

21.12.04

Ex/BESUS/CE-501/07

B.E. (CE) Part-III 5th Semester Examination, 2007

### Theory of Structures-I

(CE-501)

Time : 3 hours

Full Marks : 100

Use separate answerscript for each half.

Answer SIX questions, taking THREE from each half.

Two marks are reserved for neatness in each half.

#### FIRST HALF

(The questions are of equal value.)

1. Analyse the beam loaded as shown in Fig.Q.1 by moment distribution method. Also draw BM diagram.

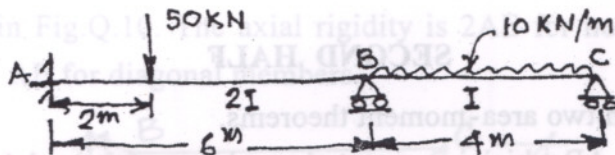


Fig.Q.1

2. Find the horizontal deflection of node B by virtual work method.  $AE = \text{constant}$  for all members shown in Fig.Q.2.

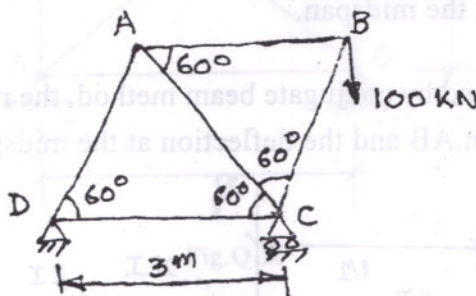


Fig.Q.2

3. Calculate the redundant reaction at C and also draw BM diagram in Fig.Q.3.

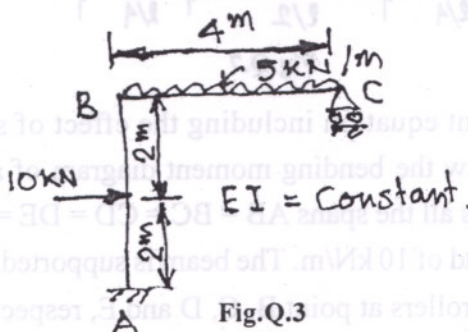


Fig.Q.3

(CE-501)

4. Calculate the tension in the tie rod as shown in Fig.Q.4.

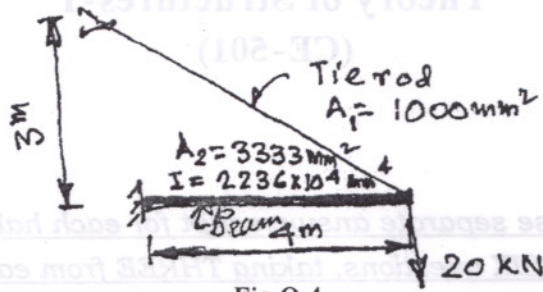


Fig.Q.4

5. Write short notes on any four of the following :

- i) Castigliano's Theorems
- ii) Strain energy and complementary strain energy
- iii) Virtual work method for axial load
- iv) Rotational and modified stiffness
- v) Carry over and distribution factor.

### SECOND HALF

6. State and explain two area-moment theorems.

Consider a beam AB which is supported on a hinge at the end A and supported on a roller at end B. It is having a span of 5.4 m. A concentrated load of 120 kN is applied at a distance of 1.8 m from left hand support A. Find out by moment area method, the rotations of beam at its two ends, namely,  $\theta_A$  and  $\theta_B$ , respectively, and the deflection at the midspan. [5+11]

7. Referring Fig.Q.7, find by conjugate beam method, the rotations  $\theta_A$  and  $\theta_B$  at the two ends of the beam AB and the deflection at the midspan. [16]

