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10CV43

Fourth Semester B.E. Degree Examination, Dec.2014/Jan.2015
Structural Analysis – I

Time: 3 hrs. Max. Marks:100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

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

b. Explain the principle of minimum potential energy. **(05 Marks)**

c. Explain determinate and indeterminate structures with suitable examples. **(05 Marks)**

d. Find the statical and kinematic indeterminancy for the following structures: **(04 Marks)**

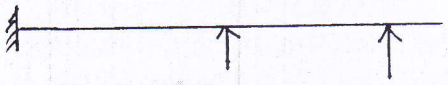

Fig.Q.1(d)(i)

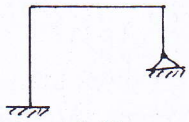

Fig.Q.1(d)(ii)

2 a. Determine the rotation and deflection at the free end of a cantilever beam shown in Fig.Q.2(a), by moment area method. Take EI = constant. **(10 Marks)**

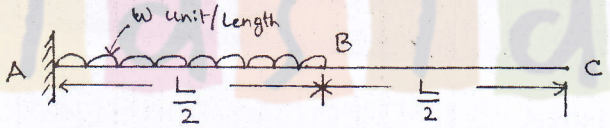

Fig.Q.2(a)

b. Determine the maximum slope and deflection for the given simply supported beam as shown in Fig.Q.2(b), by conjugate beam method. **(10 Marks)**

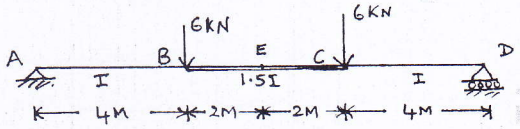

Fig.Q.2(b)

3 a. State Clark Maxwell's law of reciprocal deflection. **(02 Marks)**

b. Determine the vertical deflection at 'C' for the beam shown in Fig.Q.3(b), by Castigliano's method. **(09 Marks)**

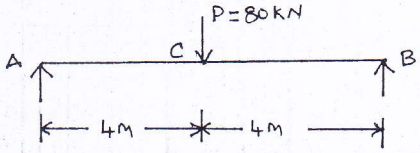

Fig.Q.3(b)

c. Determine the rotation at the free end of a cantilever beam shown in Fig.Q.3(c), by Castigliano's method. **(09 Marks)**

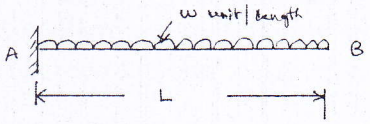

Fig.Q.3(c)

4 a. Find the vertical deflection at 'C' for the beam shown in Fig.Q.4(a), by strain energy method. **(08 Marks)**

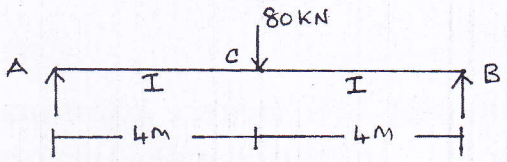

Fig.Q.4(a)

b. Determine the vertical deflection at 'C' for the frame loaded as shown in Fig.Q.4(b), by using unit load method. Cross sectional area of horizontal, vertical and inclined members are 1500, 2000 and 4000mm^2 respectively. Take EI = 2.1 × 10^5 N/mm^2. **(12 Marks)**

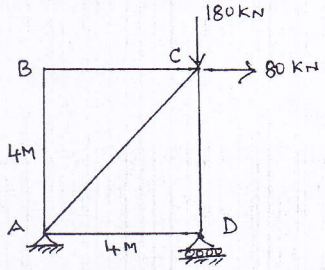

Fig.Q.4(b)

PART – B

5 A three hinged parabolic arch of span 24m, rise 6m with hinges at abutments and at crown point. Arch is subjected to a point load of 50kN and 150kN at a distance of 8m and 20m from left support. Determine:

i) Reaction at supports.
ii) Resultant reaction and its inclination at supports.
iii) Bending moments at load points and draw BMD.
iv) Normal thrust and radial shear at a distance of 6m from left and right supports.

(20 Marks)

6 A beam AB of span 4m is fixed at A and B carries a point load of 5kN at a distance of 1m from end A. Calculate the support reactions by the method of consistent deformation. Also draw BMD and SFD. Take EI = constant. **(20 Marks)**

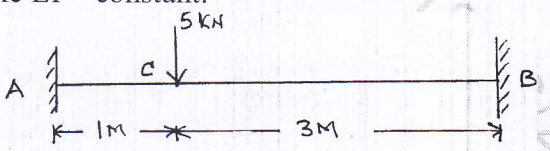

Fig.Q.6

7 Analyze the continuous beam by three moment equation. Find reactions and draw BMD and SFD. **(20 Marks)**

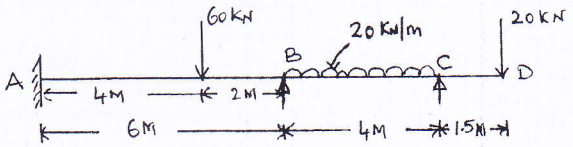

Fig.Q.7

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

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