CBCS SCHEME

USN | | | | | | | | | | |

18CV42

Fourth Semester B.E. Degree Examination, Dec.2024/Jan.2025
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 degree of freedom. What is the degree of freedom for a (i) Hinged support (ii) Fixed support **(06 Marks)**

b. Find the static and kinematic indeterminacy for the following structures shown in Fig.Q1(b).

i)

ii)

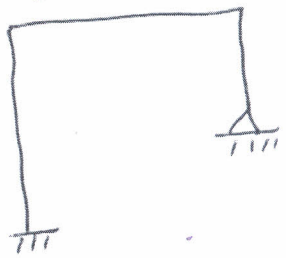

Fig.Q1(b) **(04 Marks)**

c. Determine the influence line diagram for the support reactions of the truss shown in Fig.Q1(c). Also, sketch ILD for member AC of the truss.

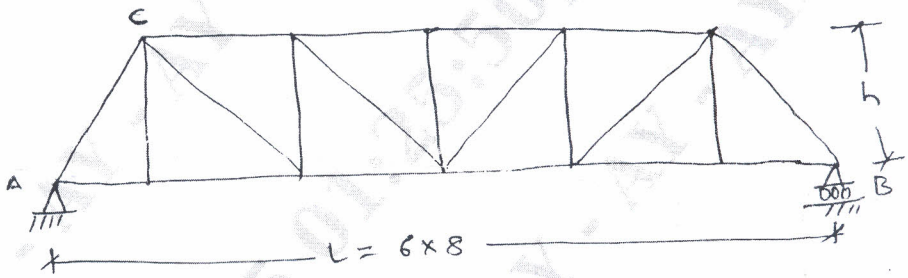

Fig.Q1(c) **(10 Marks)**

OR

2 a. Differentiate between statically determinate and indeterminate structures. State linear and non-linear analysis in structures. **(10 Marks)**

b. Determine the ILD for reactions at support, shear force and bending moment at C for the diagram shown in Fig.Q2(b).

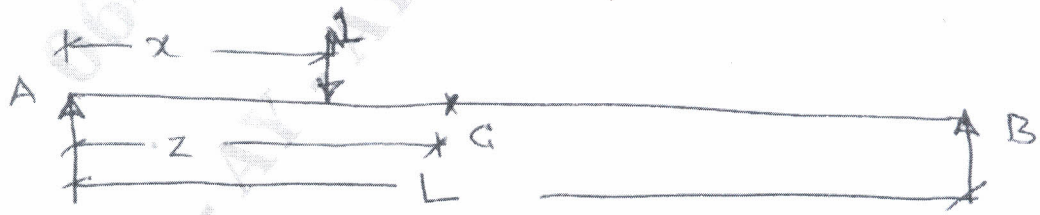

Fig.Q2(b) **(10 Marks)**

Module-2

3 A simply supported girder of span 16 m is subjected to a set of moving loads as shown in Fig.Q3. Determine the absolute maximum shear force and bending moment developed in the beam.

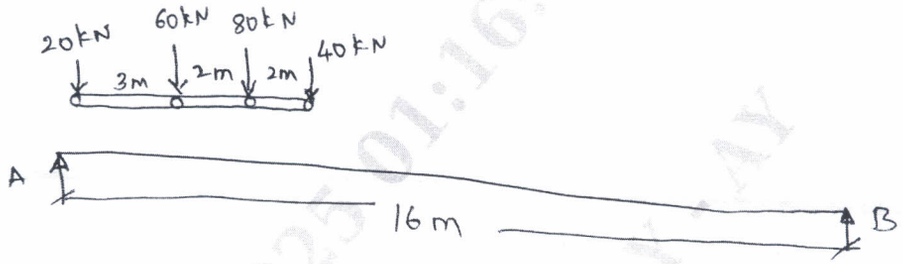

Fig.Q3 **(20 Marks)**

OR

4 Determine the maximum forces in members CE, DE and DF of the truss shown in Fig.Q4, due to a dead load of 10 kN/m and a moving load of 20 kN/m over the lower chord of the truss.

