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S.E. CIVIL (II Sem.) EXAMINATION, 2018

STRUCTURAL ANALYSIS-I

(2015 COURSE)

Time : Two Hours

Maximum Marks : 50

*N.B.* :— (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4,  
Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Assume suitable data, if necessary.

(v) Use of electronic pocket calculator is allowed.

1. (a) Derive equation to determine slope and deflection at free end of a cantilever beam subjected to a clockwise moment at free end. Use Macaulay's method. 'EI' is constant. [6]

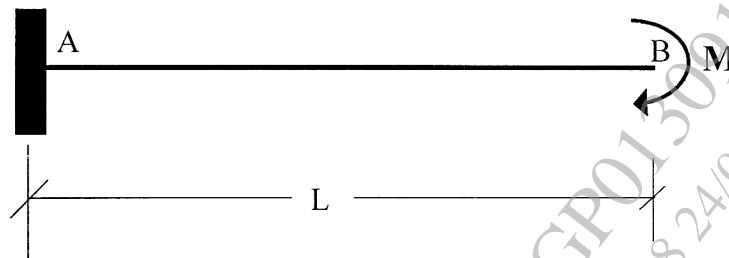
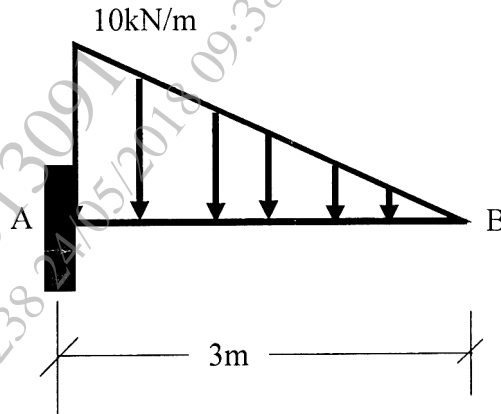


Fig. 1

- (b) For the beam shown below, determine magnitude and direction of a couple 'M' to be applied at free end of same beam so

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that deflection at free end becomes zero. [6]



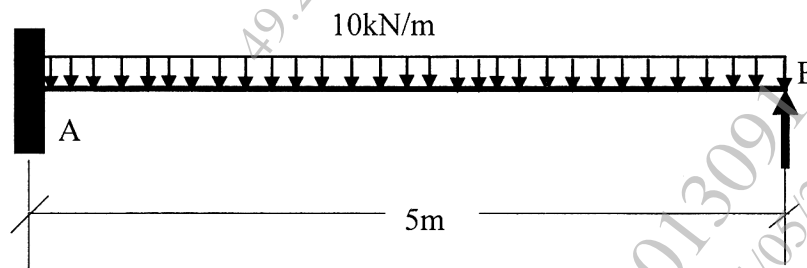
**Fig. 2**

Or

2. (a) Write notes on : [6]

- (i) Maxwell-Betti's Theorem
- (ii) Advantages and disadvantages of fixed beam over simply supported beam.

(b) Analyze the beam by Castigliano's second theorem and determine reaction of prop at 'B' if 10 mm sinking is allowed at 'B'. Take  $E_{prop} = 0.23 \times 10^5$  MPa and  $I_{prop} = 3 \times 10^8$  mm<sup>4</sup> [6]



**Fig. 3**

3. (a) A cantilever truss shown below is loaded by a vertical force of 10 kN at free end. Find modulus of elasticity of member material, if area of each member is 70 mm<sup>2</sup> and vertical deflection

is 5 mm at E. All members are made of same material. [6]

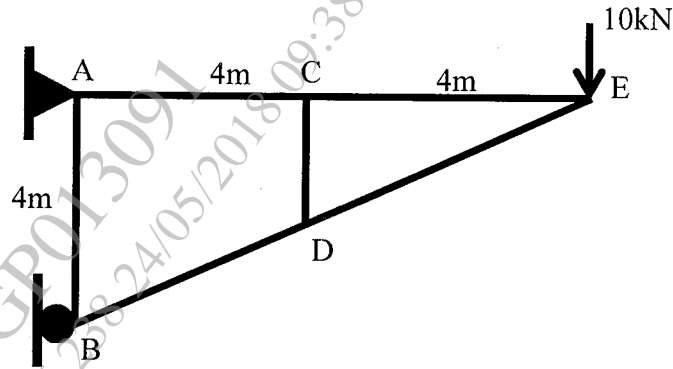


Fig. 4

- (b) For a cantilever beam shown below, calculate reactions at fixed end and shear force and bending moment at C by influence line diagram method. [6]

