Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 70290

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Fifth Semester

Civil Engineering

CE 6501 – STRUCTURAL ANALYSIS — I

(Regulations 2013)

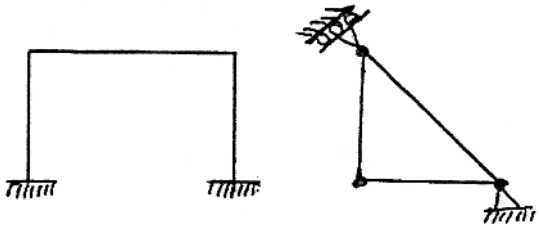
(Common to : PTCE 6501 – Structural Analysis – I for B.E. (Part-Time) – Civil Engineering – Third Semester (Regulations – 2014)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Find the degree of static indeterminacy for the following structures and specify whether the structure is stable or not.



(a) (b)

2. Determine the prop reaction of a propped cantilever using energy method when it is subjected to a uniformly distributed load over the entire span.

3. What are the uses of influence lines?

4. What is meant by Begg's deformeter?

5. Determine the value of horizontal thrust at the supports of a three hinged symmetrical parabolic arch having 15 m span and 3 m central rise with a point load 10 kN at a section 5 m from the left support.

6. What is meant by "reaction locus" of a two hinged arch?

7. What are the conditions used in slope deflection method to determine the unknown joint deformations (translations and rotations) in an unsymmetrical portal frame?

8. How do you analyze a symmetrical frame Subjected to symmetrical loading using the advantage of symmetry by slope deflection method?

9. Define stiffness and carry over factor in moment distribution method.

10. What is meant by the terms :
    (a) Moment distribution
    (b) Distribution factor.

PART B — (5 × 13 = 65 marks)

11. (a) The frame shown in Fig. Q.11 (a) is pin jointed to rigid supports at A and B and the joints C and D are also pinned. The diagonals AD and BC act independently and the members are all of the same cross sectional area and material. ABC and BCD are equilateral triangles. Using energy method, find the forces in all the members if a load of 5 kN is hung at D.

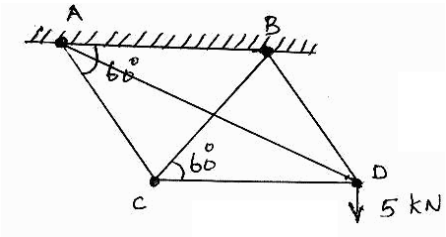


Fig Q. 11 (a)

Or

(b) Using consistent deformation method, determine the horizontal reaction at the support C for the frame shown in Fig. Q.11 (b). Flexural rigidity EI is constant for both the members.

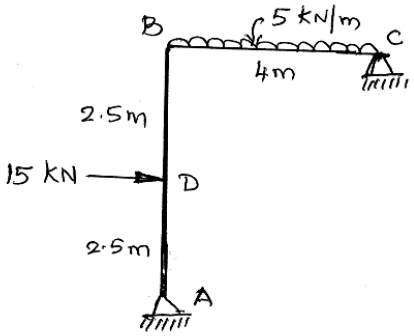


Fig Q. 11 (b)

12. (a) A simply supported girder has a span of 40 m. A moving load consisting of a uniformly distributed load of 1 kN/m over a length of 8 m preceded by a concentrated load of 6 kN moving at a fixed distance of 2 m in front of the distributed load crosses the girder. Determine using influence line diagram the value of greatest bending moment.

Or

(b) A continuous beam ABC is simply resting on supports A and C, and continuous over the support B. The span AB is 8 m and the span BC is 6 m. Draw the influence line for moment at B. Assume flexural rigidity is constant throughout and calculate the influence line ordinates at 2 m intervals.

13. (a) A symmetrical three hinged circular arch has a span of l6m and rise to the central hinge of 3.5 m as shown in Fig. Q.No. 13 (a). It carries a vertical load of 16 kN at 3.5 m from the left hand end. Find:

(i) the magnitude of horizontal thrust at supports

(ii) the reactions at the supports

(iii) bending moment of 6 m from the left hand hinge and

(iv) the maximum positive and negative moment.

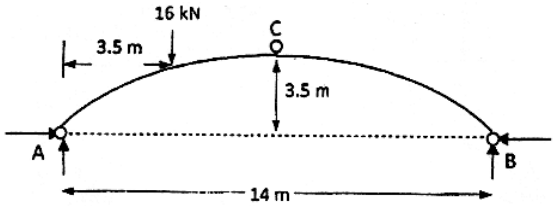


Fig. Q.No. 13 (a)

Or

(b) A parabolic 3 hinged arch shown in Fig. 13 (b) carries loads as indicated. Determine :

(i) resultant reactions at the end supports

(ii) bending moment, shear (radial) and normal thrust at D, 5 m from A.

