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10CV43

**Fourth Semester B.E. Degree Examination, Jan./Feb. 2021**  
**Structural Analysis – I**

Time: 3 hrs.

Max. Marks:100

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

**PART – A**

- 1 a. Explain the following with examples :
  - i) Static indeterminacy and kinematic indeterminacy
  - ii) Geometric nonlinearity and material nonlinearity.
- b. Determine kinematic indeterminacy for following structures.(Refer Fig,Q1(b)).

(08 Marks)

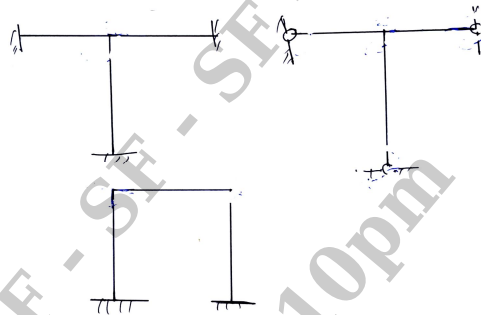


Fig.Q1(b)

(06 Marks)

- c. Derive the expression for strain energy due to bending moment.
- 2 a. Determine maximum slope and deflection of a cantilever beam shown in Fig.Q2(a) by using moment area method.  $EI = 4000\text{kN m}^2$ .

(06 Marks)

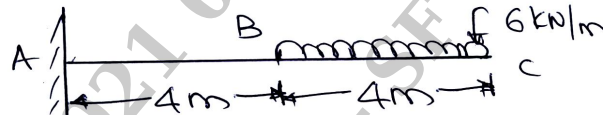


Fig.Q2(a)

(10 Marks)

- b. For the beam shown in Fig.Q2(b), determine midspan deflection, using conjugate beam method.  $E = 2 \times 10^5 \text{ N/mm}^2$ ,  $I = 80 \times 10^6 \text{ mm}^4$ .

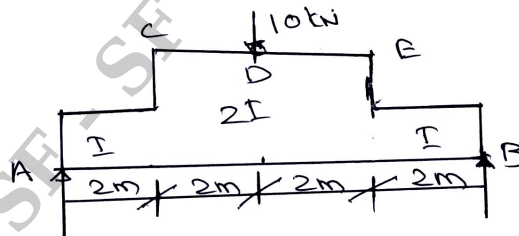


Fig.Q2(b)

(10 Marks)

- 3 a. State Castigliano's first and second theorems.
- b. Determine slope at support and deflection at midspan for a simply supported beam of spanL carrying UDL w/m over entire span using Castigliano's theorem.

(06 Marks)

(14 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.

- 4 a. Determine prop reaction for a propped cantilever shown in Fig.Q4(a) using strain energy method.

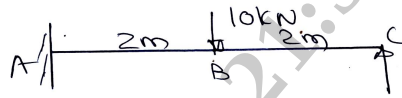


Fig.Q4(a)

(08 Marks)

- b. Analyse fixed beam shown in Fig.Q4(b) using strain energy method. Sketch SFD and BMD.

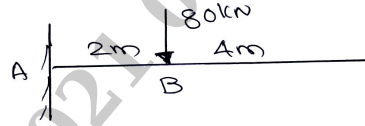


Fig.Q4(b)

(12 Marks)

**PART - B**

- 5 a. A foot bridge 4m wide is carried over by a suspension bridge of span 30m by two cables with central dip of 3m. If the plat form load is  $6\text{kN/m}^2$ , determine the maximum and minimum pull in the cables and also length of cable. (10 Marks)
- b. For the three hinged parabolic arch shown in Fig.Q5(b), find normal thrust and radial shear at a section 5m from left.

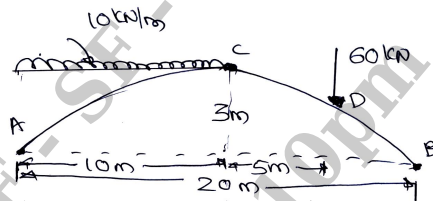


Fig.Q5(b)

(10 Marks)

- 6 Analyse the beam shown in Fig.Q6 using consistent deformation method. Draw SFD and BMD.

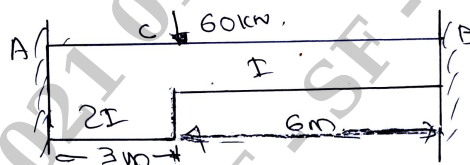


Fig.Q6

(20 Marks)

- 7 Analyse the continuous beam shown in Fig.Q7, using Clapeyron's theorem. Support C sinks by 5mm. Draw SFD and BMD  $E = 210\text{GPa}$   $I = 25 \times 10^6\text{mm}^4$ . End A is fixed.

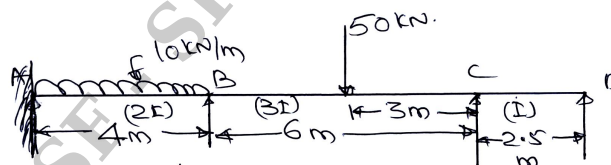


Fig.Q7

(20 Marks)

- 8 A two hinged parabolic arch of span 30m and central rise 6m is carrying UDL of  $20\text{kN/m}$  for a length of 12m from left support. Find reaction at hinges. Draw BMD. Indicate maximum positive and negative bending moments. (20 Marks)

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