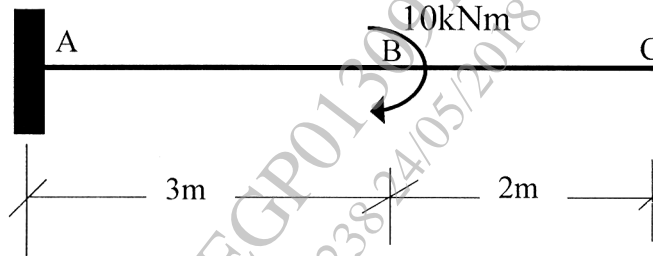


Fig. 5

Or

4. (a) For the following bracket, members of same cross-sectional area and same material are used. If horizontal deflection at 'C' is 5 mm and modulus of elasticity is  $2.1 \times 10^5$  MPa, determine area of members. [6]

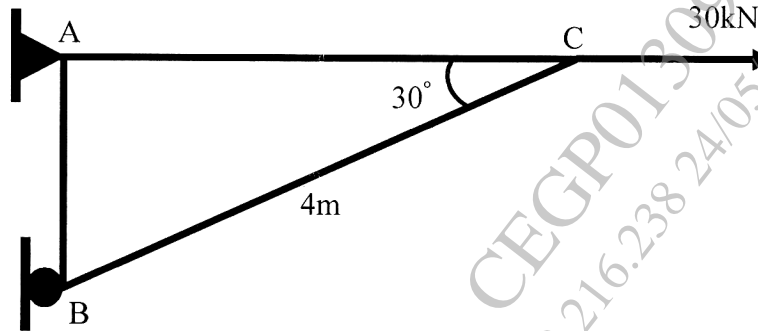


Fig. 6

- (b) For the cantilever beam shown below, calculate reactions at fixed end and shear force and bending moment at 'C' by influence line diagram method. Also draw influence line diagrams. [6]

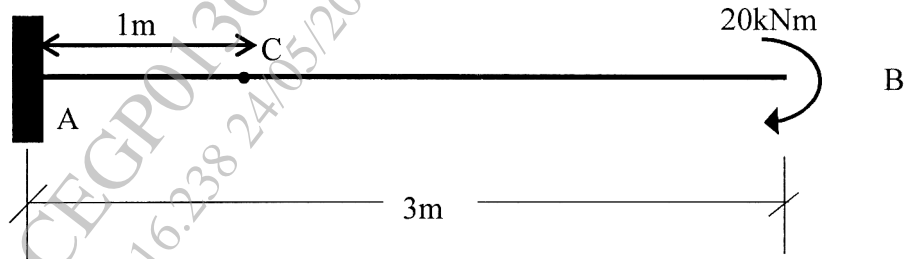


Fig. 7

5. A three hinged parabolic arch is loaded and supported as shown in figure below. Determine : [13]
- Support reactions
  - Maximum positive and negative moment.

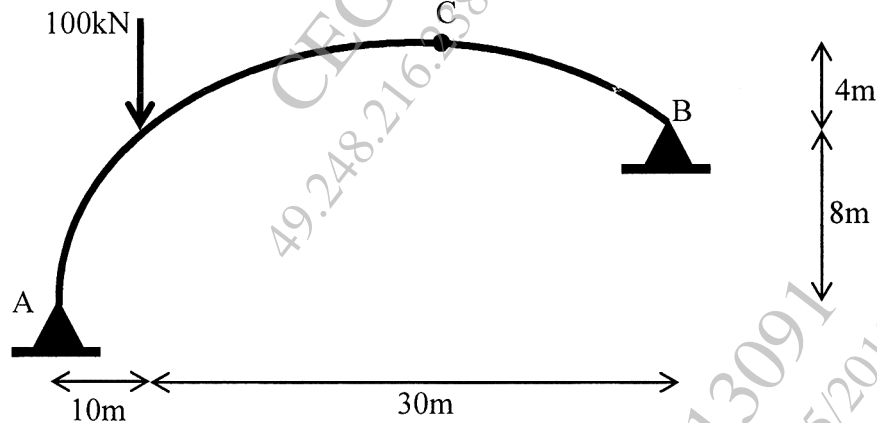


Fig. 8

Or

6. Determine horizontal thrust for a two hinged arch of span 'L' and central rise 'H' carries a point load 'W' at a distance 'a' from left hand support. Assume  $I + I_0 \sec \theta$ . [13]

7. (a) Explain : [9]

(i) Plastic Moment

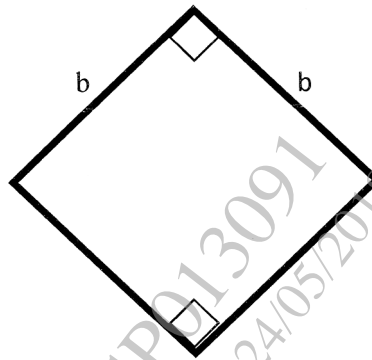
(ii) Plastic Collapse

(iii) Shape Factor.

(b) Write a note on Elastic-Plastic behavior beam. [4]

*Or*

8. For the cross-section shown below find shape factor. [13]



**Fig. 9**