Code : 011511

2012

STRUCTURAL ANALYSIS—I

Time : 3 hours *Full Marks* : 70

Instructions :

(i) All questions carry equal marks.

(ii) There are ***NINE*** *questions in this paper.*

(iii) Attempt ***FIVE*** *questions in all.*

(iv) Question No. ***1*** *is compulsory.*

1. Answer the following as directed (any seven) :

(a) The slope of an elastic curve of an element at the point of contraflexure

(i) must be equal to zero

(ii) is greater than zero

(iii) needs not be equal to zero

(iv) is maximum

(Choose the correct option)

(b) Maximum bending moment caused by concentrated load (W) acting at midspan on a simply-supported beam of span L is

(i) $M = WL/2$

(ii) $M = WL/8$

(iii) $M = WL/4$

(iv) $M = WL/12$

(Choose the correct option)

(Turn Over)

(c) Three hinges in the arch make it

(i) statically unstable structure

(ii) statically determinate structure

(iii) geometrically unstable structure

(iv) indeterminate structure

(Choose the correct option)

(d) Find the degree of indeterminateness of the beam as shown in Fig. 1.

Fig. 1

(e) Define 'indeterminate structure'.

(f) Discuss different types of support.

(g) Define 'redundant frame'.

(h) Write different methods for determination of forces in the members of truss.

(i) For concentrated load the BMD will be ——.

(Fill in the blank)

(j) Find the member force in *BC* as shown in Fig. 2.

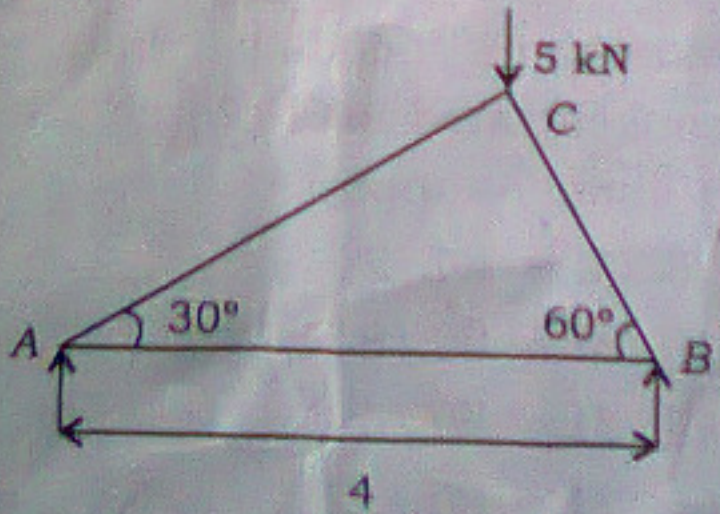

Fig. 2

2. Determine the forces in all members of the truss as shown in Fig. 3.

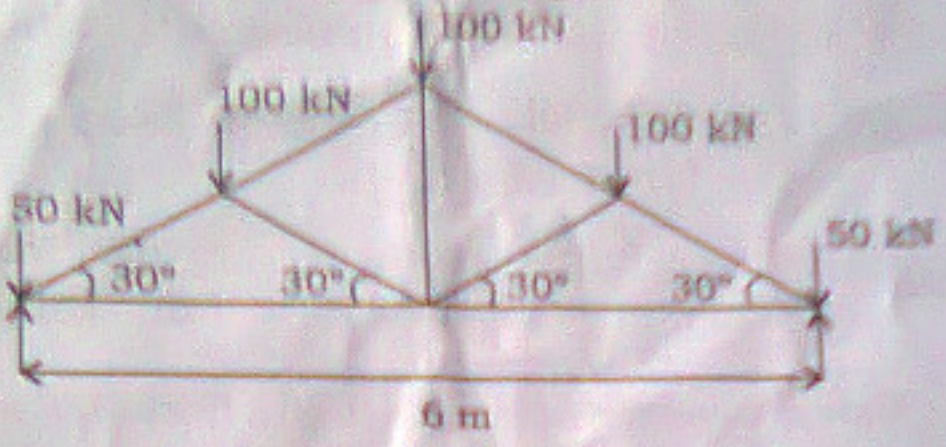

Fig. 3

3. Two wheel loads of 16 kN and 8 kN, at a fixed distance apart of 2 m, cross a beam of 10 m span. Draw the ILD for bending moment and shear force for a point 4 m from the left abutment and find the maximum bending moment and shear force at that point.

4. Using Castigliano's first theorem, determine the deflection and cotation of the overhanging end A of the beam loaded as shown in Fig. 4.

