Reg. No. :

Question Paper Code: 1035022

B.E. / B.Tech. DEGREE EXAMINATIONS, NOV/ DEC 2024
Fifth Semester
Civil Engineering
U20CE501 – STRUCTURAL ANALYSIS
(Regulation 2020)

Time: Three Hours   Maximum: 100 Marks

Answer ALL questions

PART – A   (10 x 2 = 20 Marks)

1.   Define: Indeterminate structures.

2.   What is meant by lack of fit in a truss?

3.   Write down the assumptions made in slope deflection method.

4.   In which situation, the sway may occur in portal frames?

5.   Distinguish between carry over moment and carry over factor.

6.   In a member AB, if moment of 10kN.m is applied at A, what is the moment carried over to B.

7.   State Eddy's theorem.

8.   Under what conditions will the bending moment in an arch be zero throughout?

9.   Explain the upper bound theory.

10. List the theorems for determining the collapse load.

PART – B   (5 x 16 = 80 Marks)

11. (a) Using the principle of virtual work, determine the vertical and horizontal deflection components of joint C of the truss .E=200x10^{6}kN/m^2 and cross sectional area of each bar = 150x10^{-6}m^4.   (16)
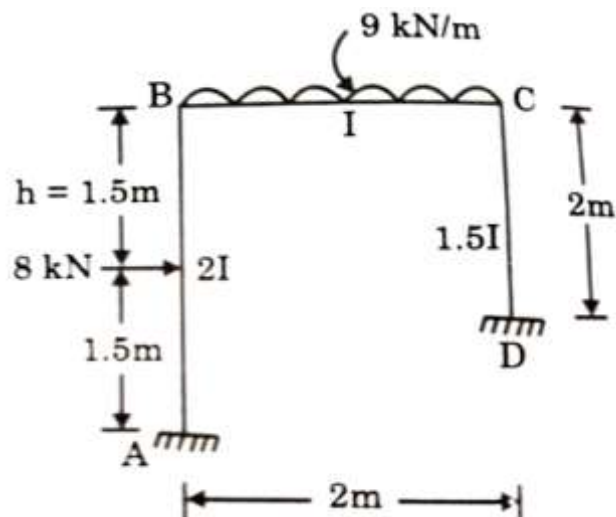
150 kN

A 50°   40° B

3 m
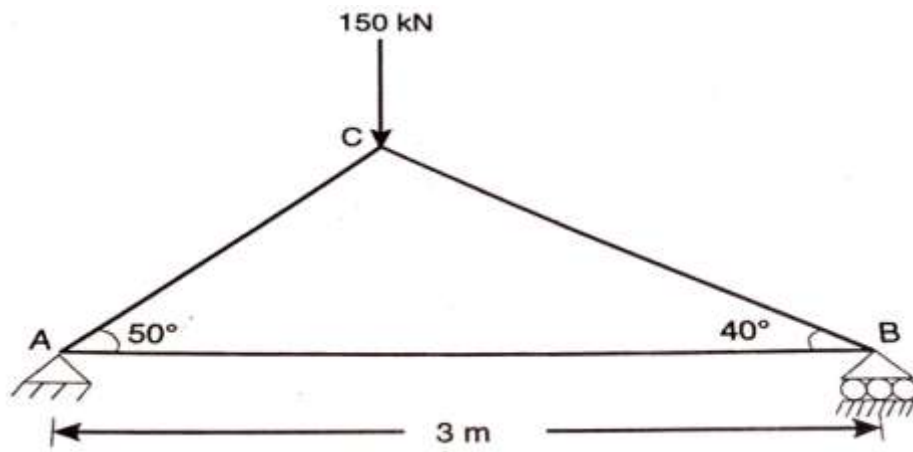
(OR)

(b)   Using the method of virtual work, determine the horizontal displacement of a point C of the frame .Take $E=2\times10^5 N/mm^2$, $I = 4\times10^6 mm4$. (16)
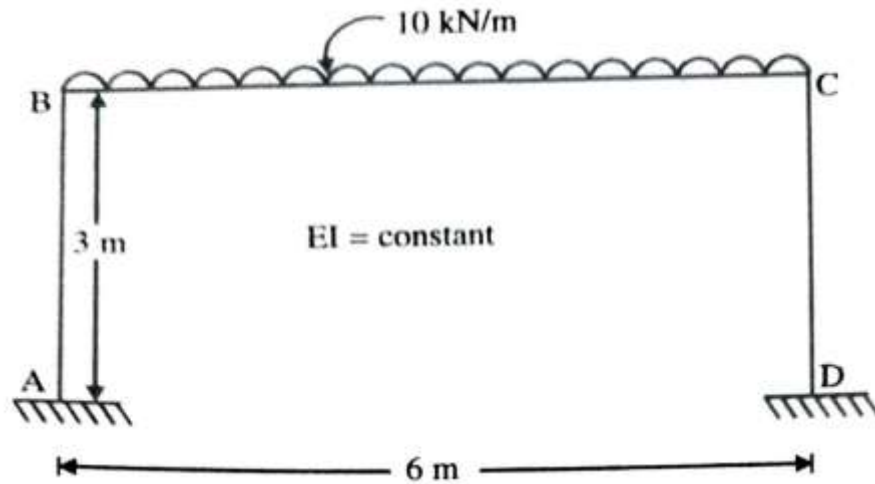

