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17CV42

## Fourth Semester B.E. Degree Examination, Aug./Sept. 2020 Analysis of Determinate Structures

Time: 3 hrs.

Max. Marks: 100

- Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Assume any missing data suitably.

### Module-1

- 1 a. Define linear and nonlinear systems. (06 Marks)  
 b. Distinguish between static indeterminacy and kinematic indeterminacy. (06 Marks)  
 c. Determine static and kinematic indeterminacy for the following structures.

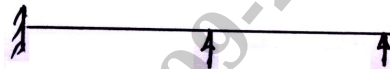


Fig Q1(c) - (i)



Fig Q1(c) - (ii)

(08 Marks)

OR

- 2 a. What are the assumptions made in the analysis of trusses? (04 Marks)  
 b. Distinguish perfect and imperfect frames. (04 Marks)  
 c. Find the forces in all members of truss shown in Fig Q2(c).

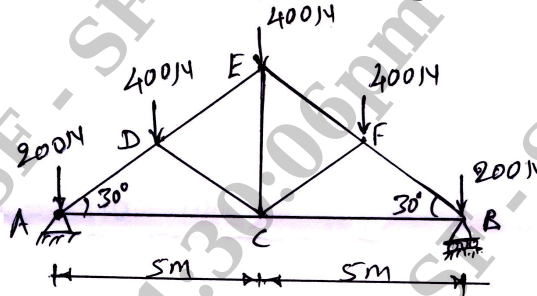


Fig Q2(c)

(12 Marks)

### Module-2

- 3 a. State the moment area theorems. (04 Marks)  
 b. Find the slope and deflection at the free end of cantilever beam subjected to udl  $w/m$  on its entire length by moment area method. (06 Marks)  
 c. For the cantilever beam shown in Fig Q3(c), compute the slope and deflection at the free end. Take  $EI = 4 \times 10^{12} \text{ Nmm}^2$ . Use Macaulay's method.

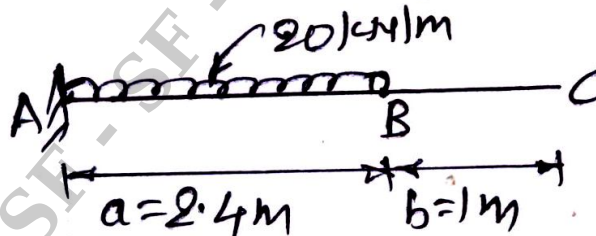


Fig Q3(c)

(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.

OR

- 4 a. Determine the slopes at the supports and deflection under the point load by conjugate beam method.

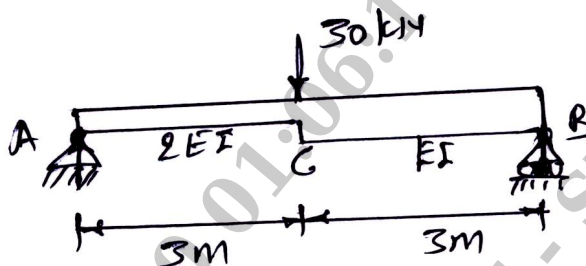


Fig Q4(a)

(10 Marks)

- b. Determine the deflection under the load points shown in Fig Q4(b) by Macanlay's method. Take  $EI = 1 \times 10^{12} \text{ Nmm}^2$ .

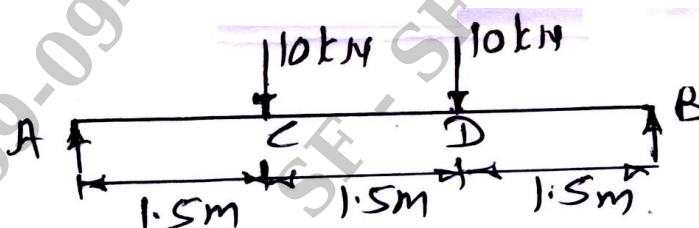


Fig Q4(b)

(10 Marks)

**Module-3**

- 5 a. Derive the strain energy stored in a beam due to bending. (06 Marks)  
 b. Compute the deflection and rotation (slope) at the free end C of cantilever beam by unit load method. Shown in Fig Q5(b). Take  $E = 200 \text{ GPa}$   $I = 8 \times 10^7 \text{ mm}^4$ .

