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10CV43

**Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018**  
**Structural Analysis – I**

Time: 3 hrs.

Max. Marks:100

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

**PART – A**

- 1 a. Difference between determinate and indeterminate structures. (05 Marks)
- b. Determine the static and kinematic in determinacy for the following structures shown in Fig.Q1(b)(i), (ii) & (iii). (06 Marks)



Fig.Q1(b)(i)

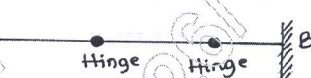


Fig.Q1(b)(ii)

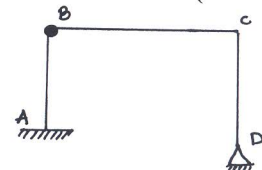


Fig.Q1(b)(iii)

- c. Derive an expression for strain energy due to bending. (09 Marks)
- 2 a. Determine the slope and deflection at the free end for the cantilever beam shown in Fig.Q2(a). Using moment area method.

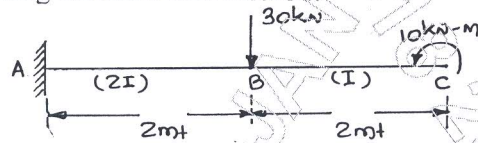


Fig.Q2(a)

(10 Marks)

- b. Determine the slope at the support and deflection under the point load as shown in Fig.Q2(b). Using conjugate beam method.

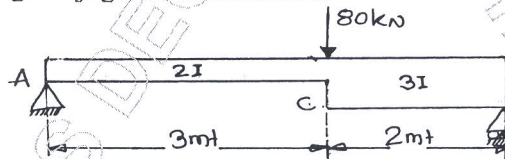


Fig.Q2(b)

(10 Marks)

- 3 a. i) State and prove Maxwell's reciprocal theorem. (06 Marks)
- ii) State Castigliano's first and second theorems. (04 Marks)
- b. Using Castigliano's theorem, determine the deflection at the load point for the simply supported beam shown in Fig.Q3(b). Take EI is constant.

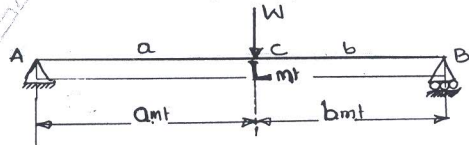


Fig.Q3(b)

(10 Marks)

- 4 a. Find the deflection under the concentrated load for beam shown in Fig.Q4(a). Using strain energy method. Take  $E = 2 \times 10^8 \text{ kN/m}^2$ ,  $I = 14 \times 10^{-6} \text{ m}^4$ .

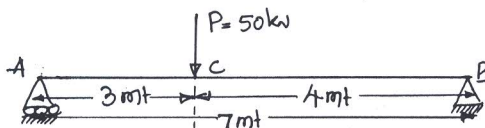


Fig.Q4(a)

(10 Marks)

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.

- b. Determine the horizontal displacement of the roller support end 'A' of the frame shown in Fig.Q4(b) by using unit load method. Take  $EI = 8000 \text{ kN-m}^2$ .

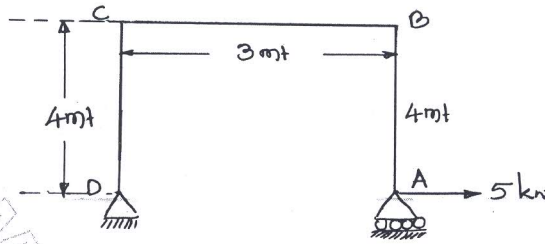


Fig.Q4(b) (10 Marks)

**PART - B**

- 5 a. A three hinged parabolic arch has a span of 30 mt and a central rise of 6 mt. The arch carries a UDL of intensity 3 kN/mt. Over left half portion and a concentrated load of 6 kN at a distance of 9 mt from right hand support, compute the bending moment, normal thrust and radial shear at 9 mt from left hand support. (10 Marks)
- b. A suspension bridge of 120 mt span has a central dip of 12 mt and a UDL of 15 kN/m of whole span. Determine:  
 i) The maximum and minimum tension in a cable.  
 ii) The size of the cable, if the permissible stress of the cable material is  $200 \text{ N/mm}^2$ .  
 iii) The length of the cable. (10 Marks)
- 6 Determine all the reaction components and, draw shear and moment diagrams for the beam shown in Fig.Q6.

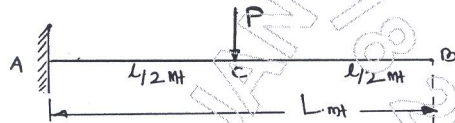


Fig.Q6 (20 Marks)

- 7 Analyze the beam shown in Fig.Q7 and draw shear force and bending moment diagrams by using Clapeyron's theorem.

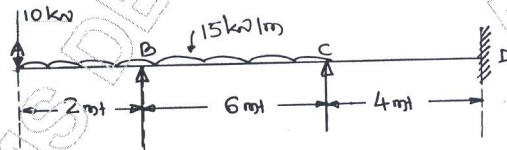


Fig.Q7 (20 Marks)

- 8 A two hinged parabolic arch of span 40 mt and carries a udl of 30 kN/mt over left half portion and a concentrated load of 120 kN at 5 mt from right hand support. Find the horizontal thrust and normal thrust and radial sheath at 10 mt from right hand support. [Refer Fig.Q8]

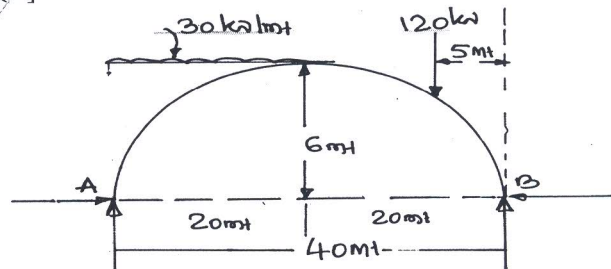


Fig.Q8 (20 Marks)

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