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Fourth Semester B.E. Degree Examination, Jan./Feb.2021 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, if any.

Module-1

- 1 a. Explain different forms of structures with examples. (04 Marks)
b. Distinguish between determinate and indeterminate structures with examples. (04 Marks)
c. Find the forces in all the members of the truss shown in Fig. Q1 (c) and tabulate it. (12 Marks)

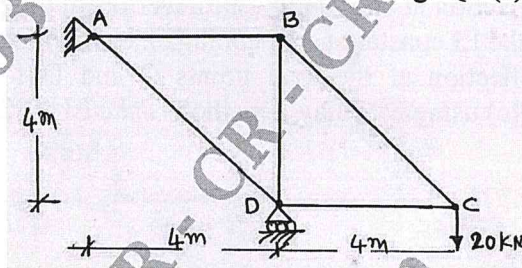


Fig. Q1 (c)

OR

- 2 a. List the assumptions made in the analysis of pin jointed plane truss. (04 Marks)
b. Determine the static and kinematic indeterminacy for the structures shown in Fig. Q2 (b). (06 Marks)

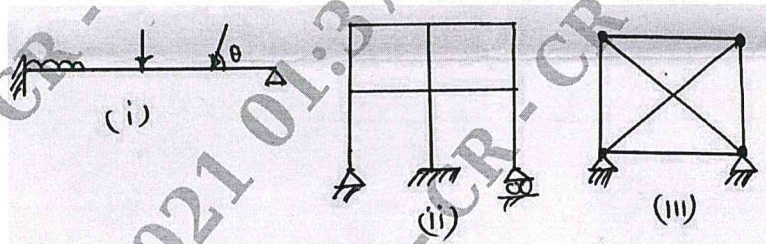


Fig. Q2 (b)

- c. Find the forces in the members DE, DF and EF of the truss shown in Fig. Q2 (c) by method of sections. (10 Marks)

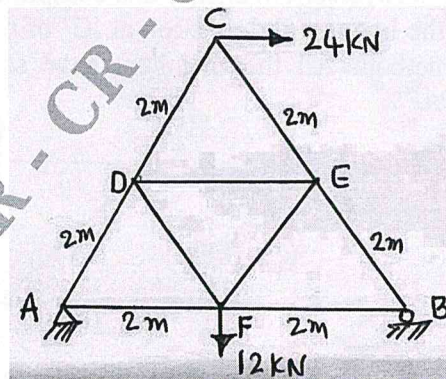


Fig. Q2 (c)

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.

Module-2

- 3 a. Derive the differential equation of deflection curve for the beam. (06 Marks)
 b. State conjugate beam theorems. (04 Marks)
 c. Find deflection at 'C' and slope at A and B for the beam shown in Fig. Q3 (c) using moment area method. (10 Marks)

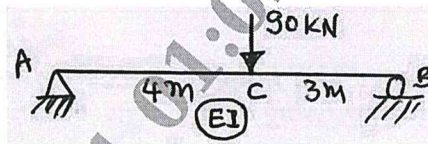


Fig. Q3 (c)

OR

- 4 a. State and prove moment area theorems. (06 Marks)
 b. Find deflection at end of the Cantilever beam of span 'L' carrying udl of w/m runover entire span. Take EI constant using conjugate beam method. (04 Marks)
 c. Find deflection at the load points C and D for the simply supported beam shown in Fig. Q4 (c) using Maculay's method. Take $EI = 12000 \text{ kN-m}^2$ (10 Marks)

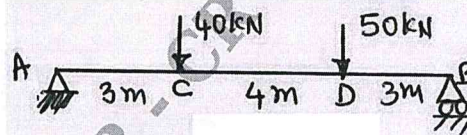


Fig. Q4 (c)

Module-3

- 5 a. State and prove in Castigliano's theorem - 1. (06 Marks)
 b. State the principle of virtual forces. (04 Marks)
 c. Determine the deflection at 'C' of the beam shown in Fig. Q5 (c) using strain energy method. (10 Marks)