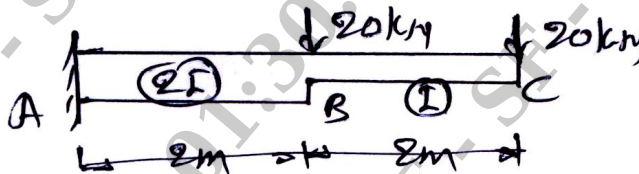


Fig Q5(b)

(14 Marks)

OR

- 6 a. Determine the horizontal deflection at D for the frame shown in Fig Q6(a) by Castiglione's theorem. Take EI constant.  $E = 2 \times 10^5 \text{ N/mm}^2$ ,  $I = 8 \times 10^8 \text{ mm}^4$ .

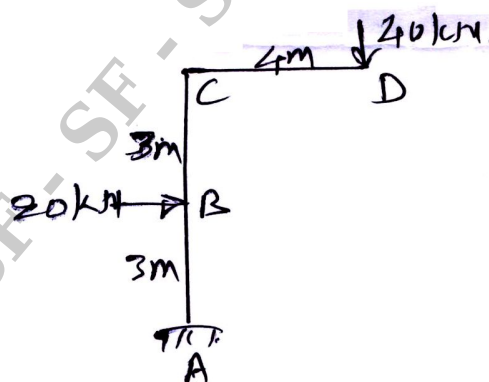


Fig Q6(a)

(11 Marks)

- b. Find the vertical deflection at joint C for the truss shown in Fig Q6(b) by unit load method c/s area of CD and DE are each 2500mm<sup>2</sup> and those of other are each 1250 mm<sup>2</sup>. Take E = 200 kN/mm<sup>2</sup>

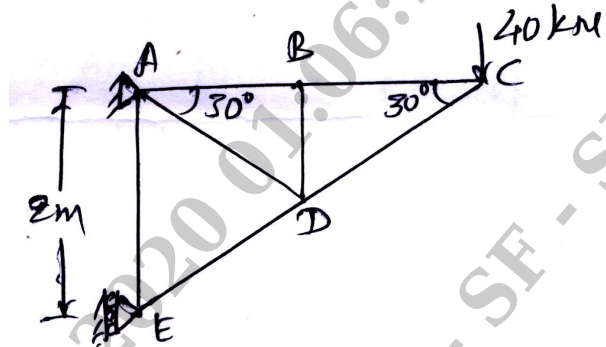


Fig Q6(b)

(09 Marks)

**Module-4**

- 7 A three hinged parabolic arch of span 18m and rise to crown hinge 3m carries a load of 120kN at the left quarter span. Find the BM, normal thrust and radial shear at section under the load. Also find maximum positive and negative b.m. in the arch. Sketch BMD. (20 Marks)

OR

- 8 A cable of span 120m and dip 10m carries a load of 6kN/m of horizontal span. Find the maximum tension in the cable and inclination of cable at the support. Find the forces transmitted to the supporting pier if the cable passes over smooth pulleys on top of pier. The anchor cable is at 30° to the horizontal. Determine the maximum bending moment for the pier if height of pier is 15m. (20 Marks)

**Module-5**

- 9 a. What are the uses of influence lines? (05 Marks)  
 b. A simply supported beam has a span of 15m. A udl of 40kN/m and 5m long crosses the girder from left to right. Draw the influence line diagram for SF and BM at a section 6m from left end. Using these diagrams. Calculate maximum SF and BM at this section. Also determine the position and magnitude of absolute maximum BM in the beam. (15 Marks)

OR

- 10 A train of 5 wheel loads as shown in Fig Q10 crosses a simply supported beam of span 24m from left to right. Calculate the maximum positive and negative SF values at the centre of span and the absolute maximum B.M anywhere in the span.

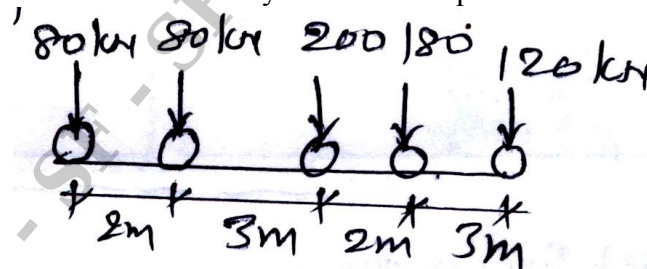


Fig Q10

(20 Marks)

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