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Question Paper Code : 71570

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Fifth Semester

Civil Engineering

CE 6501 — STRUCTURAL ANALYSIS — I

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Determine the degree of kinematic indeterminacy of the frame shown in Fig. Q.1 and show the same in the frame.

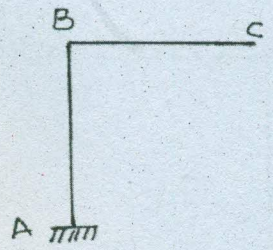

Fig. Q.1

2. What is the reaction at the Propped end of a propped cantilever when it is subjected to a concentrated load 'W' at mid-span?

3. Specify the condition for position of loading to obtain maximum bending moment at any section in a simply supported beam when a uniformly distributed load shorter than span crosses the beam.

4. What is the limiting distance from propped end for having only Positive portion in the influence line diagram for bending moment at any point in a propped cantilever?

5. Name the internal stress resultants induced in an arch section

6. What are the methods available for the analysis of a fixed 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. State the reasons for a portal frame to sway.

10. Specify the condition to use the Naylor's simplification in moment distribution method for the analysis of frames.

PART B — (5 × 16 = 80 marks)

11. (a) A continuous beam ABC of uniform section is simply supported at A, B and C. The spans AB and BC are 6 m and 4 m respectively. The span AB carries a uniformly distributed load of 8 kN/m and the span BC carries a central concentrated load of 12 kN. Determine the support reactions Using energy method and draw the bending moment diagram.

Or

(b) Using consistent deformation method, determine the vertical reaction at the roller support (D) for the frame shown in Fig. Q.11(b). Flexural rigidity EI is constant for all the members.

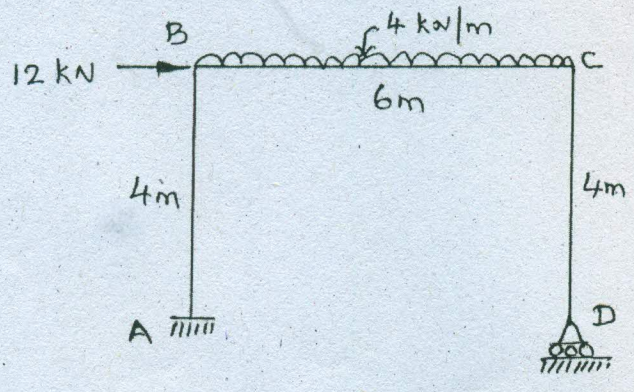

Fig. Q.11(b)

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 circular arch rib of 20 m span with a central rise of 5 m is hinged at the crown and at the springing. It carries a vertical point load of 20 kN at a horizontal distance of 4 m from left hinge. Calculate the horizontal thrust and maximum hogging bending moment in the arch. Also draw the bending moment diagram.

Or

(b) A two hinged parabolic arch of span 60 m and central rise 6 m is subjected to a vertical crown load of 40 kN. Allowing for rib shortening, temperature rise of 20°C and yield of each support of 0.06 mm/10 kN, determine the horizontal thrust. Take moment of inertia at the crown as 60×10^8 mm^4, area of cross section of arch rib as 1,00,000 mm^2, modulus of elasticity of arch material as 10 kN/mm^2 and coefficient of thermal expansion of arch material as 11×10^{-6} /° C.

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

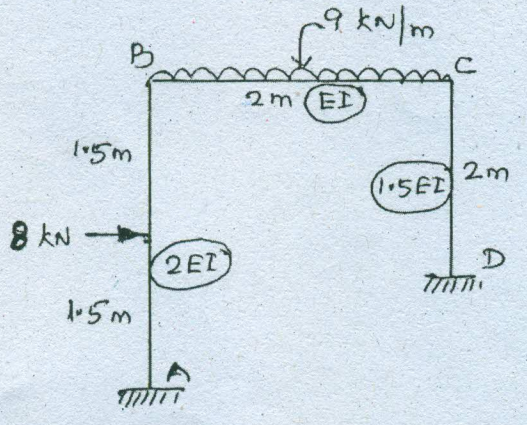

Fig. Q.14(b)

15. (a) A continuous beam ABC is simply supported at A, fixed at C and continuous over support B. The span AB is 6 m and carries a concentrated load of 60 kN at its mid-span and the span BC is 8 m and carries a uniformly distributed load of 10 kN/m. Take the flexural rigidity for portion AB as 2EI and that for portion BC as EI. Analyze the beam by moment distribution method and draw the shearing force and bending moment diagrams.

Or

(b) Analyze the frame shown in Fig. Q.15(b) by moment distribution method and draw the bending moment diagram.

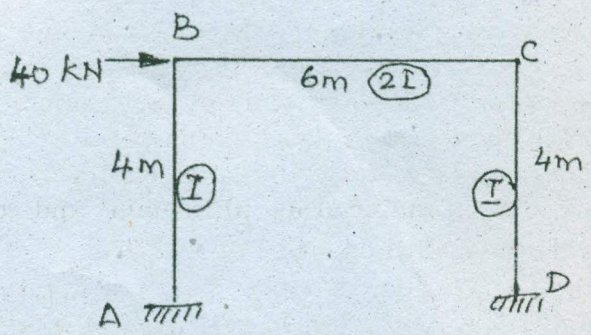

Fig. Q.15(b)