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Question Paper Code : 21206

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Fifth Semester

Civil Engineering

CE 2302/CE 51 — STRUCTURAL ANALYSIS — I

(Regulation 2008)

(Common to PTCE 2302 — Structural Analysis – I for B.E. (Part-Time)
Third Semester – Civil Engineering – Regulation 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Draw the influence line diagram (ILD) for reaction at left support of a simply supported beam.

2. What is the condition at which maximum absolute bending moment occurs in the simply supported beam when an udl of length more than span of the beam move on it.

3. Define the principle of virtual work.

4. What is the use of Williot diagram?

5. What are the types of Arches?

6. What is the effect of temperature on Arches?

7. What is meant by Fixed End Moment?

8. Write an equation of scope and deflection for a joint.

9. What is meant by carry over moment?

10. Define relative stiffness and distribution factor.

PART B — (5 × 16 = 80 marks)

11. (a) A simply supported beam of 15 m span is subjected to an u.d.l of 5 kN/m (self weight) and an u.d.l. of 12 kN/m (live load) acting for 6 m length travelling from right to left. Draw the ILD for shear force and bending moment at a section 10 m from the right end. Use these diagrams to determine the maximum shear force and bending moment at this section.

Or

(b) The Warren girder of 25 m span is made of 5 panels of 5 m each. The diagonals are inclined at 60° to the horizontal. Draw the influence line diagram for force in upper cord member in the second panel from left. Hence evaluate the forces in it when there is a load of 60 kN at each lower joint. (16)

12. (a) Determine the vertical displacement of joint A of the steel truss shown in Fig. 12 (a). The member BE is subjected to an increase in temperature of 70°C. Take the coefficient of linear expansion as 0.0012 per°C and $E = 2 \times 10^5$ N/mm². The cross sectional area of each member is 1250 mm². (16)

