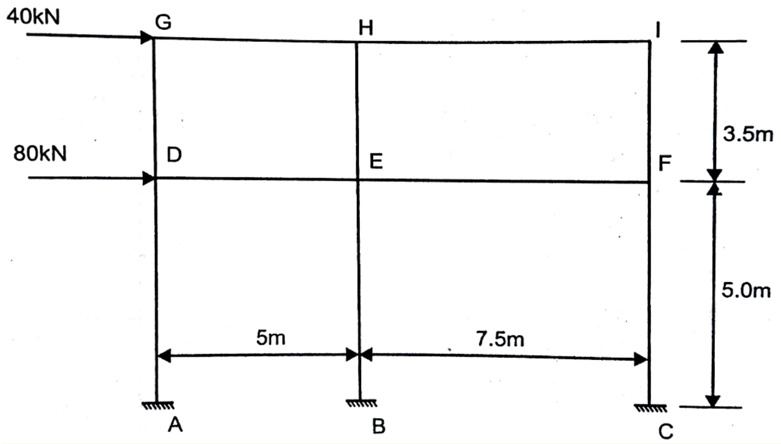

Figure 2.3

5. Using the portal method, analyze the building frame subjected to horizontal force (due to wind) as shown in Figure 2.4.Sketch the bending moment diagram.

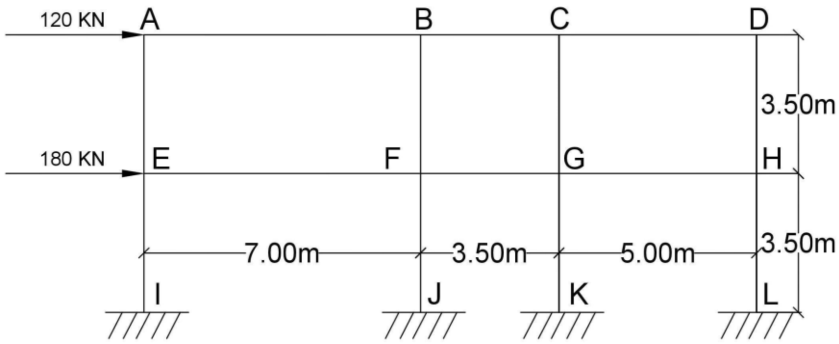

Figure 2.4

6. A 3 storey building frame has to carry equivalent live loads as shown in Figure 2.5. The inner columns have twice the area of cross section as the outer columns. Find the bending moments on the bottom storey. Use cantilever method.

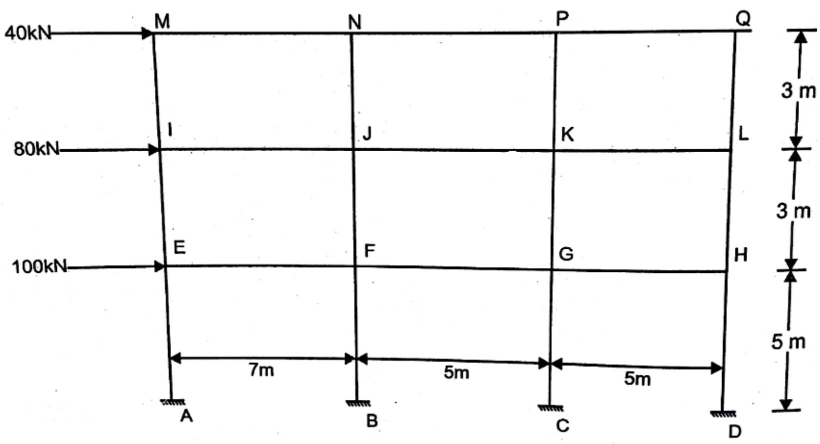

Figure 2.5

7. Use portal method, analyze the building frame subjected to horizontal force (due to wind) as shown in Figure 2.6. Draw the bending moment diagram.

