

Fourth Semester B.E. Degree Examination, July/August 2022 Analysis of Determinate Structures

Time: 3 hrs.

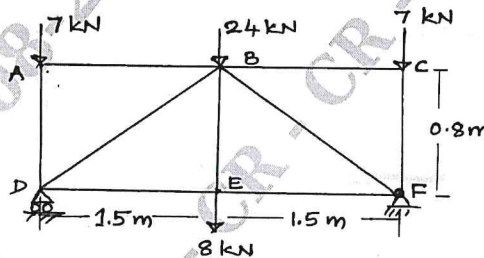
Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain the different structural forms. (08 Marks)
- b. Analyze the forces in all the members of the truss using method of joints as shown in Fig. Q1(b). (12 Marks)

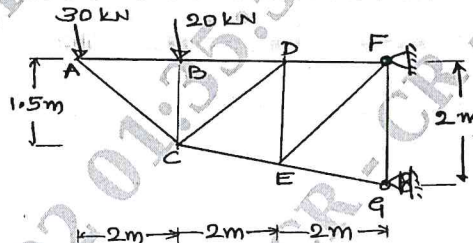
Fig. Q1(b)



OR

- 2 a. Explain the static and Kinematic Indeterminacies of structural systems. (06 Marks)
- b. Explain conditions of Equilibrium and Compatibility conditions. (04 Marks)
- c. Determine the forces in members CD and CE of the truss shown in Fig. Q2(c). (10 Marks)

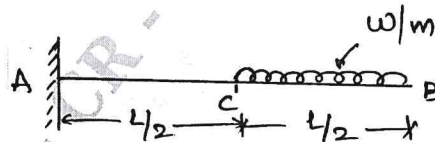
Fig. Q2(c)



Module-2

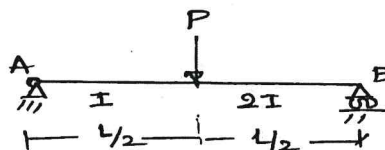
- 3 a. Determine the slope and deflection at B of a cantilever beam AB supporting a uniform load of intensity w acting over the right – half as shown in Fig. Q3(a). Use Moment Area method. (10 Marks)

Fig. Q3(a)



- b. Determine the slopes at ends and deflection at the centre of a beam shown in Fig. Q3(b) using Moment Area method. (10 Marks)

Fig. Q3(b)



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.

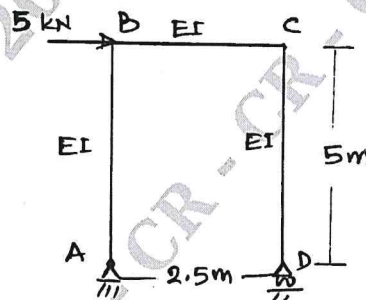
OR

- 4 a. Find the slopes at the ends and deflection at the centre of a simply supported beam with UDL over entire span using Conjugate Beam method. (08 Marks)
- b. A cantilever beam is 2m long and is required to carry a uniformly distributed load of 20 kN/m over entire length and a point load of 64 kN at the tip. Using Macaulay's method, determine the maximum deflection of the beam in terms of EI. (12 Marks)

Module-3

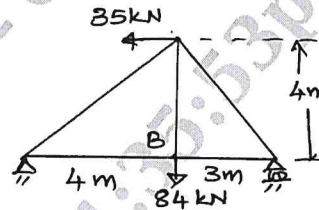
- 5 a. Find the horizontal displacement at joint B of the frame ABCD as shown in Fig. Q5(a) by Unit Load method. Assume EI to be constant for all members. (10 Marks)

Fig. Q5(a)

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- b. Determine the vertical components of the deflection at joint B of the truss shown in Fig. Q5(b) by the Virtual Work method. $E = 200 \text{ GPa}$, $A = 1200 \text{ mm}^2$. (10 Marks)

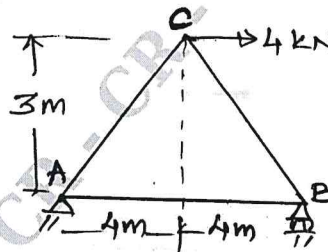
Fig. Q5(b)



OR

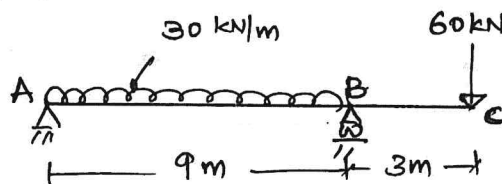
- 6 a. Determine the vertical displacement of joint C of the truss shown in Fig. Q6(a) using Castigliano's theorem. Consider $A = 400 \text{ mm}^2$ and $E = 200 \text{ GPa}$ for all members. (08 Marks)