10 kN/m

B   C

2.5 m   5 m

30 kN   D

2.5 m

A

4 m
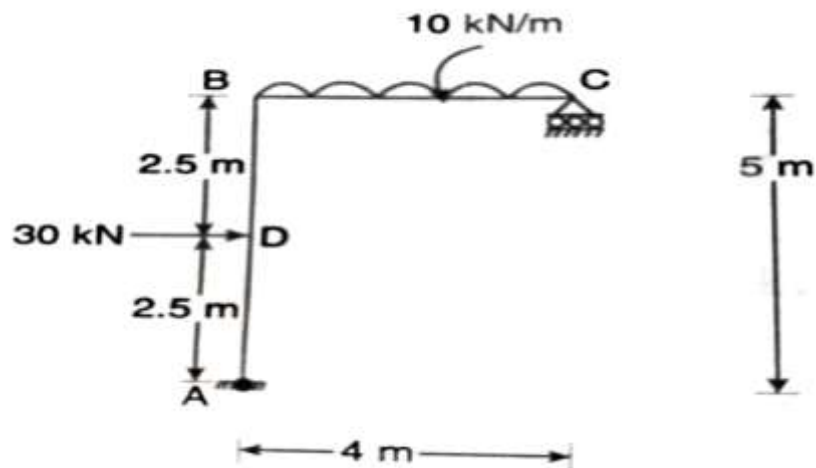
12.   (a) Analyse the frame using slope deflection method and draw the bending moment diagram. (16)

9 kN/m

B   C
   I

h = 1.5m   2m

1.5I

8 kN   2I

1.5m   D

A

2m
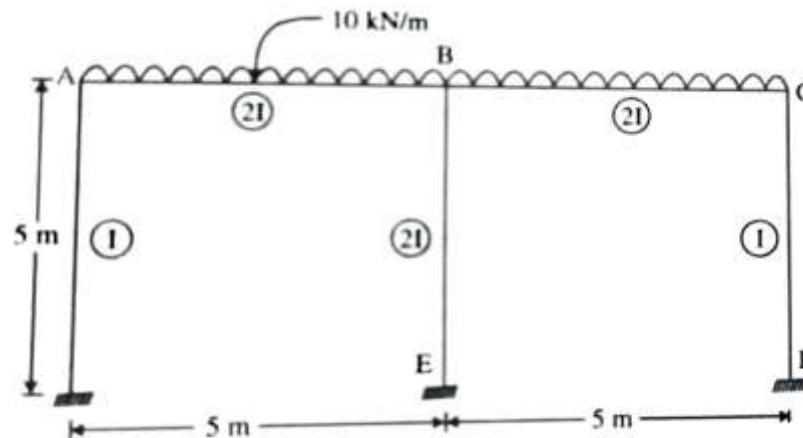
(b) Analyse the portal frame using the slope deflection method and draw the bending moment and shear force diagrams. (16)

10 kN/m

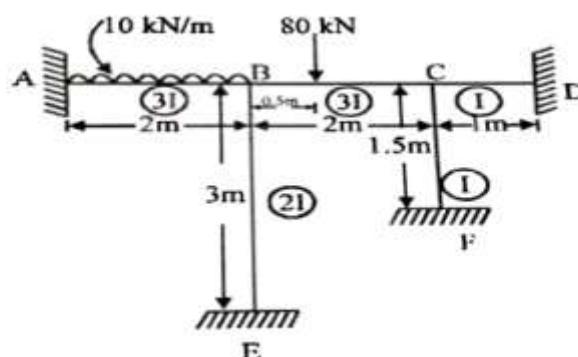B ⌒⌒⌒⌒⌒⌒⌒⌒⌒⌒⌒⌒ C

3 m   EI = constant

A   D

6 m

16

13. (a) Analyse the given using moment distribution method and also draw shear force and bending moment diagrams. (16)


10 kN/m

A ⌒⌒⌒⌒⌒⌒ B ⌒⌒⌒⌒⌒⌒ C

(2I)   (2I)

5 m (I)   (2I)   (I)

E   F

5 m   5 m

(OR)

(b) Analyse the frame loaded by the moment disturbution method. Draw the bending moment and shear force diagrams. (16)