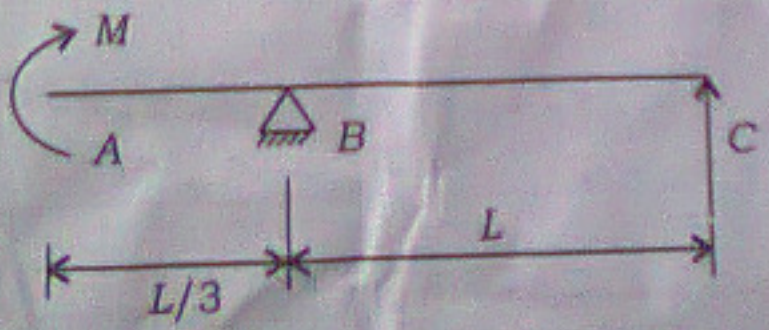

Fig. 4

5. A three-hinged parabolic arch of span 20 m and central rise of 4 m is loaded with a UDL of 2 kN/m on the left 8 m length. Calculate—

   (a) the direction and magnitude of reaction at the hinges;

   (b) the bending moment, normal thrust and shear at 4 m and 15 m from the left.

6. Using moment area method, find the slope and deflection at the free end of cantilever as shown in Fig. 5.

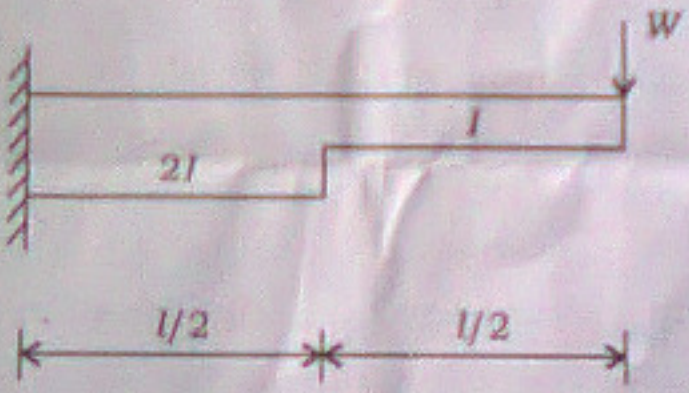

Fig. 5

7. For the given Fig. 6, find the ratio of deflections in the centre of the beam to the deflection at the point under one of the loads, using conjugate beam method.

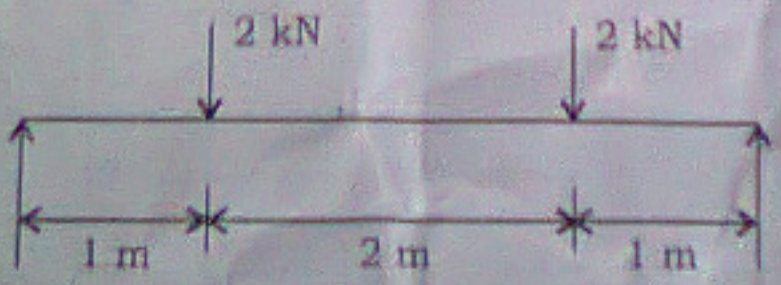

Fig. 6

8. Analyze the beam as shown in Fig. 7, using matrix method.

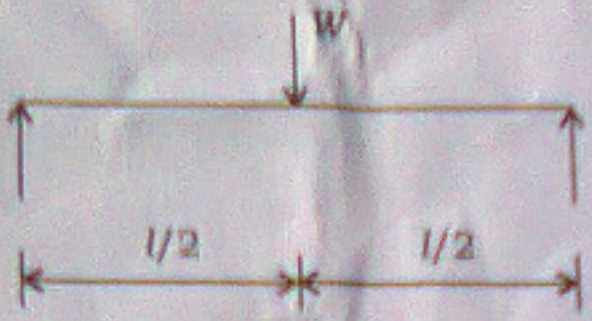

Fig. 7

9. Find the forces in all the members of the truss as shown in Fig. 8.

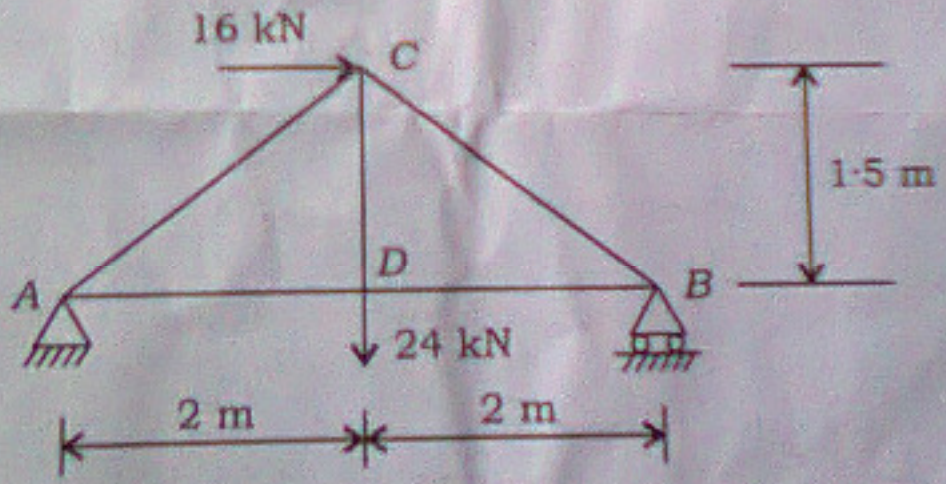

Fig. 8

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