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18CV42

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 with examples statically determinate and indeterminate structures. (08 Marks)
b. Find the Static and Kinematic indeterminacies of the following structures.

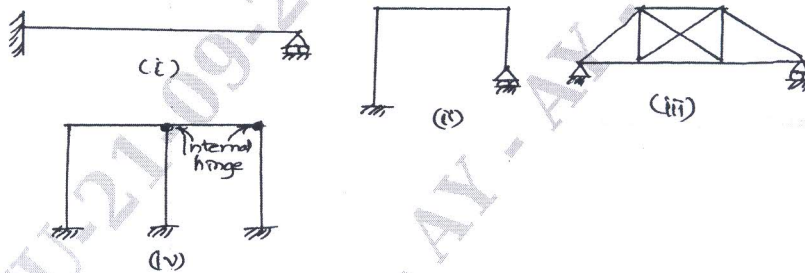


Fig.Q1(b)

(12 Marks)

OR

- 2 a. What do you mean by influence line diagram and state its applications. (08 Marks)
b. Draw ILD for
(i) Reactions at supports of a simply supported beam.
(ii) Shear force of a simply supported beam carrying concentrated unit load. (12 Marks)

Module-2

- 3 a. Two point loads 4 kN and 6 kN spaced 6m apart cross a girder of 16m span, the 4 kN load, leading from left to right. Construct the maximum SF and BM diagrams stating the absolute maximum values. [Fig.Q3(a)].



Fig.Q3(a)

(10 Marks)

- b. Draw the influence line for SF and BM at a section 5m from the left hand support of a simply supported beam 25m span. Hence calculate maximum shear force and BM at this section due to uniformly distributed load of 1 kN/m, 8m long. [Refer Fig.Q3(b)]

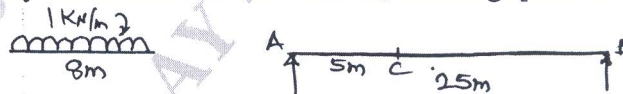


Fig.Q3(b)

(10 Marks)

OR

- 4 A simply supported beam of span 20m is subjected to a set of loads of magnitude of 20 kN, 30 kN, 15 kN and 10 kN spaced as shown with 10 kN leading. Determine the maximum BM at a section 5m from the left end and also the absolute maximum BM developed in the beam. [Refer Fig.Q4]



Fig.Q4

Module-3

- 5 a. Determine the slope and deflection at the free end of a cantilever beam loaded as shown in the Fig.Q5(a). Take $EI = 4 \times 10^5 \text{ kNm}^2$. Use moment area method.

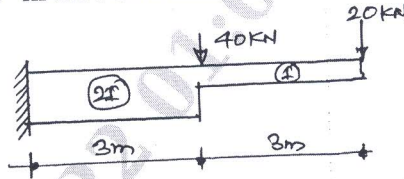


Fig.Q5(a)

(10 Marks)

- b. Determine the slope at C and deflection at D of a simply supported beam shown in Fig.Q5(b). Take $E = 200 \text{ GPa}$, $I = 2 \times 10^6 \text{ mm}^4$. Use conjugate beam method. (10 Marks)

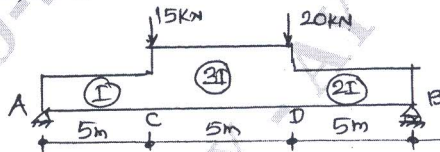


Fig.Q5(b)

OR

- 6 a. Determine the slope at the supports and deflection at the centre of a simply supported beam with a point load W at its mid span. Use moment area method. (10 Marks)
- b. Determine the slope at the supports and deflection at the centre of a simply supported beam with uniformly distributed load of W/m over the entire span. Use moment area method. (10 Marks)

Module-4

- 7 a. Derive the expression for strain energy stored in an prismatic element subjected to pure bending moment. (08 Marks)
- b. Determine the vertical deflection at C of a bent frame shown in the Fig.Q7(b). Use Castigliano's approach. Take $E = 200 \text{ GPa}$, $I = 80 \times 10^7 \text{ mm}^4$.

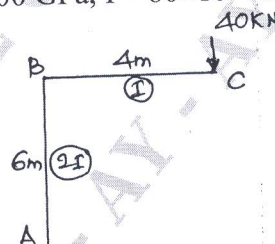


Fig.Q7(b)

(12 Marks)

OR

- 8 Determine the vertical and horizontal deflection of the point C, of the pin jointed frame shown in Fig.Q8. The cross sectional area of $AB = 100 \text{ sqmm}$ and BC and AC are 150 sqmm . Take $E = 2 \times 10^5 \text{ N/mm}^2$.

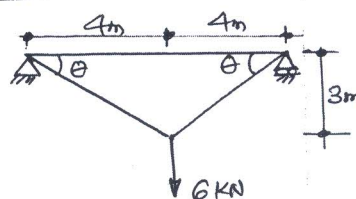


Fig.Q8

(20 Marks)

Module-5

- 9 A three hinged parabolic arch of 20m span with 4m central rise carries a point load of 4kN at 4m horizontally from the left hinge. Calculate the normal thrust and radial shear at a section just after the load. Also calculate the maximum positive and negative BM. Sketch BMD. (20 Marks)

OR

- 10 A cable is of uniform section is suspended between two supports 100m apart. It carries a uniformly distributed load of 10 kN/m spread over the horizontal span. Find
- Maximum and minimum tension in the cable.
 - Minimum cross sectional area of the cable required if the allowable stress is 300 MPa.
 - Length of the cable.
- (20 Marks)
