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.

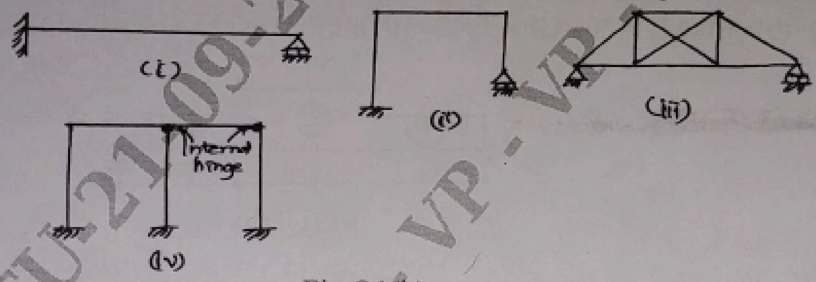

Fig.Q1(b) **(12 Marks)**

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)].

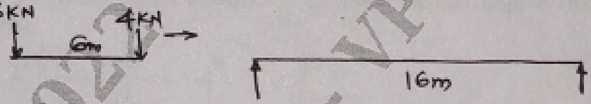

Fig.Q3(a) **(10 Marks)**

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)]

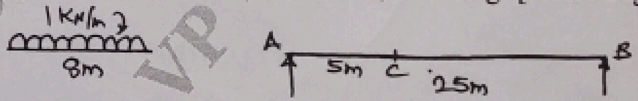

Fig.Q3(b) **(10 Marks)**

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] **(20 Marks)**

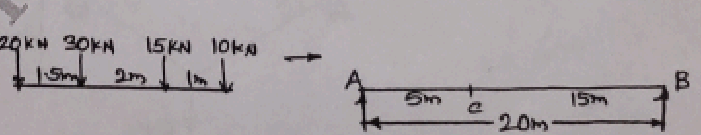

Fig.Q4

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 $EI = 4\times10^5\ kNm^2$. Use moment area method.

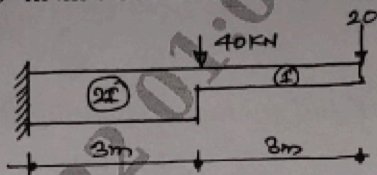

Fig.Q5(a) **(10 Marks)**

b. Determine the slope at C and deflection at D of a simply supported beam shown in Fig.Q5(b). Take E = 200 GPa, $I = 2\times10^6\ mm^4$. Use conjugate beam method. **(10 Marks)**

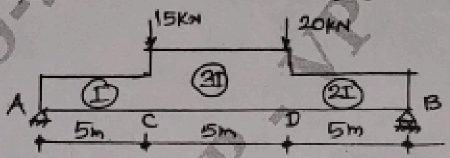

Fig.Q5(b)

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 GPa, $I = 80\times10^7\ mm^4$.

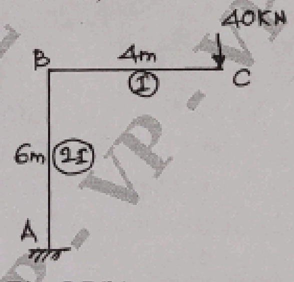

Fig.Q7(b) **(12 Marks)**

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 sqmm and BC and AC are 150 sqmm. Take $E = 2\times10^5\ N/mm^2$.

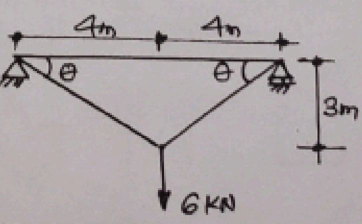

Fig.Q8 **(20 Marks)**

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
(i) Maximum and minimum tension in the cable.
(ii) Minimum cross sectional area of the cable required if the allowable stress is 300 MPa.
(iii) Length of the cable. **(20 Marks)**

* * * * *