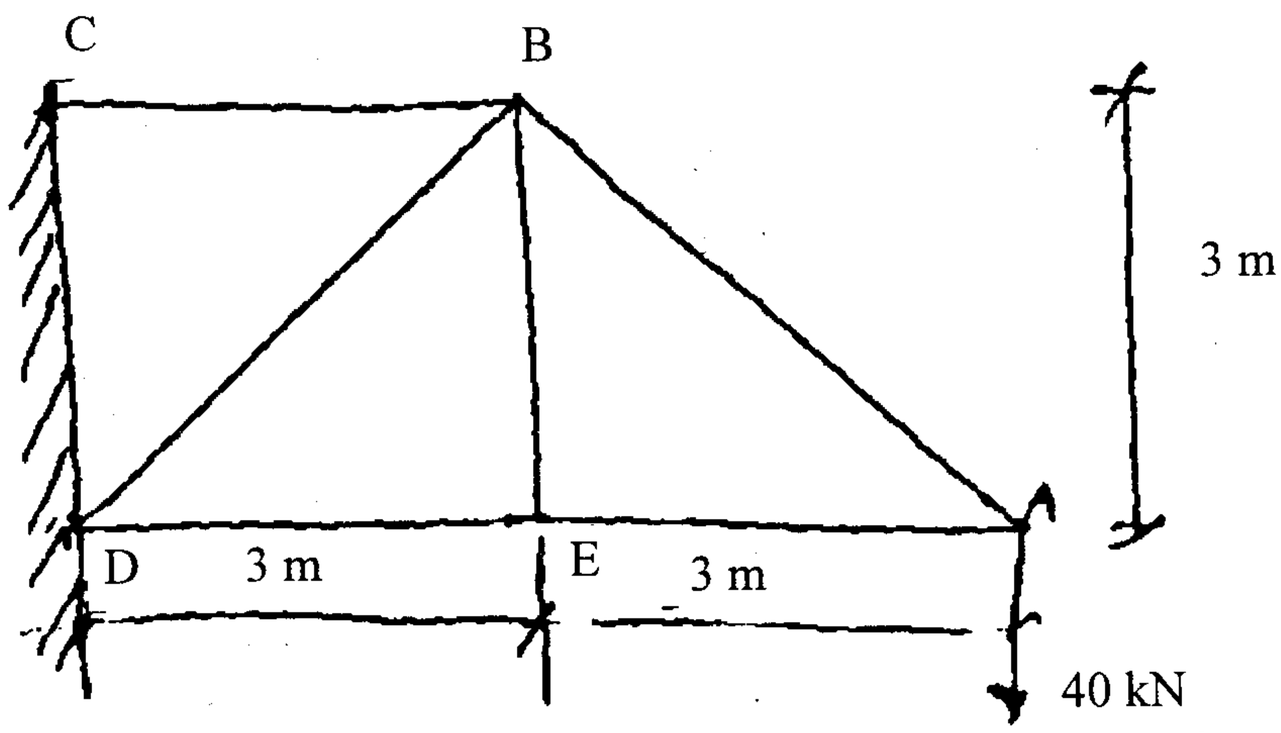

Fig. 12 (a)

Or

(b) Using the method of virtual work, determine the vertical displacement of point B of the beam shown in Fig. 12 (b). Take $E = 2 \times 10^5$ MPa ; $I = 825 \times 10^7$ mm⁴.

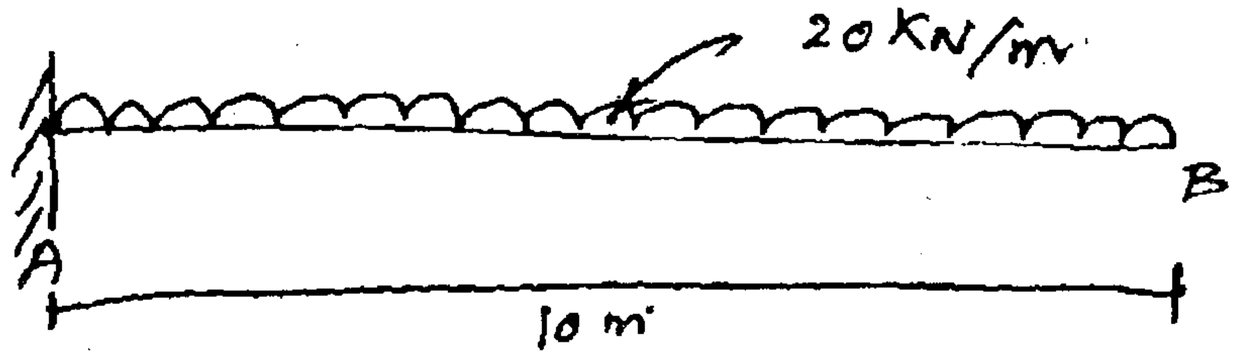

Fig. 12 (b)

13. (a) A parabolic three hinged arch carries a UDL of 15 kN/m over the left half of the span. The span of the arch is 18 m and the control rise 2.8 m. Determine the resultant reaction at the supports. Find also the bending moment, normal thrust and radia shear at a section 4.5 m from the left support. (16)

Or

(b) A parabolic two hinged arch has a span of 30 m and a rise of 3 m. A concentrated load of 12 kN acts at 7.5 m from the let end support. The second moment of area varies as the secant of the inclination of the arch axis. Calculate the horizontal thrust and reactions at the hinge. Also calculate the maximum bending moment at the section and draw the bending moment diagram. (16)

14. (a) Analyse the beam loaded as shown in Fig. 14 (a) by the slope deflection method and drawn the bending moment diagram and shear force diagram. EI is constant. (16)

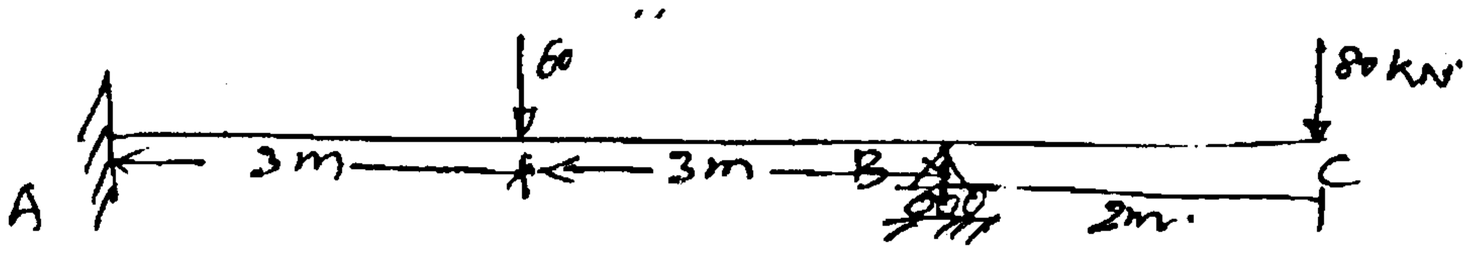

Fig. 14 (a)