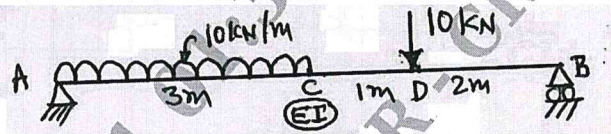


Fig. Q5 (c)

OR

- 6 a. Derive the expression for the strain energy stored in a beam due to flexure. (06 Marks)
 b. Distinguish between strain energy and complimentary energy. (04 Marks)
 c. Determine the horizontal deflection at 'C' of the truss loaded as shown in Fig. Q6 (c) using unit load method. All the members have same cross sectional area of 1500 mm^2 and $E = 200 \text{ GPa}$. (10 Marks)

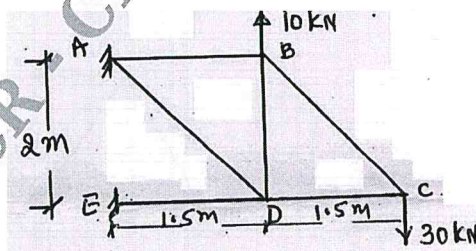


Fig. Q6 (c)

Module-4

- 7 a. A three hinged parabolic arch has a span of 24 m and a central rise of 4 m. It carries concentrated loads of 75 kN at 18 m from the left support and udl of 45 kN/m over the left half of the portion. Determine the moment, normal thrust and radial shear at a distance 6 m from the left support. (12 Marks)
- b. A cable used to support two loads of 40 kN and 40 kN across a span of 60 m. The cable length is 62 m. The loads acting at 20 m from left and right support. Find the tension in various segments of the cable shown in Fig. Q7 (b). (08 Marks)

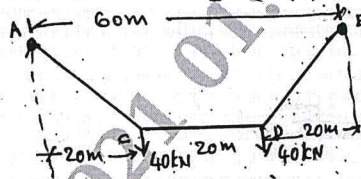


Fig. Q7 (b)

OR

- 8 a. A cable is suspended from two points A and B which are 80 m apart. A is 5 m below B. The lowest point on the cable is 10 m below A. The cable supports a udl of 20 kN/m over entire span. Calculate (i) reactions at supports (ii) Maximum tension in cable. (08 Marks)
- b. A three hinged parabolic arch of span 50 m has its supports at depth 4m and 16 m below crown shown in Fig. Q8 (b). Determine reactions at the supports and bending moments under the loads. Also draw BMD. (12 Marks)

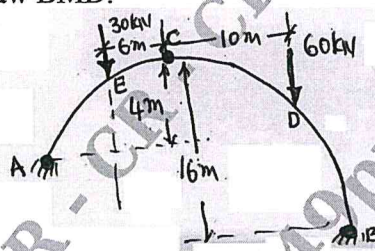


Fig. Q8 (b)



Module-5

- 9 a. Draw ILD for SF and BM at a section 3 m from left support for a S.S beam of span 12 m. Calculate maximum SF and BM at this section due to rolling load 5 m long and 2 kN/m intensity. (08 Marks)
- b. A series of wheel loads crosses over a girder of span 15 m from left to right with 40 kN load leading as shown in Fig. Q9 (b). Determine maximum BM and SF at a section 4 m from left support. (12 Marks)

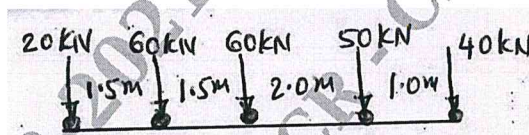


Fig. Q9 (b)

OR

- 10 a. Draw influence line diagram for shear force at any section from first principles. (04 Marks)
- b. What is influence line and state the importance of influence lines? (04 Marks)
- c. A train of five wheel loads crosses a simply supported beam of span 30 m as shown in Fig. Q10 (c). Calculate maximum positive and negative SF at midspan and absolute maximum BM anywhere in the span. (12 Marks)

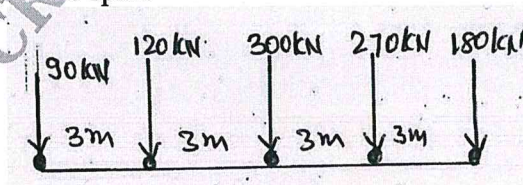


Fig. Q10 (c)
