

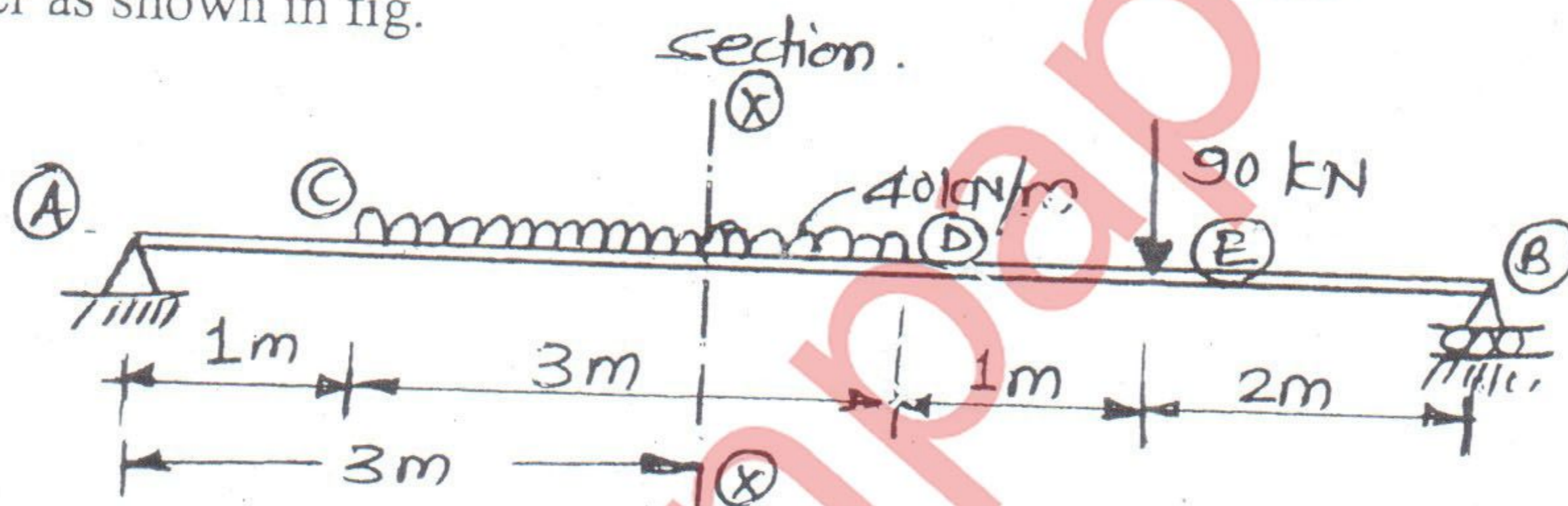
(3 Hours)

(Total Marks: 80)

- 1) Question No.1 is compulsory.
- 2) Attempt any **three** questions out of remaining four questions.
- 3) Assume suitable data wherever required and state it clearly.
- 4) Illustrate your answers with neat component sketches wherever required.
- 5) Answers should be written in the legible handwriting, stepwise and in the systematic manner.