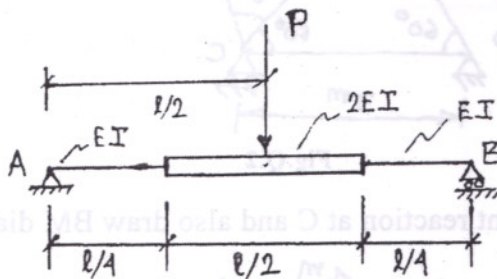


Fig.Q.7

8. Derive the three moment equation including the effect of support settlement.

Using this equation, draw the bending moment diagram of a four span continuous beam ABCDE which has all the spans  $AB = BC = CD = DE = 5 \text{ m}$  and subjected to a uniformly distributed load of  $10 \text{ kN/m}$ . The beam is supported by a hinge at support A while it is supported on rollers at point B, C, D and E, respectively. [7+9]



(CE-501)

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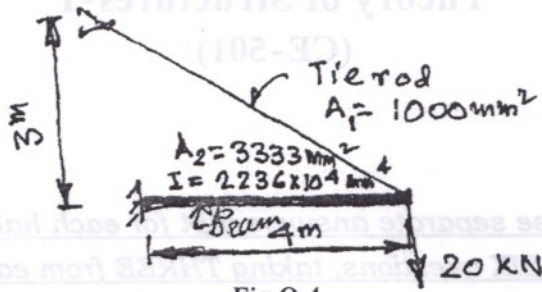


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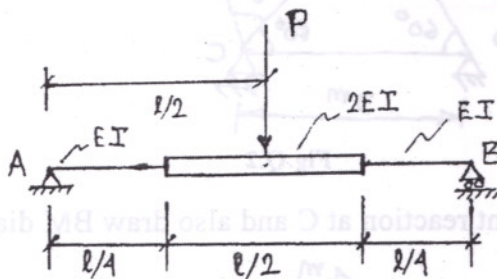


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9. Explain what you understand by 'Influence line diagram' of any structural member. Explain Muller Breslau principle in this context.

Consider the beam ABC which has span AB simply supported at A and B and has an overhang BC. Span AB is 8m long and span BC is 2m long. Calculate the maximum positive and negative reactions  $R_A$  due to three concentrated loads as shown in Fig.Q.9.

[2+3+11]

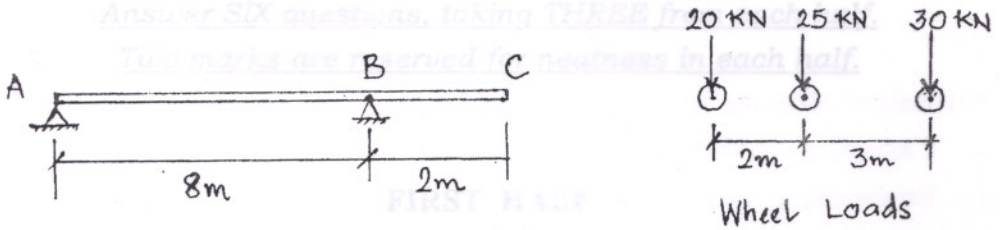


Fig.Q.9

10. Explain the concept of analysing a truss by tension coefficient method. Using tension coefficient method, determine the forces in the members of the truss shown in Fig.Q.10. The axial rigidity is  $2AE$  for horizontal and vertical members and  $AE$  for diagonal members.

[5+11]

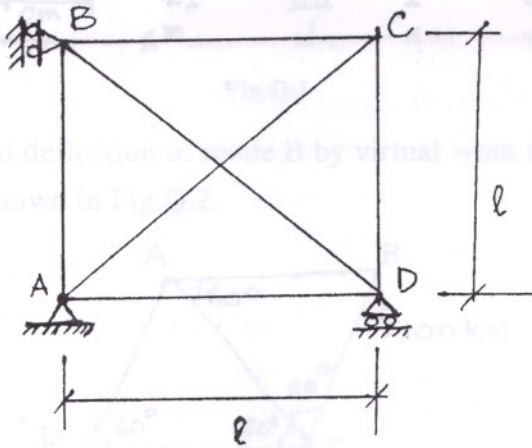


Fig.Q.10