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Question Paper Code : X20303

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020

Fifth Semester

Civil Engineering

CE 6501 – STRUCTURAL ANALYSIS – I

(Regulations 2013)

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

Time : Three Hours Maximum : 100 Marks

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. Calculate degree of indeterminacy of propped cantilever beam.

2. Write the difference between static and kinematic indeterminacies.

3. State the position of loading for maximum bending moment at a point in a simply supported beam when it subjected to a series of moving point loads.

4. Draw influence line for shearing force at any point in a simply supported beam using Muller Breslau's principle.

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. Write the generalized form of slope-deflection equation with necessary explanation.

8. A propped cantilever of span 6 m is subjected to a uniformly distributed load of 6 kN/m over the entire span. Using slope deflection method, determine the slope at B. Take the flexural rigidity EI as 9000 kN-m^2.

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

10. What is meant by the term Carry over factor ?

PART – B **(5×13=65 Marks)**

11. a) A continuous beam ABC of uniform section is simply supported at A, B and C. The spans AB and BC are 6m and 4m 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.

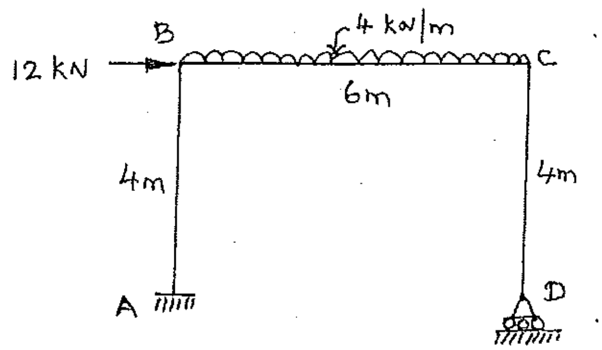

Fig. Q. 11 (b)

12. a) Using Muller Breslau principle, draw the influence line for the bending moment at D, the middle point of span AB of a continuous beam shown in Fig. Q.No. 12 (a). Compute the ordinates at 1 m interval. Determine the maximum hogging bending moment in the beam when two concentrated loads of 8 kN each and separated by a distance 1 m passes through the beam from left to right.

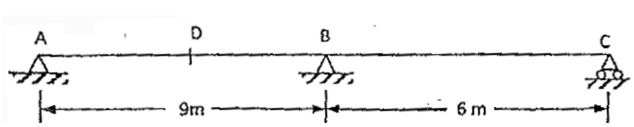

Fig. Q. 12 (a)

(OR)

b) Draw the IL for force in member BC and CI for the truss shown in Figure Q.No. 12(b). The height of the truss is 9m and each segment is 9m long.

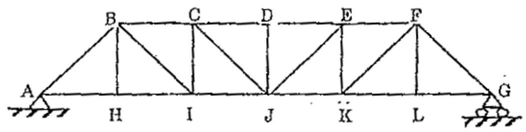

Fig Q.No. 12 (b)

13. a) A symmetrical three hinged parabolic arch of span 30 m and rise 8 m carries an UDL of 40 kN/m over the left half of the span. The hinges are provided at the supports and at the center of the arch. Calculate :

a) Reactions of the supports

b) Bending moment

c) Radial shear and normal thrust at a distance of 8 m in the left support.

(OR)

b) A three hinged arch is circular, 25 m in span with a central rise of 5 m. It is loaded with a concentrated load of 10 kN at 7.5 m from the left hand hinge. Find the (a) Horizontal thrust (b) Reaction at each end hinge (c) Bending moment under the load.

14. 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 slope deflection method and draw the shearing force and bending moment diagrams.

(OR)

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

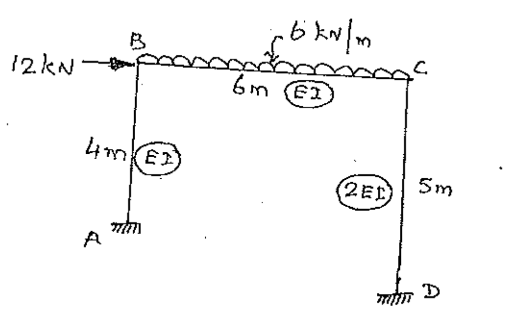

Fig. Q. 14.(b)

15. a) A continuous beam ABCDE 18 m long is simply supported at A and also at B, C and D at 4m, 10 m and 16 m respectively from the left end A and the portion DE being overhanging over 2 m. The span AB carries a point load of 40 kN at its mid-span, the span BC is subjected to a uniformly distributed load of 12 kN/m, the span CD carries a point load of 60 kN at 2 m from C and the free end (E) carries a point load of 10 kN. Analyse the beam by moment distribution method and draw the shearing force and bending moment diagrams. Consider the flexural rigidity for the portions AB, BC and CD, DE as EI 3EI and 2EI, 2EI respectively.

(OR)

b) Analyse the portal frame shown in Fig. Q. 15 (b) by moment distribution method and draw the bending moment diagram. Assume flexural rigidity is constant for all the members.

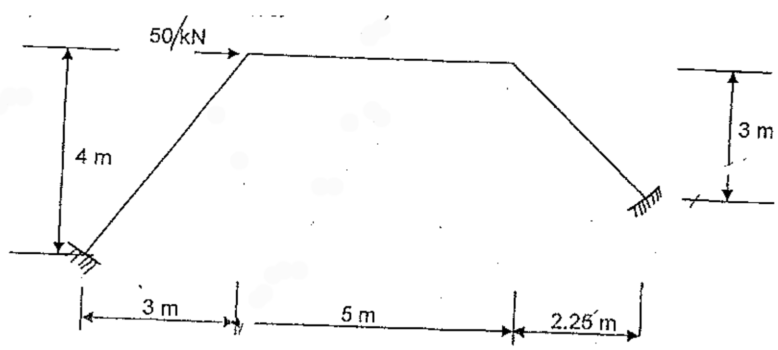

Fig. Q. 15. (b)

PART – C **(1×15=15 Marks)**

16. 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