Fig. Q6(a)



- b. Determine the deflection at point C of the beam shown in Fig. Q6(b) by Castigliano's Second theorem. $E = 200 \text{ GPa}$, $I = 800 \times 10^6 \text{ mm}^4$. (12 Marks)

Fig. Q6(b)



Module-4

- 7 a. Determine the reaction components at A and B, tension in the cable and the sag Y_B and Y_D of the cable shown in Fig. Q7(a). Neglect the self weight of the cable in the analysis. (14 Marks)

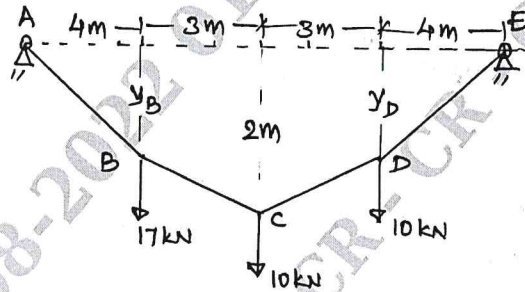


Fig. Q7(a)

- b. Determine the tension in the cables shown in Fig. Q7(b). (06 Marks)

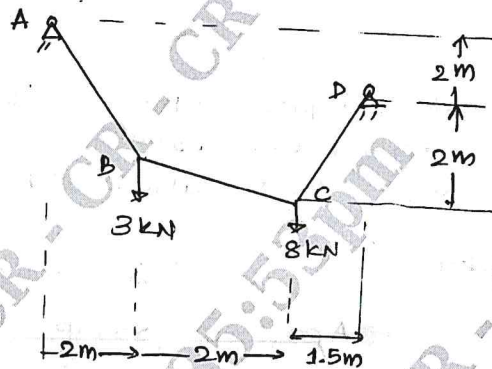


Fig. Q7(b)

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OR

- 8 a. For a three-hinged parabolic arch of uniform cross section has a span of 60m and a rise of 10m. It is subjected to a uniformly distributed load of intensity 10kN/m over entire span. Show that the bending moment is zero at any cross section of the arch. (10 Marks)
- b. Determine the normal thrust, radial shear and bending moment at section D of a 3 hinged arch as shown in Fig. Q8(b). (10 Marks)

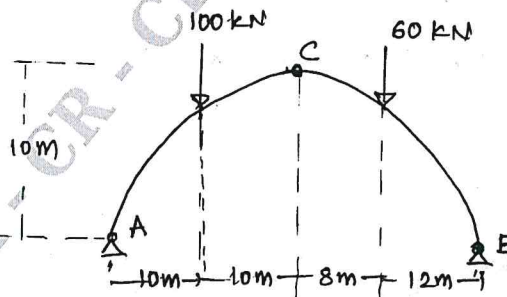
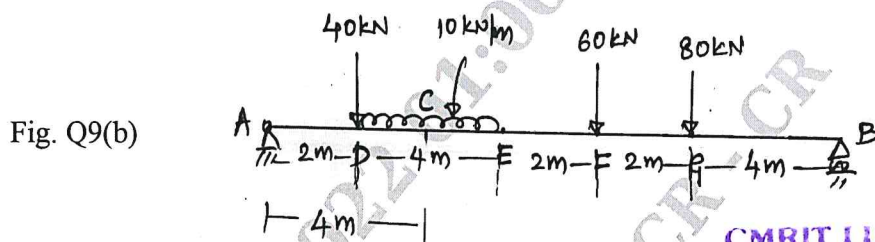


Fig. Q8(b)

Module-5

- 9 a. Draw the influence line diagram for support reactions, shear force and bending moment at a section for a simply supported beam subjected to a single point load. (08 Marks)

- b. Using influence line diagram, determine the shear force and bending moment at section 'C' in the simply supported beam shown in Fig. Q9(b). (12 Marks)



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OR

- 10 a. Write the application of influence line diagram in the analysis of structures. (05 Marks)
 b. Draw the influence line diagram for forces in the members $U_3 L_4$ and $U_3 U_4$ of the frame shown in Fig. 10(b). Find the maximum forces developed. When UDL of 40kN/m, longer than the span moves from left to right on bottom chord. (15 Marks)

Fig. Q10(b)