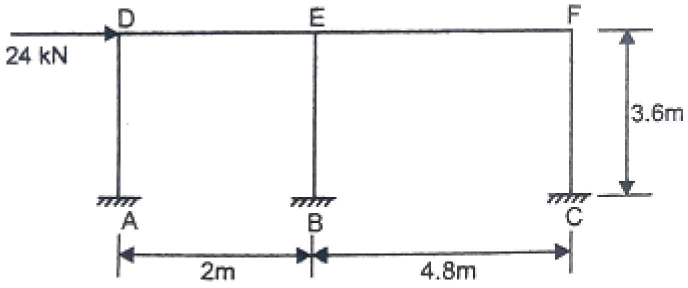

Figure 2.6

8. Explain the substitute Frame method of analysis for a multistoried frame for obtaining the maximum bending moment in a particular beam or a column.
9. Analyze the frame shown in Figure 2.7 by Cantilever method. Draw the bending moment diagram and Cross-sectional area of all columns is equal

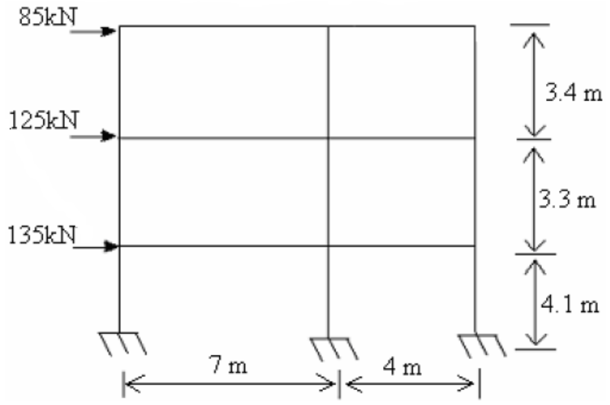

Figure 2.7

10. Using the Cantilever method, analyses the building frame subjected to horizontal force (due to wind) as shown in Figure 2.8.Sketch the bending moment diagram.

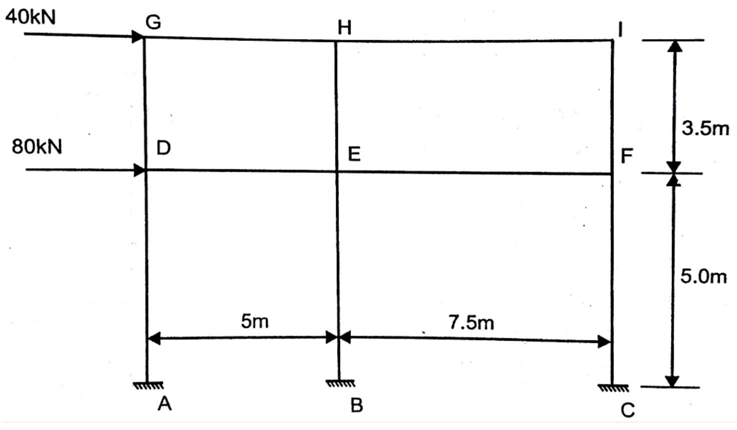

Figure 2.8

UNIT – III

INFLUENCE LINES AND MOVING LOADS

1. Four point loads of 120 KN, 160 KN, 160 KN and 80 KN spaced 2 m between consecutive loads move on a girder of 25 m span from left to right with the 120 KN load leading. Calculate the maximum bending moment at a point 10 m from left support. Also calculate the position and value of the absolute maximum bending moment.
2. Four equal loads of 150 KN each equally spaced at 2 m apart followed by a uniformly distributed load of 60 KN/m at a distance of 1.5m from the last 150 KN load cross a girder of 20 m span from right to left. Using influence lines, calculate the shear force and bending moment at a section 8 m from left hand support when the leading 150 KN load is at 5 m from the left hand support.
3. The beam is loaded with concentrated loads, which are moving from right to left as shown in Figure 3.1. Compute the maximum moment at the section C and also calculate absolute maximum bending moment.

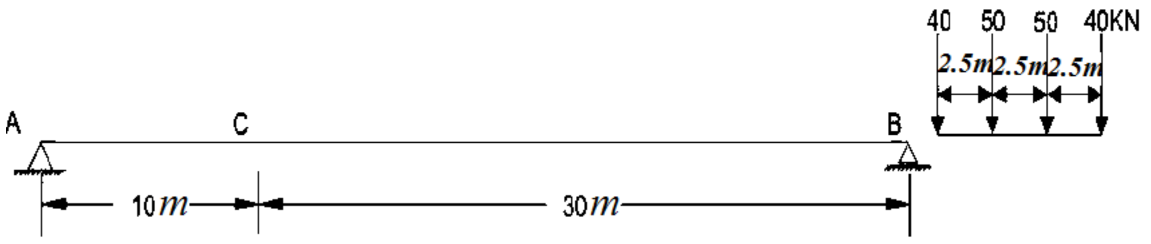

Figure 3.1

4. A UDL of length of 6 m and intensity 20 KN/m moves across a simple beam of span 20 m. Determine the maximum negative and positive shear force at sections 4 m from left support and 5 m from right support. Also find the absolute maximum bending moment that may occur anywhere in the girder

