[01 – 3210]

III/IV B.E. DEGREE EXAMINATION.

Second Semester

Civil Engineering

STRUCTURAL ANALYSIS – III

(Common for Civil and Civil Environmental Engineering)

(Effective from the admitted batch of 2006–2007)

Time : Three hours Maximum : 70 marks

Answer question No.1 and any other FOUR questions.

Question No.1 carries 20 marks and the remaining questions carry $12\frac{1}{2}$ marks each.

Any data missing may be assumed suitably.

1. Answer the following :

   (a) Explain the use of Slope deflection method.

   (b) Write the difference between Parabolic Arch and CircularArch.

   (c) Define flexural rigidity.

(d) Differentiate perfect frame and imperfect frame.

(e) State and explain the Castigliano's theorem- II.

(f) Explain the theory of column analogy.

(g) Distinguish between Stiffness and Flexibility methods.

(h) Discuss the importance of moment distribution method.

(i) Define kinematic indeterminacy.

(j) What do you understand by the term's 'carry over factor' and 'distribution factor'?

2. A frame shown in Figure 1 has sectional area equal to 3500 mm^2 for all the members. The member AB was found be to 0.003 mm shorter than its correct length at the time of assembling. Find the forces in the members, if the member AB is forced in position. Take $E = 2 \times 10^5$ N/mm^2.

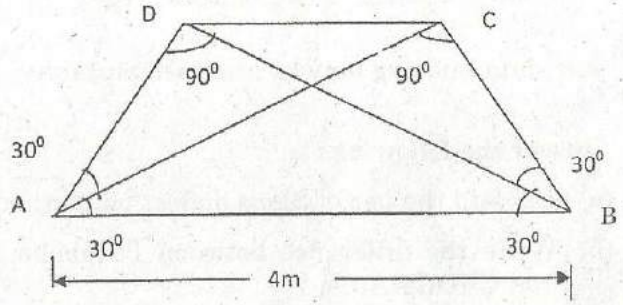

Figure 1

4. A portal frame ABCD is fixed at A and hinged at D. The columns AB and CD are 3 m and 2 m long respectively. The beam BC is 2 m long and is carrying uniformly distributed load of 50 kN/m, Determine the moments A, B, C and D by column analogy method and draw the bending moment diagram.

5. A two hinged arch of span 25 m and rise 5 m carries a uniformly distributed load of 30 kN/m covering a distance of 10 m from left end. Find the horizontal thrust, the reactions at the hinges and the maximum negative moment.

6. A three hindged stiffening girder of a suspension bridge of 80 m span is subjected to two point loads 10 kN each placed at 25 m and 35 m, respectively from the left hand hinge. Determine the bending moment and shear force in the girder at section 40 m from each end. Also determine the maximum tension in the cable which has a central dip of 10 m.

7. An unstiffened suspension cable carries a uniformly distributed load of 50 kN/m over a span of 30 m as shown in Figure 3. The suspension cable is supported on frictionless rollers, fixed to the piers. The anchor cables are inclined at 30° to the horizontal. One pier is 4.5 m below the other and the maximum dip of the cable at the lowest point is 3 m below the lower pier. Calculate.

(a) The maximum and minimum tension in the cable, and

(b) The horizontal and vertical forces at support A.

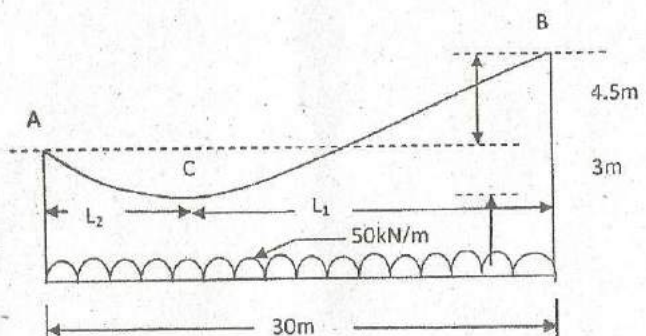

Figure 3

3. A portal flame shown in Figure 2 is to resist a horizontal load of 10 kN applied at B, the moment of inertia of the column section is I and the moment of inertial of the beam is 2I. Determine the moments at A, B, C and D by moment distribution method. Also draw the bending moment diagram.

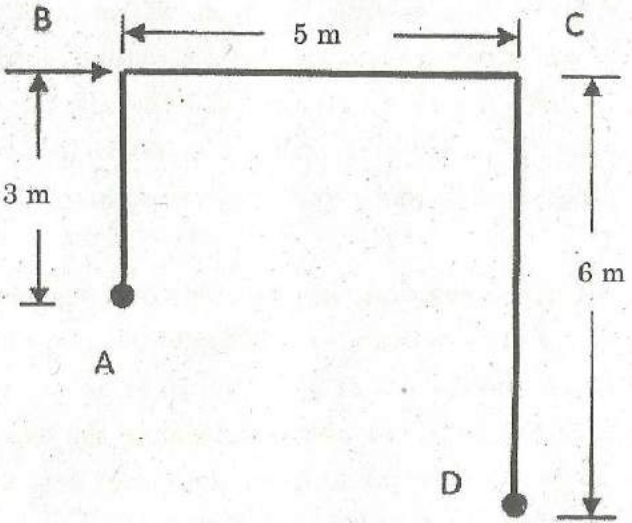

Figure 2

8. Analyse the continuous beam shown in Figure 4. using stiffness method.

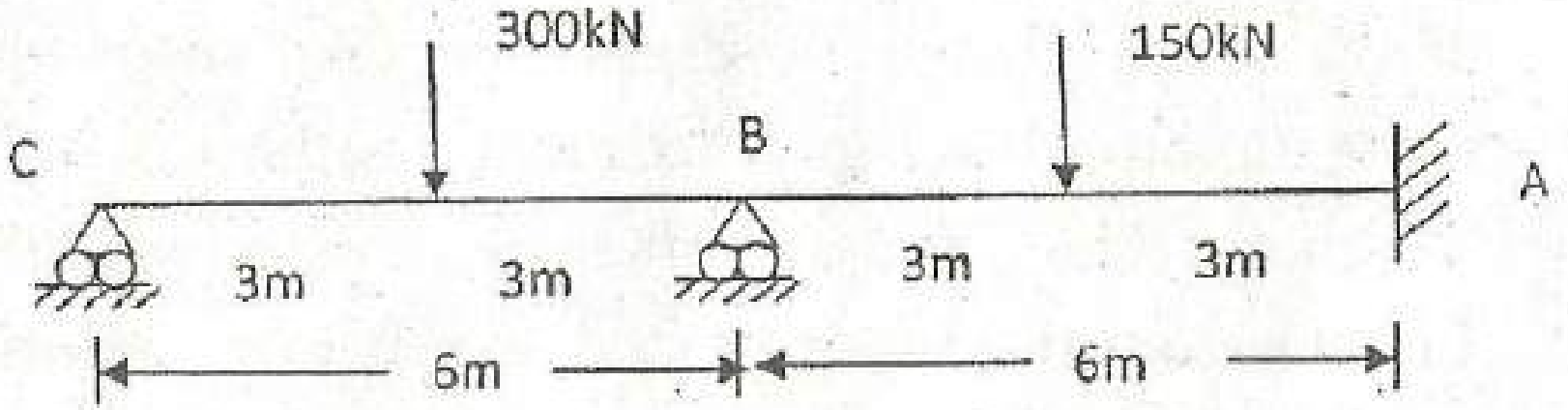

Figure 4