1. Attempt any FOUR of the following:

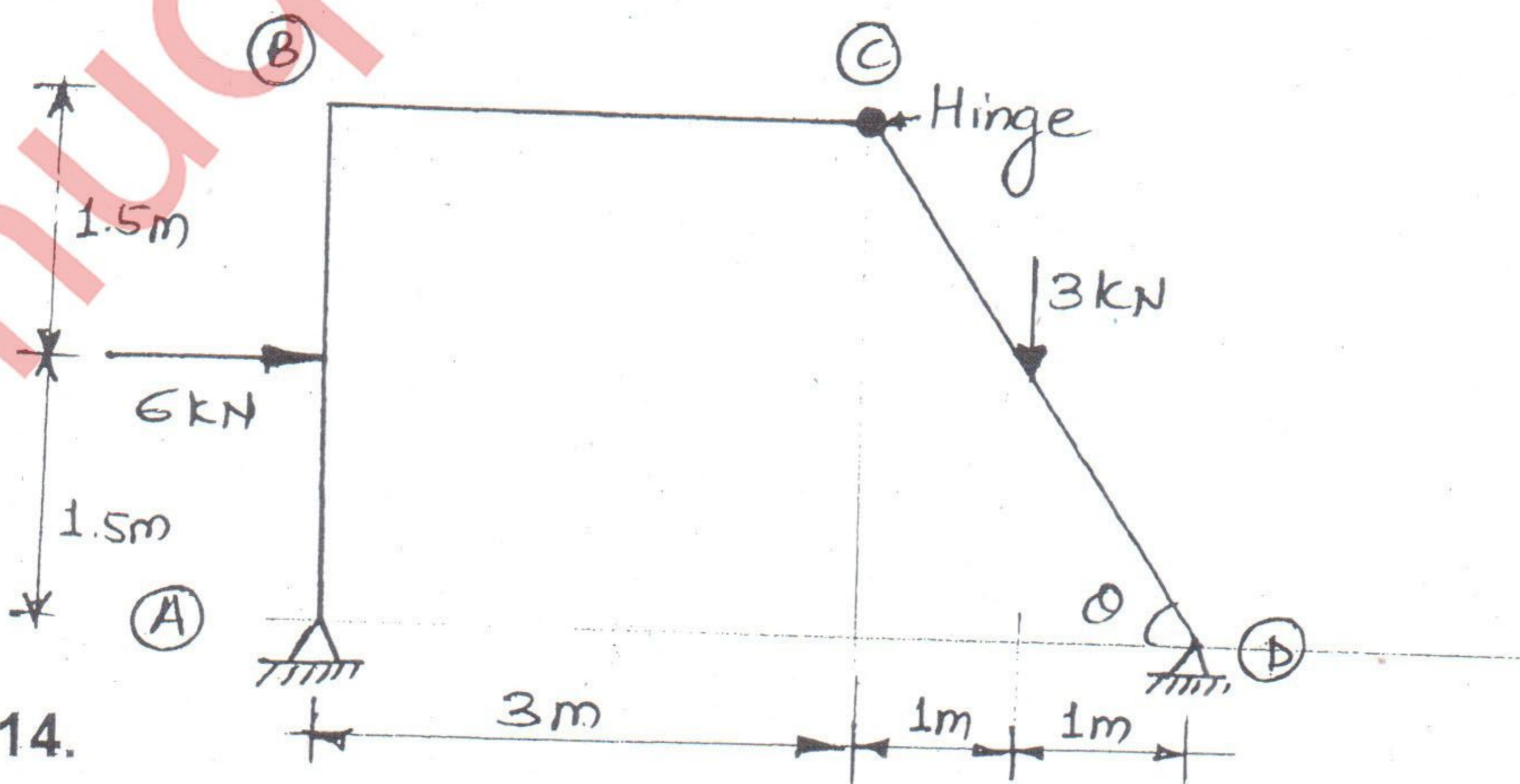
- (a) Explain the principle of superposition with examples. 05
- (b) For a three hinged parabolic arch of span L and rise h carries udl of intensity w per unit run over whole span. Show that horizontal thrust at each support of arch is $wl^2/8$ and bending moment at any section of arch is zero. 05
- (c) Using influence lines find out the shear force at any section for the loaded girder as shown in fig. 05