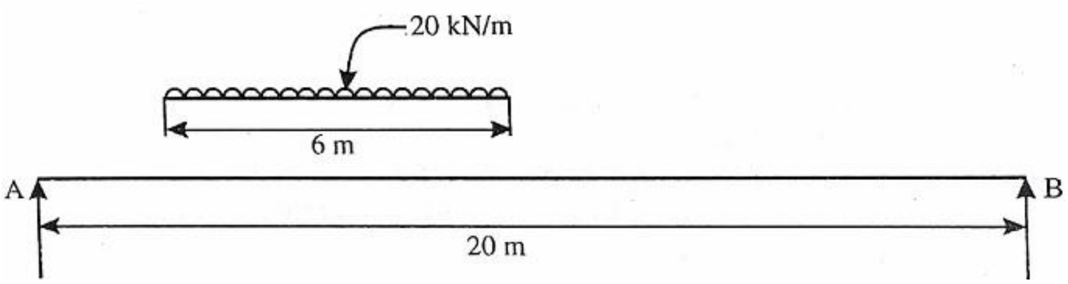

Figure 3.2

5. A train of 5 wheel loads crosses a simply supported beam of span 22.5 m as shown in Figure 3.3 .Using influence lines, calculate the maximum positive and negative shear forces at mid span and absolute maximum bending moment anywhere in the span

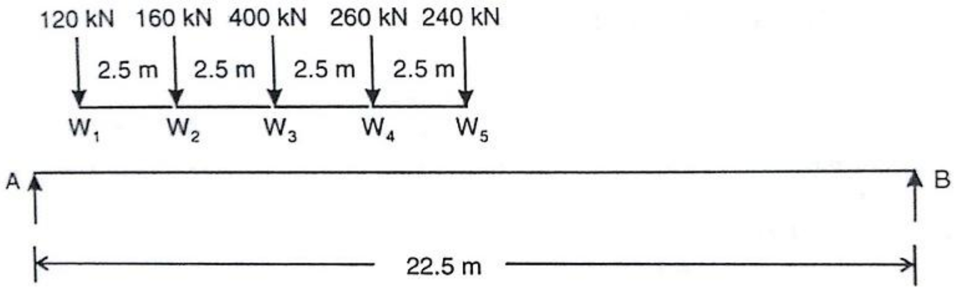

Figure 3.3

6. A train of concentrated loads shown in Figure 3.4. The loads moves from left to right on a simply supported girder of span 16.0 m. Determine absolute maximum bending moment.

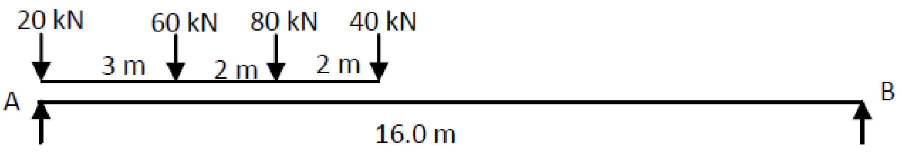

Figure 3.4

7. For a simply supported beam of span 'L' as shown in Figure 3.5 draw:
   (a)Influence line for RA.
   (b)Influence line diagram for RB.
   (c)Influence line diagram for shear force at 'C'.
   (d)Influence line diagram for B.M at 'C'.