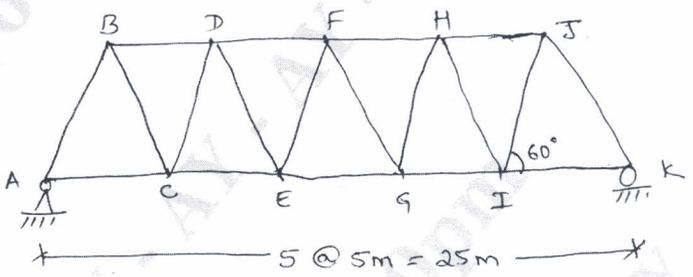

Fig.Q4 **(20 Marks)**

Module-3

5 a. State and prove theorems of moment area method. **(08 Marks)**

b. Determine the slope and deflection at the free end for the cantilever beam shown in Fig.Q5(b) by Moment Area Method. Take EI = 6×10^3 kN.m^2.

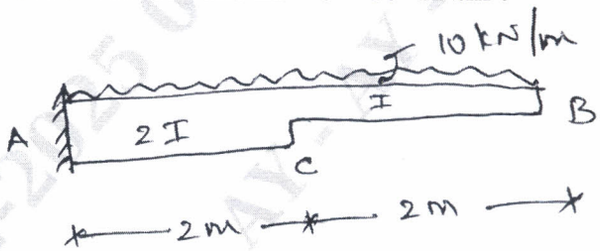

Fig.Q5(b) **(12 Marks)**

OR

6 a. Differentiate between real beams and conjugate beam with sketches. **(08 Marks)**

b. Find the maximum slope and deflection for the beam shown in Fig.Q6(b) by conjugate beam method. Take EI = 10.2×10^3 kN-m^2.

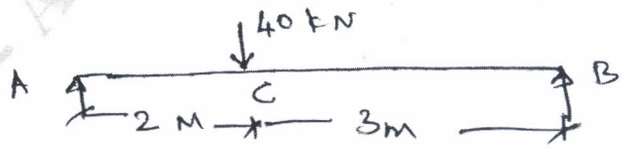

Fig.Q6(b) **(12 Marks)**

Module-4

7 a. Derive the expression for strain energy in an elastic member due to bending. **(10 Marks)**

b. Determine the vertical deflection at the free end for the overhanging beam shown in Fig.Q7(b). Assume constant EI. Use Castiglione's method.

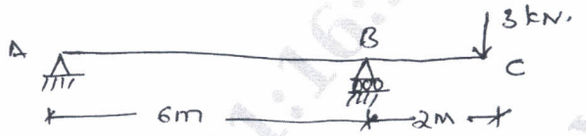

Fig.Q7(b) **(10 Marks)**

OR

8 a. State and prove principal of virtual displacements and principal of virtual work done in deformable bodies. **(08 Marks)**

b. Determine the vertical deflection at D for the loaded frame shown in Fig.Q8(b) by using unit load method. The cross sectional areas of members are 1500 mm^2 for AD and DE, while others are 1000 mm^2. Take E = 200 kN/mm^2.

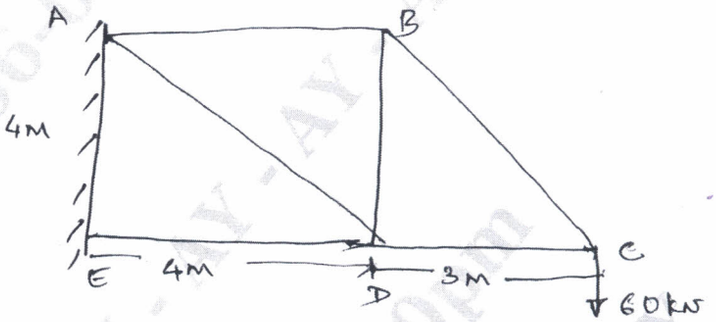

Fig.Q8(b) **(12 Marks)**

Module-5

9 A three hinged parabolic arch hinged at the supports and at the crown has a span of 24 m and a central rise of 4m. It carries a concentrated load of 75 kN at 18 m from the left support and a uniformly distributed load of 45 kN/m over the left half of the portion. Determine the bending moment, normal thrust and radial shear at a section 6m from the left support. **(20 Marks)**

OR

10 A cable of span 20 m and a central dip 4 m carries a udl of 20 kN/m over the whole span. Find:

(i) Maximum tension in the cable
(ii) Minimum tension in the cable
(iii) Length of the cable
(iv) Horizontal and vertical forces transmitted on to the supporting pier, if the cable is passed over a smooth frictionless pulley. **(20 Marks)**

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