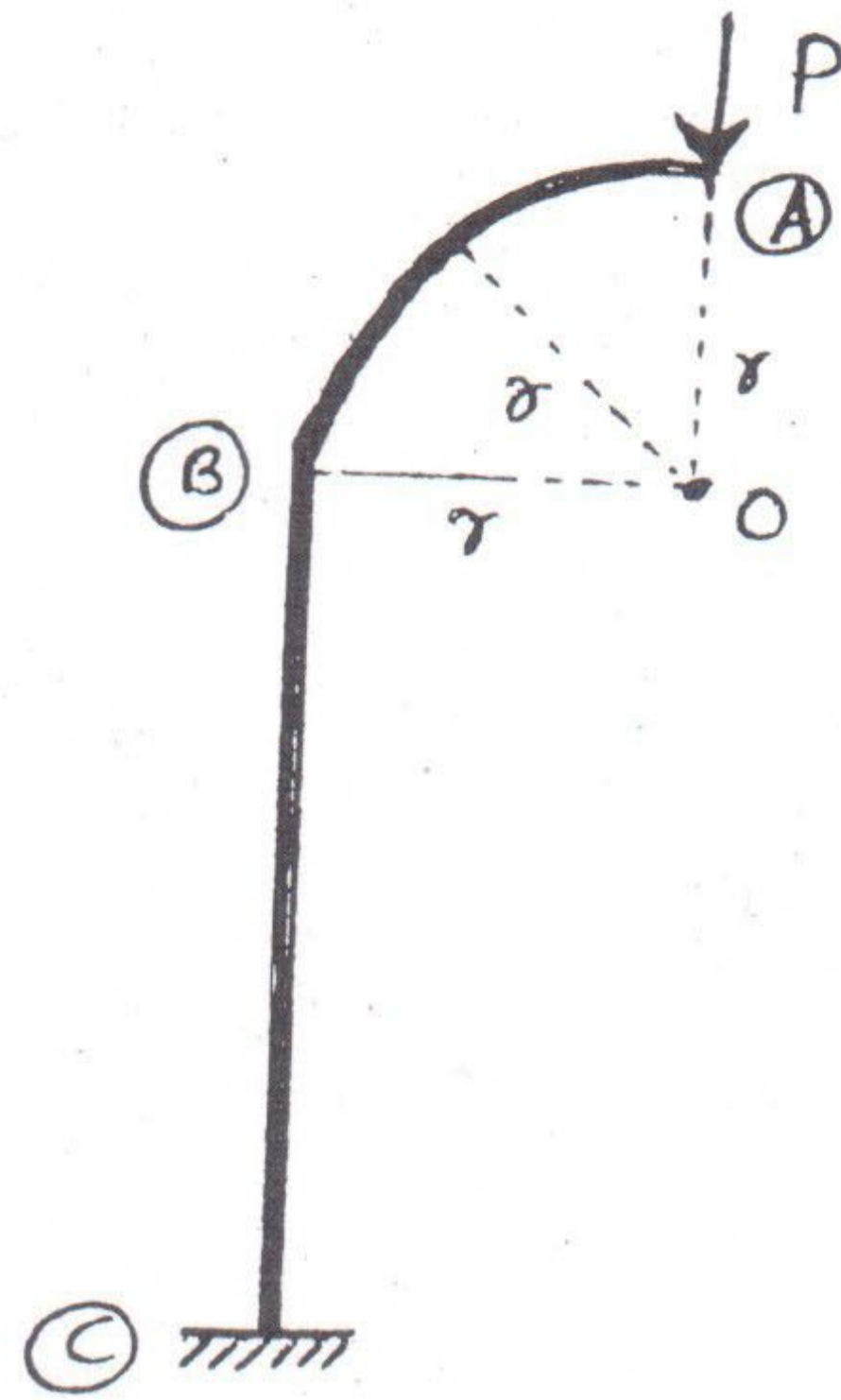
- (d) A rod, 2 m long and rectangular in cross section $88 \text{ mm} \times 44 \text{ mm}$ is subjected horizontally through pin joints. It carries a vertical load of 3.3 kN/m length and axial thrust of 110 kN . If $E = 208 \text{ kN/mm}^2$, calculate the maximum stress induced. 05
- (e) What is strain energy? Write the expression for the strain energy stored due to shear force, bending moment. 05

2. (a) Draw SFD, BMD and AFD for the frame as shown below.

