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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)

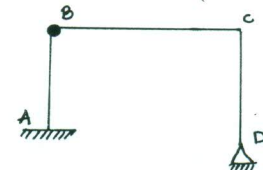


Fig.Q1(b)(iii)

- 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.

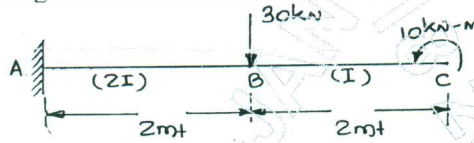


Fig.Q2(a)

(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.

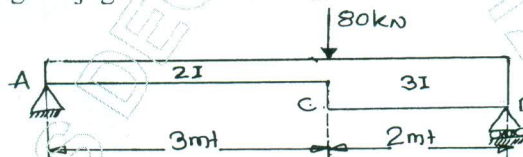


Fig.Q2(b)

(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.

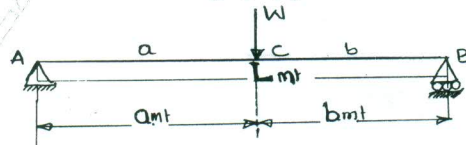


Fig.Q3(b)

(10 Marks)

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

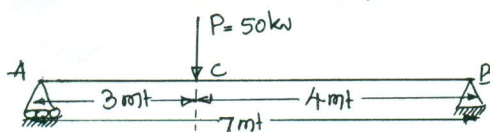


Fig.Q4(a)

(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 $EI = 8000 \text{ kN-m}^2$.

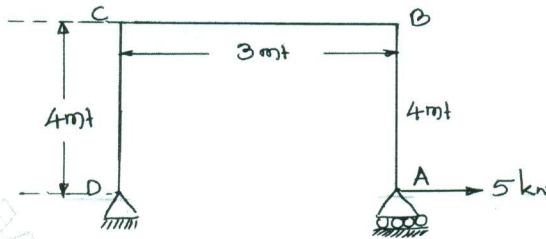


Fig.Q4(b)

(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:
- The maximum and minimum tension in a cable.
 - The size of the cable, if the permissible stress of the cable material is 200 N/mm^2 .
 - 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.

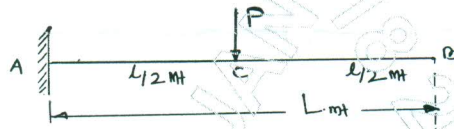


Fig.Q6

(20 Marks)

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

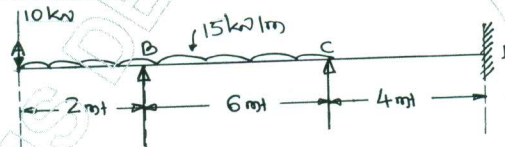


Fig.Q7

(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]

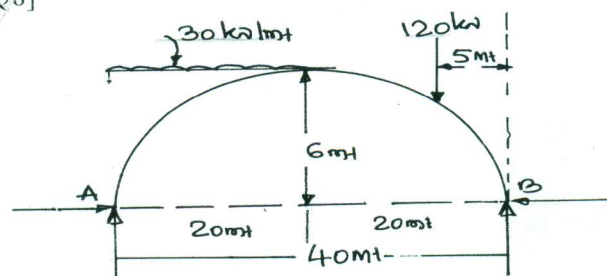


Fig.Q8

(20 Marks)
