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10CV43

Fourth Semester B.E. Degree Examination, Dec.2015/Jan.2016
Structural Analysis – I

Time: 3 hrs. Max. Marks:100

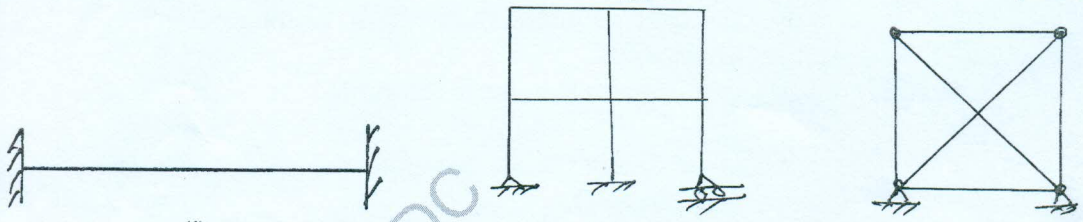
Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define : (i) Degree of static indeterminacy and ii) Degree of freedom. **(05 Marks)**

b. Derive an expression for strain energy due to bending. **(06 Marks)**

c. Determine the degree of static and kinematic indeterminacies for the structures shown in Fig.Q1(c) **(09 Marks)**



(i) (ii) (iii)

Fig.Q1(c)

2 a. For the beam loaded as shown in Fig.Q2(a), determine the slope and deflection at the free end. Take E = 204×10^6 kN/m^2. Use moment area method. **(10 Marks)**

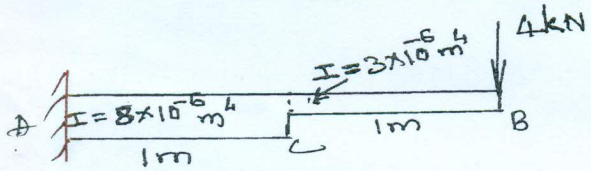


Fig.Q2(a)

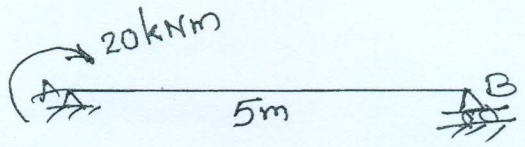


Fig.Q2(b)

b. Calculate the maximum slope and maximum deflection for the beam shown in Fig.Q2(b). Use conjugate beam method. Take E = 2×10^5 N/mm^2, I = 40×10^6 mm^4. **(10 Marks)**

3 a. State Castigliano's First and second theorems. **(04 Marks)**

b. Using Castigliano's theorem compute the deflection at the mid-point of simply supported beam of span 'L' and flexural rigidity EI, carrying a point load 'W' at the midspan. **(06 Marks)**

c. Determine the vertical and horizontal deflection at 'C' of the beam shown in Fig.Q3(c). Take E = 200 GPa and I = 80×10^6 mm^4. **(10 Marks)**

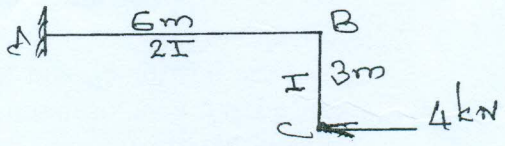


Fig.Q3(c)

4 a. Using strain energy method determine reaction at B for the beam shown in Fig.Q4(a). Draw BMD and SFD. **(10 Marks)**

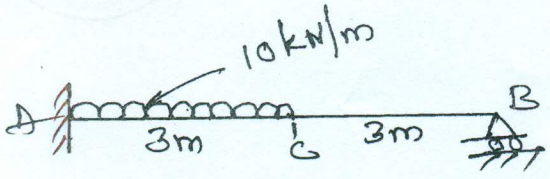


Fig.Q4(a)

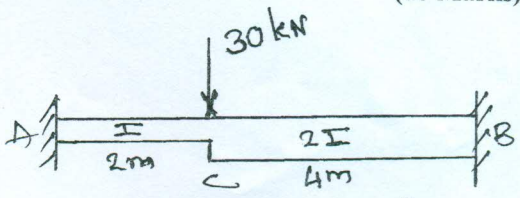


Fig.Q4(b)

b. Analyse the fixed beam shown in Fig.Q4(b) using strain energy method and draw BMD. **(10 Marks)**

PART – B

5 a. A three hinged symmetrical parabolic arch has a span of 36m and central rise of 6m. The arch carries a UDL of intensity 30 kN/m over left half portion and a concentrated load of 60 kN at 9 m from right support. Compute the bending moment, normal thrust and radial shear at 9 m from left support. **(12 Marks)**

b. A cable is suspended between two points A and B, 80 m apart horizontally and a central dip of 6 m. It supports a UDL of intensity 20 kN/m. Compute:
   i) The length of the cables.
   ii) Maximum and minimum tension in the cable. **(08 Marks)**

6 a. For the beam shown in Fig.Q6(a), compute the reaction at B by consistent deformation method. Draw BMD and SFD. **(10 Marks)**

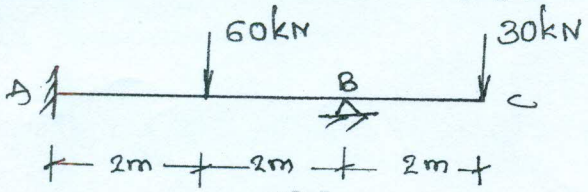


Fig.Q6(a)

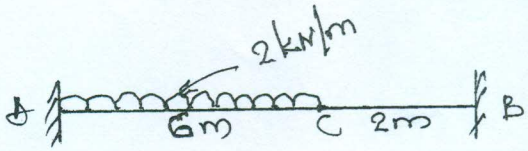


Fig.Q6(b)

b. Analyse the fixed beam shown in Fig.Q6(b) using consistent deformation method. **(10 Marks)**

7 Analyse the continuous beam shown in Fig.Q7 by Clapeyron's theorem. Draw SFD & BMD. **(20 Marks)**

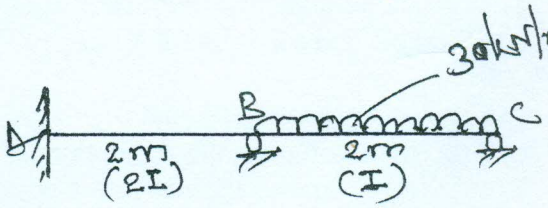


Fig.Q7

8 A two hinged parabolic arch has a span of 32m and a rise of 8m. A uniformly distributed load of 1 kN/m covers 8 m horizontal length of the left side of the arch. If $I = I_0 \sec\theta$, where θ is the inclination of the arch section to the horizontal, and I_0 is the moment of inertia at the crown. Find the horizontal thrust at hinged and bending moment at 8 m from the left hinge. Also find the normal thrust and radial shear at this section. **(20 Marks)**

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