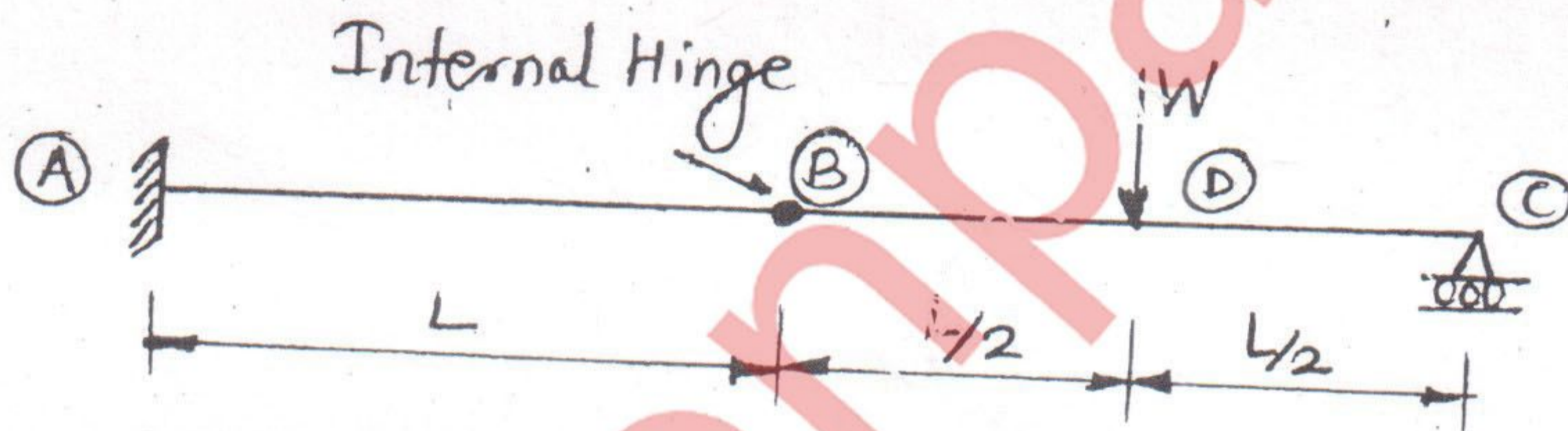
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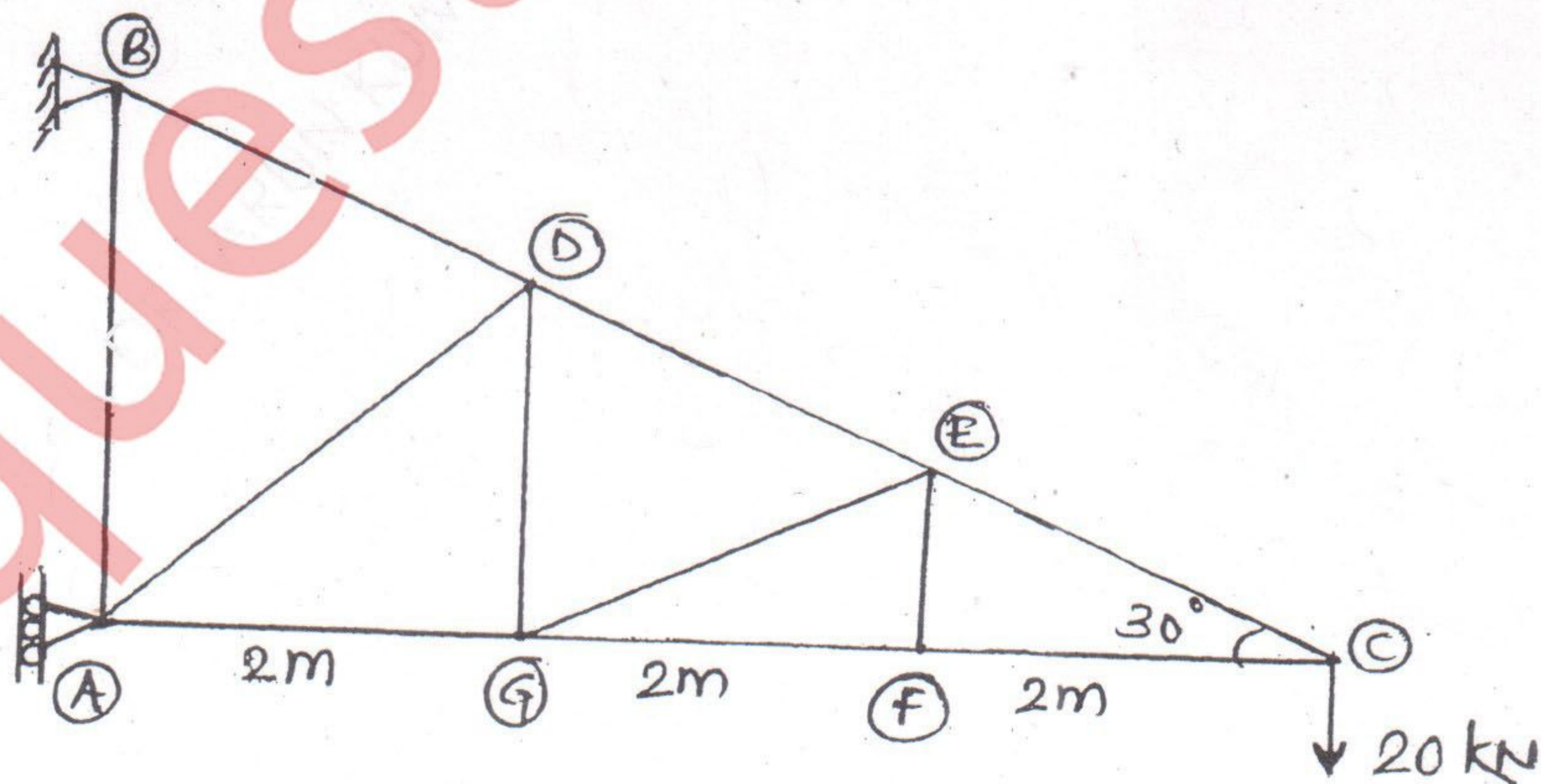
- (b) Find out the vertical and horizontal deflection of point A of the lamp post shown in fig. Use strain energy concept. 07