10 kN/m   80 kN

A ⌒⌒⌒⌒ B   C   D

(3I)   (3I)   (I)

2m   2m   1m

1.5m

3m (2I)   (I)

E   F

14. (a) (i) A symmetrical three hinged parabolic arch of span L and central rise y_c carries a u.d.l of w/unit run over the left half of the span .The hinges are provided at the supports and at the centre of the arch .Calculate the location and magnitude of the maximum bending moments (positive and negative). (8)
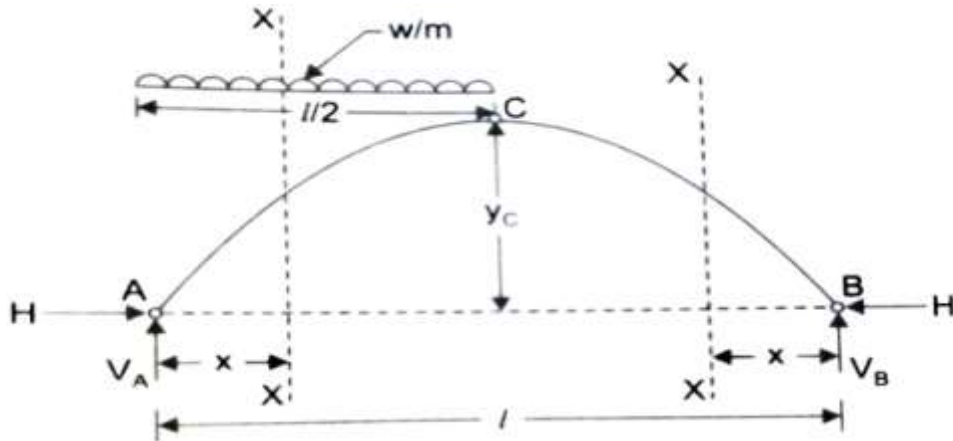

ii) A three hinged circular arch of span 16m and rise 4m is subjected to two point loads of 100 kN and 80kN at the left and right quarter span ponts respectively.Find the reactions at supports .Find also the bending moment radial shear and normal thrust at 6m from left support. (8)
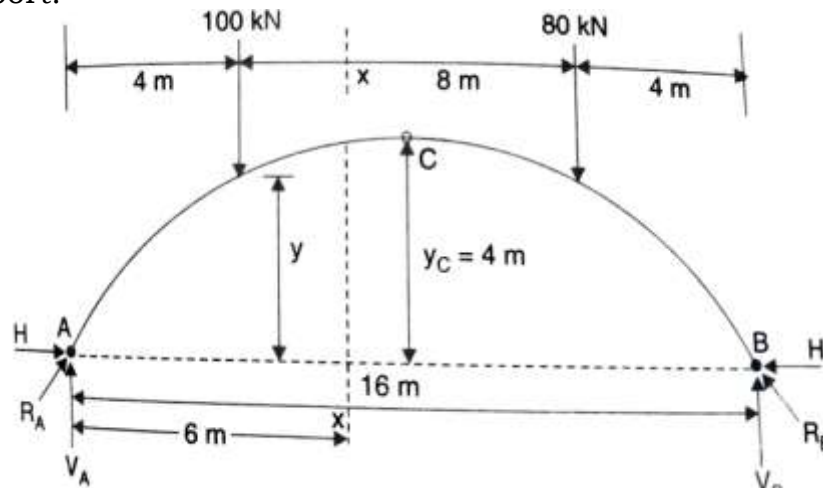

(OR)

(b) A two hinged parabolic arch of span L and rise r carries a UDL of w/meter run over the left hand half of the span .The moment of inertia of the arch rib varies as the secant of the slope of the rib axis.

a)Obtain the expression for the horizontal thrust H.

b) Calculate the horizontal thrust and bending moment at quarter span point on the right half of the span if l=20m, r =4m and w = 20kN/m. (16)