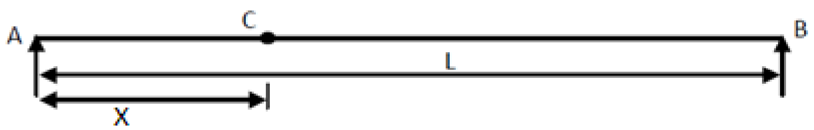

Figure 3.5

8. For a truss as shown in figure 3.6, draw the influence line diagram for the forced in member P, Q, R, S of the truss

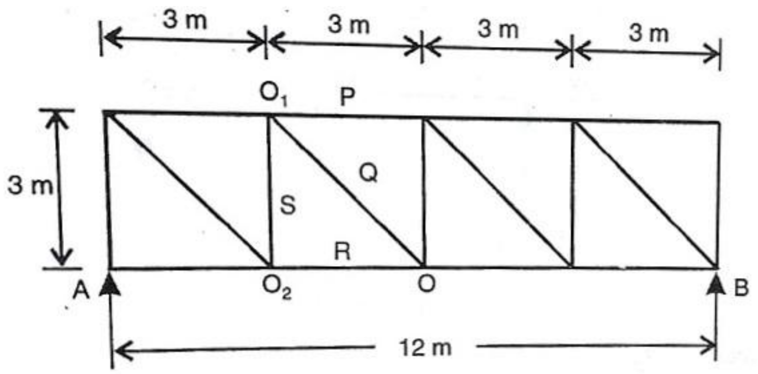

Figure 3.6

9. A girder having a span of 18 m is simply supported at the ends. It is traversed by a train of loads as shown in Figure 3.7. The 50 KN load is leading. Find the maximum bending moment which can occur (i) Under the 200 KN (ii) Under 50 KN load

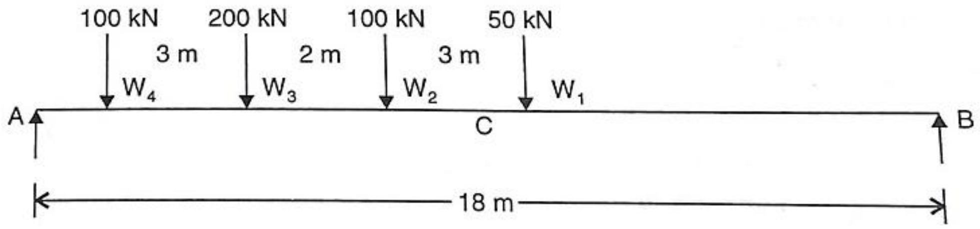

Figure 3.7

10. a) A single load of 100 KN rolls along a girder of 20 m span. Draw the diagrams of maximum bending moment and shear force (positive and negative).What will be the absolute maximum positive shear force and bending moment?

b) In a simply supported girder AB of Span 20 m, Determine the maximum bending moment and maximum shear force at a section 5 m form A, due to the passage of a uniformly distributed load of intensity 20 KN/m, longer than the span

UNIT – IV

INTRODUCTION TO MATRIX METHODS OF STRUCTURAL ANALYSIS

1. Determine the degree of statically indeterminacy and degree of kinematic indeterminacy of the beams in Figure 4.1

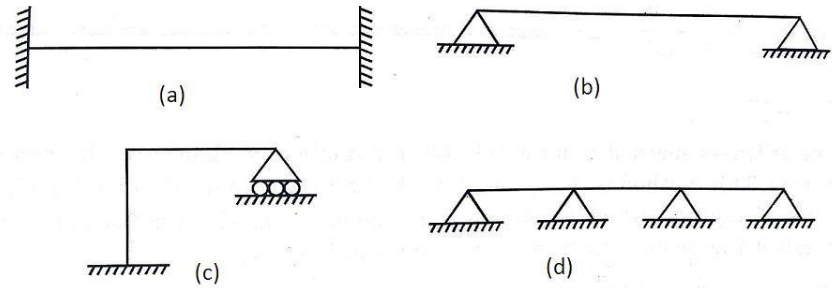

Figure 4.1

2. Analyze the continuous beam shown in figure 4.2. by flexibility matrix method. Draw the bending moment diagram. Take EI is constant throughout.

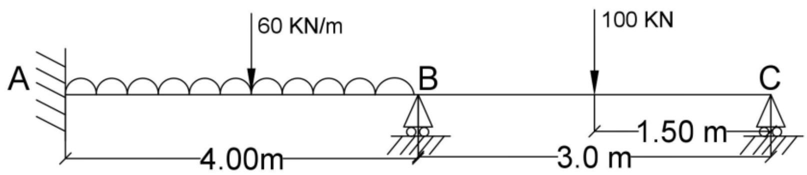

Figure 4.2

3. Using flexibility matrix method for the continuous beam shown in figure 4.3 and draw the bending moment diagram, EI is Constant.