Or

(b) Analyse the portal frame loaded in Fig. 14 (b) by the slope deflection method and sketch the bending moment and shear force diagrams. (16)

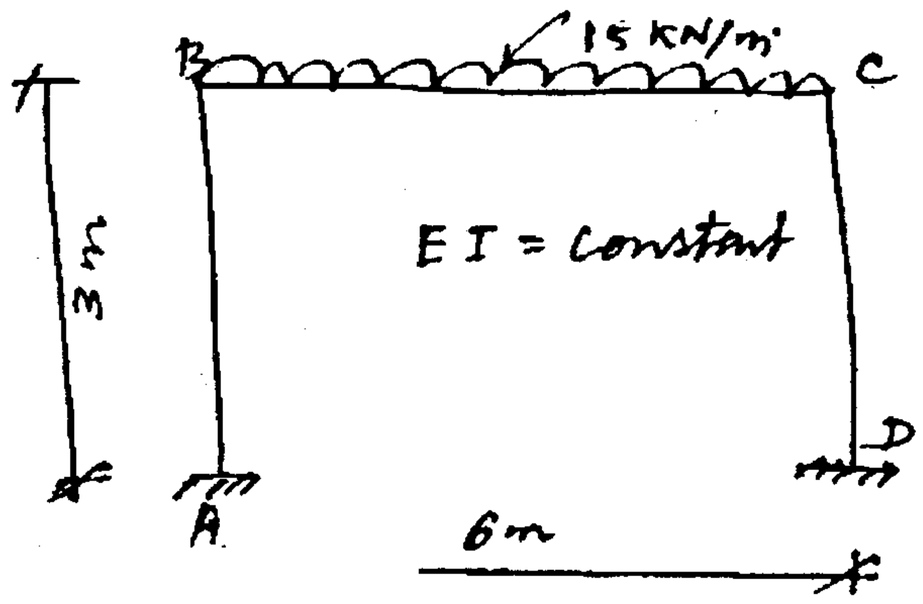

Fig. 14 (b)

15. (a) Analyse the continuous beam shown in Fig. 15 (a) by the method of moment distribution. (16)

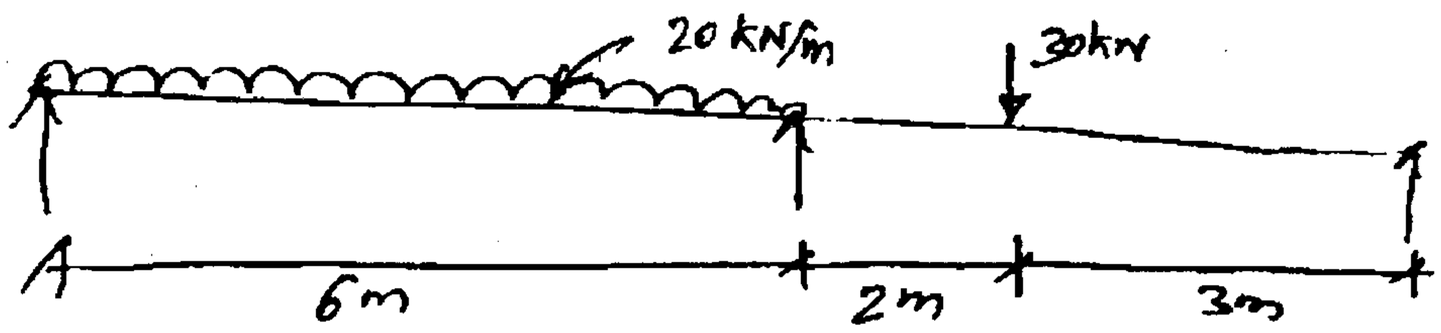

Fig. 15 (a)