$$V_A = \frac{3}{8} wl \qquad\qquad V_B = \frac{wl}{8}$$
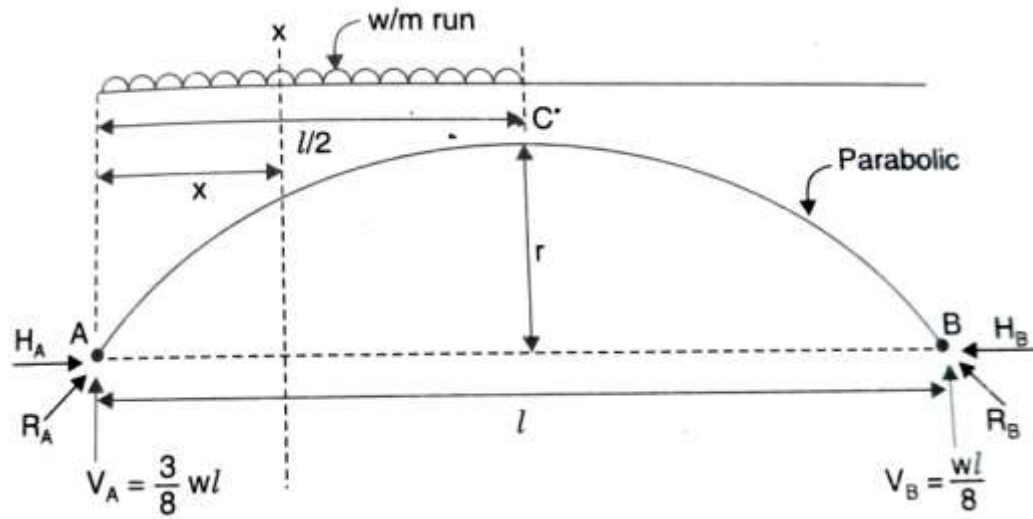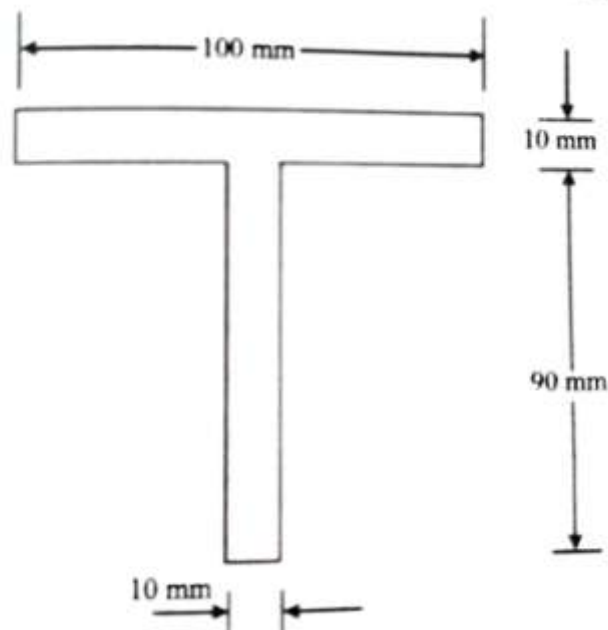
15. (a) i) Find the shape factor of the I-secti (8)
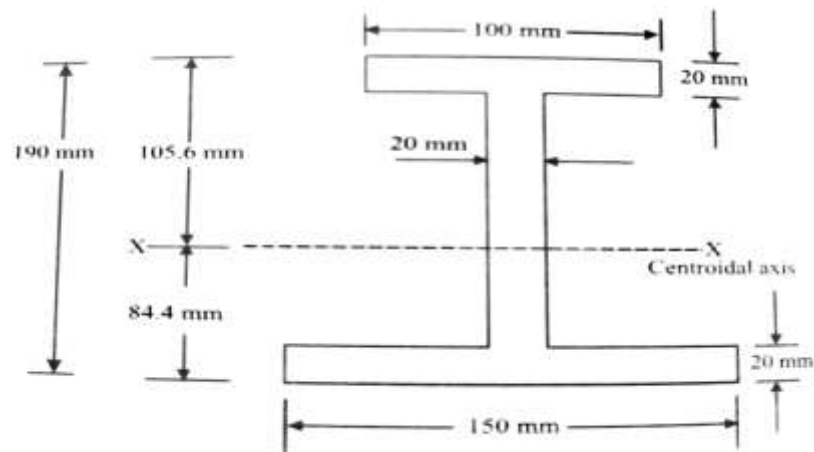
(ii) Find the shape factor of the Tee section. (8)
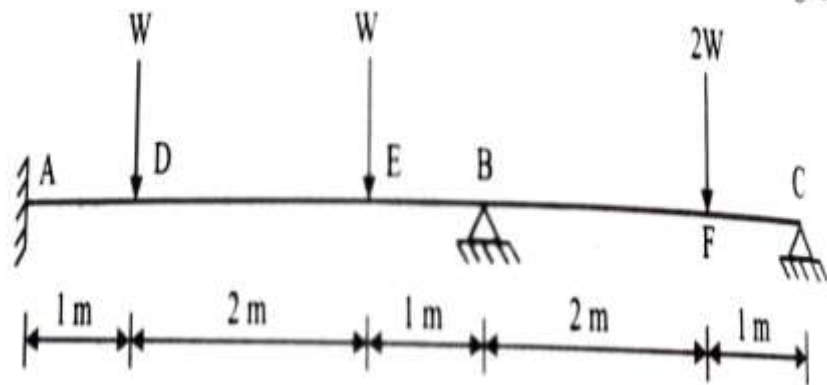
(b) Determine the collapse load of the beam load.   (16)

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