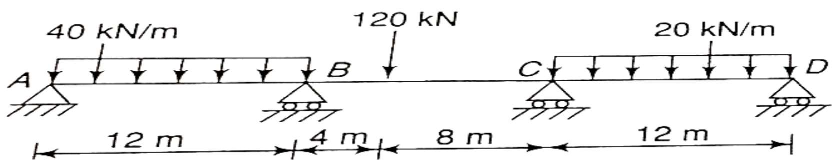

Figure 4.3

4. Analyze the continuous beam shown in figure 4.4, if the downward settlement of supports B and C are 10 mm and 5mm respectively. Take EI=184×10^{11} Nmm^2 .Use flexibility matrix method.

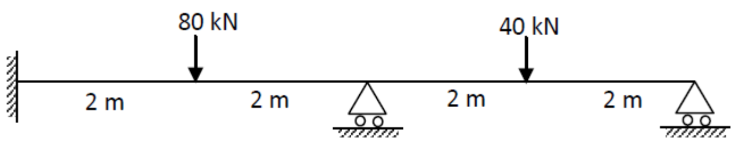

Figure 4.4

5. Analyze the continuous beam shown in figure 4.5. by stiffness matrix method. Draw the bending moment diagram. Take EI constant throughout.

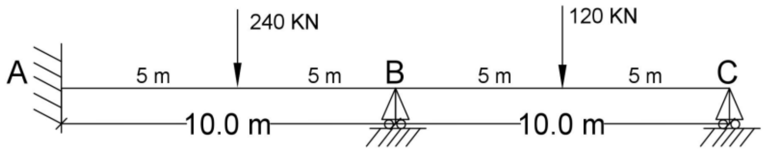

Figure 4.5

6. Analyze the continuous beam shown in figure 4.6 by displacement method. Draw the bending moment diagram. Take EI constant throughout.

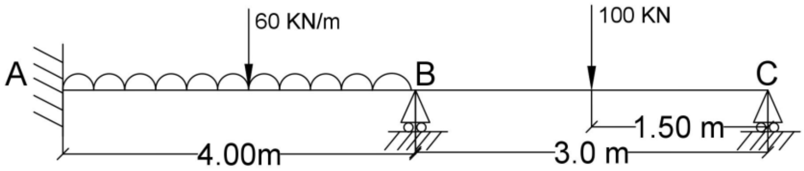

Figure 4.6

7. Analyze the continuous beam shown in figure 4.7, if the support B sinks by 10 mm. Take EI=200x10^{14} KNm^2 .Use displacement method.

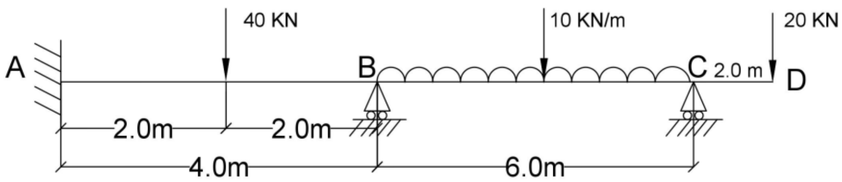

Figure 4.7

8. Analyze the continuous beam given in figure 4.8, by the stiffness method. Draw the bending moment diagram. Take AB=2I, BC=CD=I

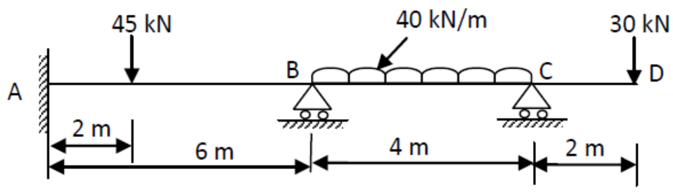

Figure 4.8

9. A two span continuous beam shown in figure 4.9. The moment of inertia is constant throughout. Analyze the beam by stiffness method.

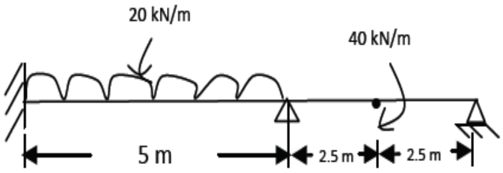

Figure 4.9

10. Analyze the continuous beam shown in figure 4.10, if the support B sinks by 10 mm. Take EI=6000 KNm^2 .Use displacement method.

