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10CV43

Fourth Semester B.E. Degree Examination, Aug./Sept. 2020
Structural Analysis – I

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions, selecting at least TWO questions from each part.***
2. Assume any missing data suitably.

PART – A

1 a. Define the following :
(i) Linear and Non-linear structural systems.
(ii) Geometric and material non-linearity. **(06 Marks)**

b. Explain determinate and indeterminate structures with suitable examples. **(06 Marks)**

c. Determine the degree of static and kinematic indeterminacy for the structures shown in Fig. Q1 (c). **(08 Marks)**

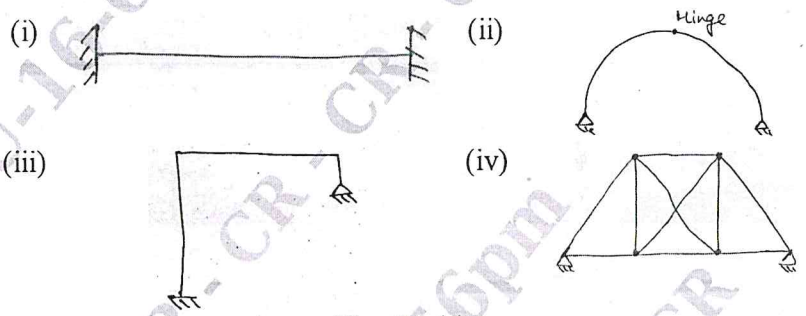

Fig. Q1 (c)

2 a. For the Cantilever beam shown in Fig. Q2 (a), determine the slope and deflection at B, using moment area method. Take EI = 70000 kN-m^2. **(10 Marks)**

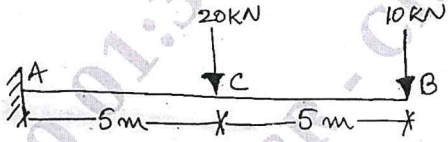

Fig. Q2 (a)

b. For the beam shown in Fig. Q2 (b), determine the maximum slope and maximum deflection using conjugate beam method. **(10 Marks)**

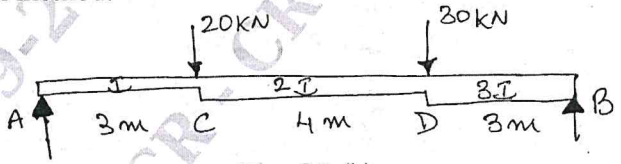

Fig. Q2 (b)

3 a. State and prove Castigliano's first theorem. **(06 Marks)**

b. Determine the slope and deflection at the free end of the Cantilever beam shown in Fig. Q3 (b) by strain energy method. Take E = 2×10^5 N/mm^2 and I = 12×10^6 mm^4. **(14 Marks)**

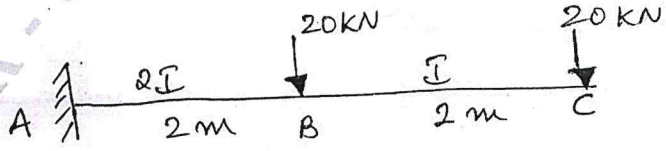

Fig. Q3 (b)

4 Find the vertical deflection at D for a pin jointed truss shown in Fig. Q4 using unit load method. Assume cross sectional area of each member as 1000 mm^2 and E = 200 GPA. **(20 Marks)**

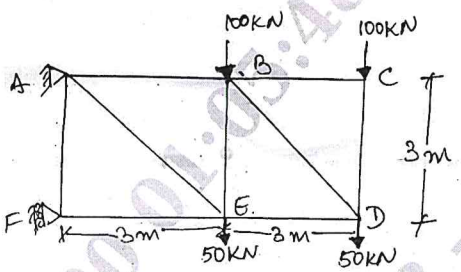

Fig. Q4

PART – B

5 a. A three hinged symmetrical parabolic arch has a span of 20 m and a rise of 4 m. The arch carries a UDL of intensity 15 kN/m over the left half of its span and a concentrated load of 30 kN at 5 m from the right support. Compute the bending moment, normal thrust and radial shear at 5 m from the left support. Also draw BMD. **(12 Marks)**

b. A cable is suspended between points A and B 120 m apart horizontally and a central dip of 12 m. It carries a uniformly distributed load of 15 kN/m. Compute

(i) Length of the cable.

(ii) Maximum and minimum tension in the cable. **(08 Marks)**

6 a. For the propped cantilever beam shown in Fig. Q6 (a). Find the support reaction at B by consistent deformation method. Draw SFD and BMD. EI is constant. **(10 Marks)**

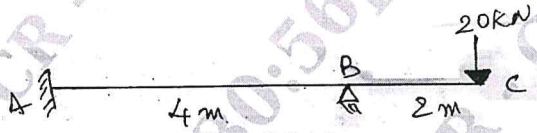

Fig. Q6 (a)

b. For a rigidly fixed beam AB of span 5 metres carrying a udl of 10 kN/m over the entire span, locate the point of contraflexure and draw BMD and SFD. **(10 Marks)**

7 A continuous beam ABC is fixed at A and simply supported at C and is continuous over support B, with AB = 8 m and BC = 6 m. A load of 100 kN is acting at 4 m from A udl of 20 kN/m is acting on BC. The moment of inertia of AB and BC are 2I and 1.5I respectively. Analyse the continuous beam and hence draw SFD and BMD for the beam. **(20 Marks)**

8 A two hinged parabolic arch has a span of 30 m and rise 5 m. A concentrated load 90 kN acts at 10 m from the right hinge. The second moment of area varies as the secant of the slope of the rib axis. Find horizontal thrust and reactions at the hinges. Also draw BMD. **(20 Marks)**

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