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10CV43

Fourth Semester B.E. Degree Examination, June/July 2018
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 linear and non-linear structures, static and kinematic indeterminacies. **(04 Marks)**

b. Determine static and kinematic indeterminacies of structures shown in Fig.Q1(b). **(10 Marks)**

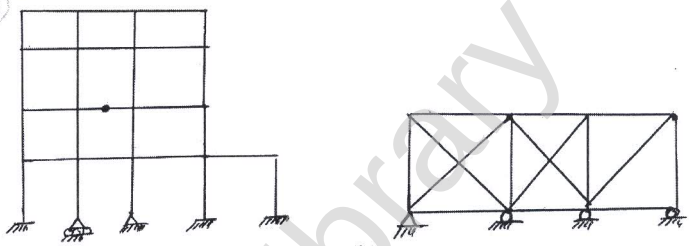

Fig.Q1(b)

c. Obtain an expression for strain energy stored in flexure for a cantilever with a concentrated load at the free end, with usual notations. **(06 Marks)**

2 a. Using moment–area method obtain maximum slope and maximum deflection for a simply supported beam of span 6m, subjected to a concentrated load of 30 kN, at a distance of 2m from the left support. Take $E = 204 \times 10^6$ kN/m^2 and $I = 50 \times 10^{-6}$ m^4. **(10 Marks)**

b. Determine slopes at the supports and deflection at the centre for the beam shown in Fig.Q2(b), using conjugate beam method. **(10 Marks)**

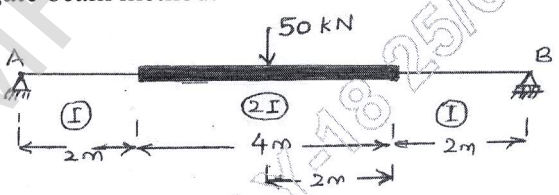

Fig.Q2(b)

3 a. State and prove Betti's law. **(06 Marks)**

b. Obtain vertical and horizontal deflections at the free end of the cantilever frame shown in Fig.Q3(b), using Castigliano's theorem. **(14 Marks)**

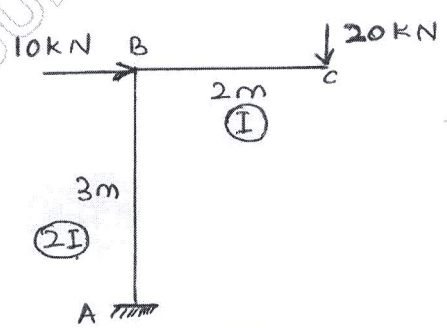

Fig.Q3(b)

4 a. Determine reaction at the propped end of a propped cantilever, loaded with a uniformly distributed load, throughout its span. Use strain–energy method. **(06 Marks)**

b. For the pin-jointed frame shown in Fig.Q4(b), determine vertical deflection under the load, using unit-load method. Cross–sectional area of each member is $500 \times 10^{-6} m^2$ and Young's modulus is 2×10^8 kN/m^2. **(14 Marks)**

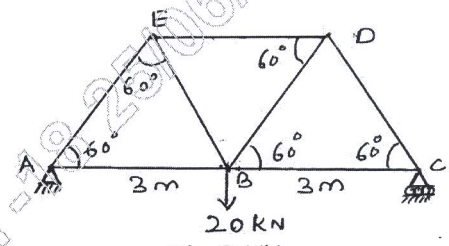

Fig.Q4(b)

PART – B

5 a. A three-hinged parabolic arch, hinged at the crown and at the supports has a span of 24m and a central rise of 4m. It carries a uniformly distributed load of 45kN/m over its left half portion and a concentrated load of 75kN at 6m from the right support. Determine bending moment, normal thrust and radial shear at a section 6m from the left support. **(10 Marks)**

b. A bridge cable is supported from the towers 80m apart and carries a uniformly distributed load of 45kN/m over the entire span. Determine maximum and minimum tensions in the cable, if the maximum sag is 8m. The cable is supported by saddles which are stayed by wires inclined at 30° to the horizontal. Determine forces developed in the towers. **(10 Marks)**

6 a. Analyse the propped cantilever shown in Fig.Q6(a) by consistent deformation method. Draw shear force diagram. **(08 Marks)**

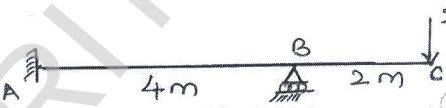

Fig.Q6(a)

b. Analyse the fixed beam shown in Fig.Q6(b) by consistent deformation method. Draw bending moment diagram. **(12 Marks)**

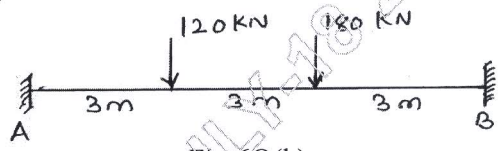

Fig.6Q(b)

7 Using Clapeyron's theorem of three–moments analyze the beam shown in Fig.Q7. Draw bending moment diagram. **(20 Marks)**

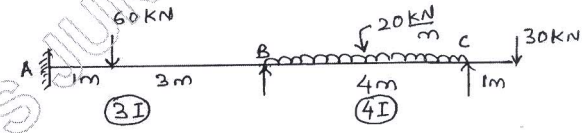

Fig.Q7

8 A two-hinged parabolic arch, with moment of inertia proportional to the secant of the slope of arch axis, span 20m and rise 4m is subjected to a concentrated load of 100kN, placed at 6m from the left support. Calculate the horizontal thrust; bending moment, normal thrust and radial shear at 5m from left support. **(20 Marks)**

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