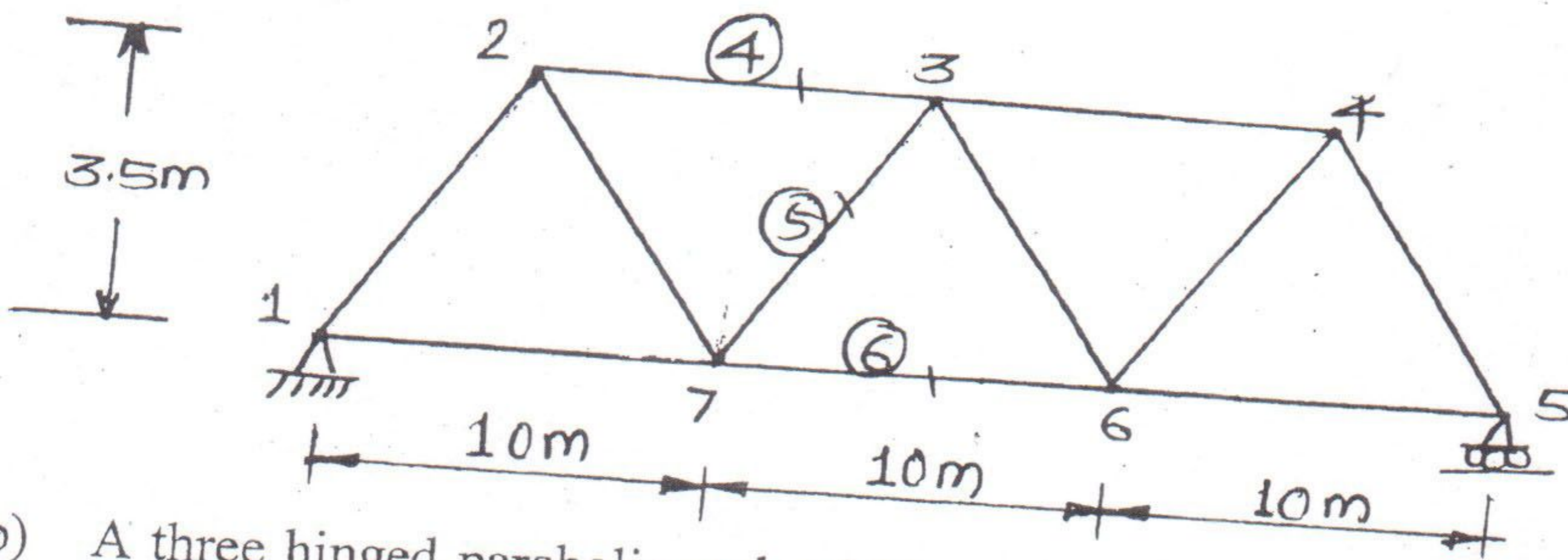
3. (a) A beam ABC is fixed at A and has roller support at end C. It is also provided with an internal hinge at B. Determine the slope and deflection at hinge B, when loaded with point load W. Use conjugate beam method. 10



- (b) Determine the horizontal and vertical deflection at joint C of a cantilever truss as shown in fig. For all members have equal area of 2000 mm^2 and $E = 200 \text{ Gpa}$. 10



4. (a) Draw influence line diagram for member 4, 5 and 6 of truss shown in fig. 10. Assume that the load moves along the bottom chord.



- (b) A three hinged parabolic arch of 20 m span and 3 m rise is carrying a point load of 100 kN at a section 7.5 m from left support. Find the values of horizontal thrust and BM at a point from right support.

5. (a) A cable of suspension bridge of span 60 m is suspended from piers which are 7.5 m and 1.5 m respectively above the lower point of cable. The load carried by each cable is 20 kN/m. Find out the

- (a) Horizontal tension in the cable
(b) Maximum tension in cable at pier.

- (b) A wooden cantilever beam of rectangular cross section supported at an inclined load P at its free end. Calculate maximum tensile stress and maximum deflection of the beam due to load P . Details of beam are as follows:

$B = 75 \text{ mm}$, $h = 150 \text{ mm}$, $L = 1.5 \text{ m}$, $P = 800 \text{ N}$, $\theta = 29.52^\circ$