Or

(b) Analyse the frame loaded as shown in Fig. 15 (b) by the moment distribution method. Sketch the bending moment and shear force diagrams. (16)

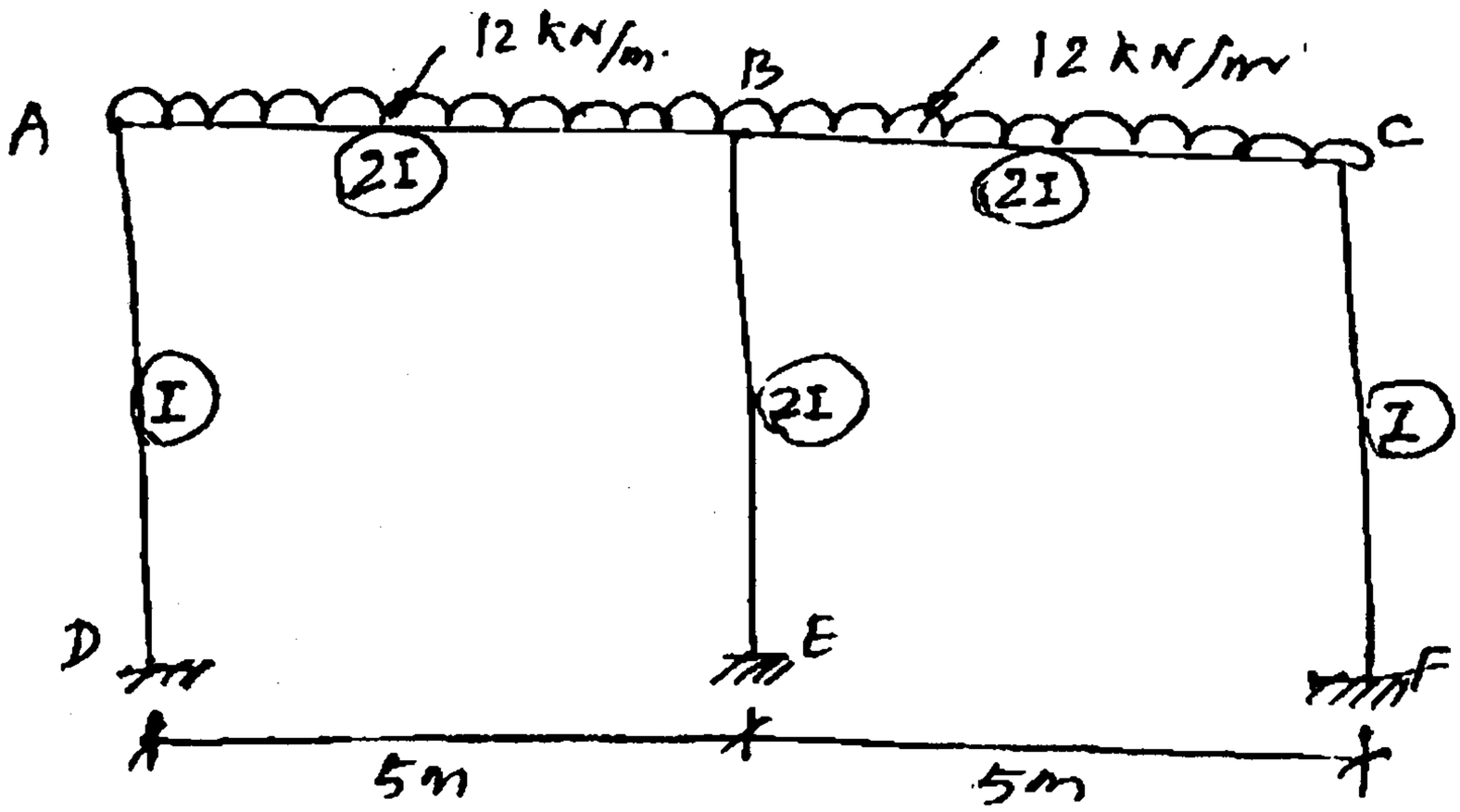

Fig. 15 (b)