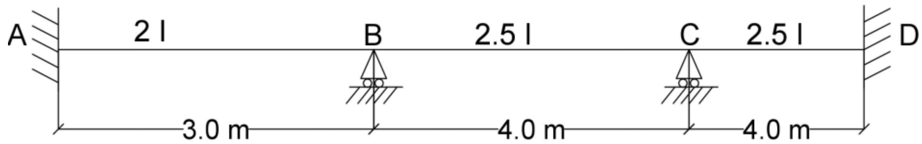

Figure 4.10

UNIT – V

PLASTIC ANALYSIS

1. Explain in details the various stage of bending of rectangular sections. Draw sketches
2. Explain: (a) Lower bound theorem (b) Upper bound theorem and uniqueness theorem.
3. Derive the shape factor for: (a) Triangular section (b) Rectangular section
4. A mild steel I-section 200 mm wide and 250 mm deep has mean flange thicKNess of 20 mm and web thicKNess of 10 mm. Calculate the shape factor and also find fully plastic moment if $\sigma_y = 252$ N/mm^2.
5. A two span continuous beam ABC has span lengths AB = 6 m and BC = 6 m and carries a U.D.L. of 30 KN/m completely covering the spans AB and BC. A and C are simple supports. If the load factor is 1.80 and the shape factor is 1.15 for the 'I' section, find the section modulus needed. Assume yield stress for the material as 250 MPa.
6. A beam fixed at both the ends is subjected to uniformly distributed load 'W' on the right half portion. Determine the value of collapse load W_C. The beam is of uniform plastic moment M_P.
7. Find the required value of plastic moment capacity at collapse load for the continuous beam shown in figure 5.1. Take AB= 2 M_P; BC =1.5M_P; CD = M_P

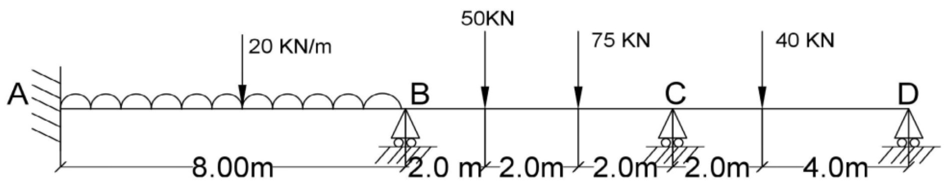

Figure 5.1

8. Determine the plastic moment capacity of a continuous beam shown in figure 5.2.
   Take λ= 1.7.

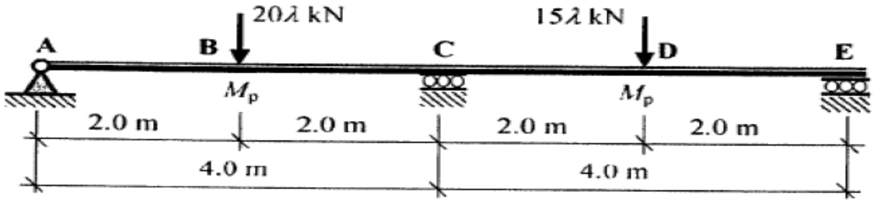

Figure 5.2

9. A beam of uniform section having span "L" and plastic moment M_P is fixed at one end and simply supported at other end, what is the maximum concentrated load W that beam can carry if the load W at L/3 from fixed end.

10. Determine the collapse load for the frame shown in figure 5.3.

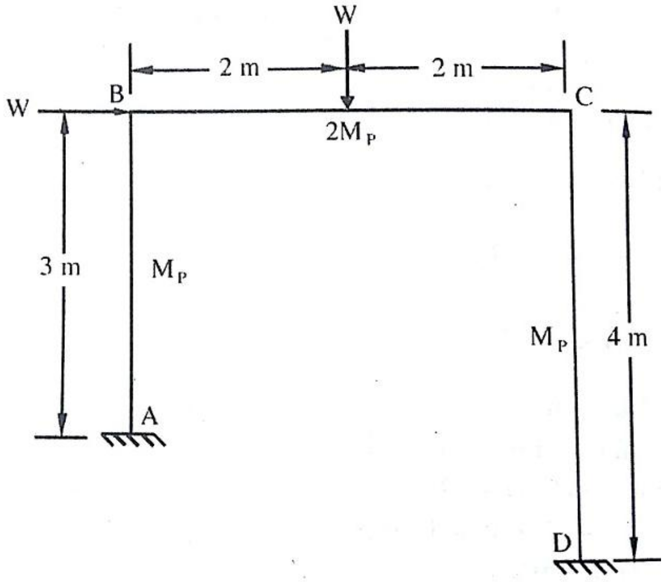

Figure 5.3

Prepared by: **A.MOHAN.**