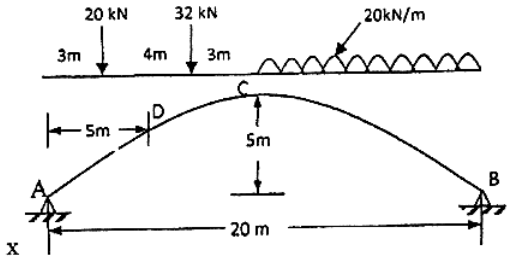


Fig. 13 (b)

14. (a) A continuous beam ABC 24 m long is fixed at A, simply supported at B and C. The intermediate support B is at 12 m from A and sinks by 30 mm. The span AB carries a uniformly distributed load of 3 kN/m and he span BC carries a point load of 24 kN at 8 m from C. Analyze the beam by slope deflection method and draw the shearing force and bending moment diagrams. Take the flexural rigidity EI as 40000 kN – m^2 and is constant throughout.

Or

(b) Analyse the portal frame shown in Fig. Q. 14 (b) by slope deflection method and draw the bending moment diagram.

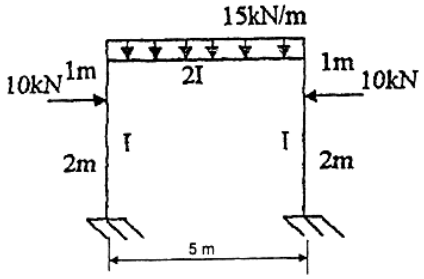


Fig. Q. 14 (b)

15. (a) Analyse the frame shown in Fig. 15 (a) by moment distribution method.

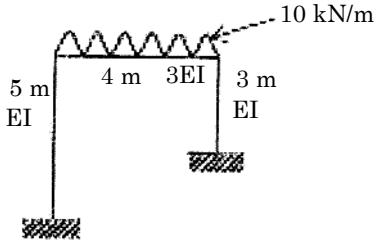


Fig. 15 (a)

Or

(b) Draw the bending moment diagram for the continuous beam shown in Fig. 15 (b) by moment distribution method.

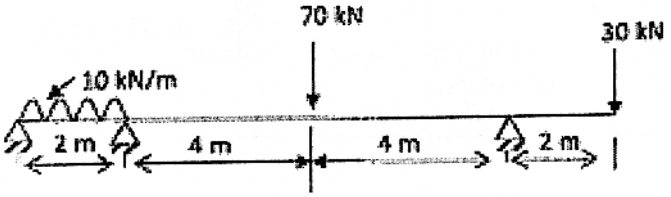


Fig. 15 (b)

PART C — (1 × 15 = 15 marks)

16. (a) Analyse the continuous beam *ABCD* by slope deflection method and find the end moments. Support B sinks by 10 mm. $E = 2 \times 10^5$ N/mm^2 and $I = 16 \times 10^7$ mm^4. (fig. 16 (a)).

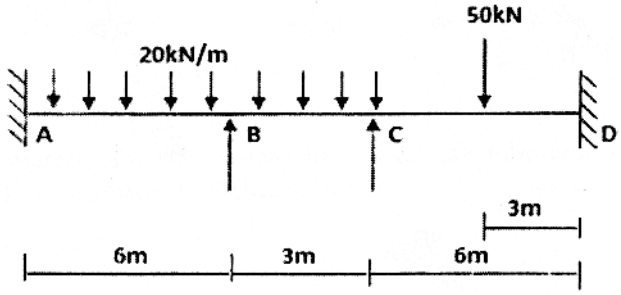


Fig. 16 (a)

Or

(b) Analyse the continuous beam loaded as shown in fig 16 (b), by moment distribution method and find final moments.

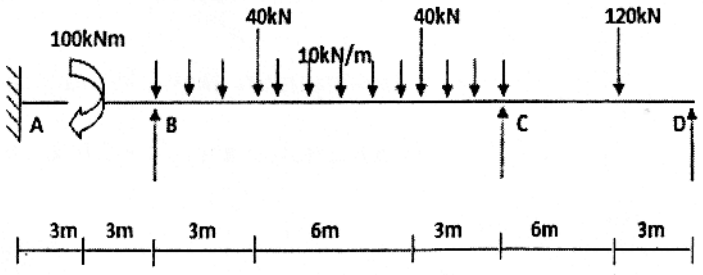


Fig. 16 (b)