

HOMEWORK 4

Question 1: (5 points)

Figure 4 is a front elevation view of a simple beam structure carrying two external loads P . The beam has section properties EI near the supports and $2EI$ in the center section.

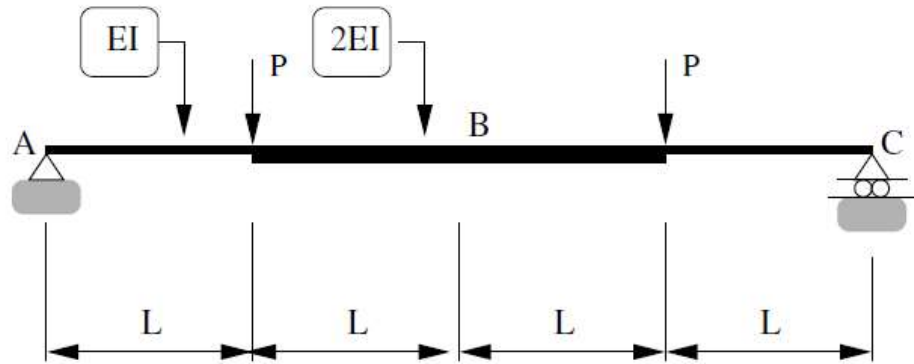


Figure 4: Simple beam structure (symmetric loads P)

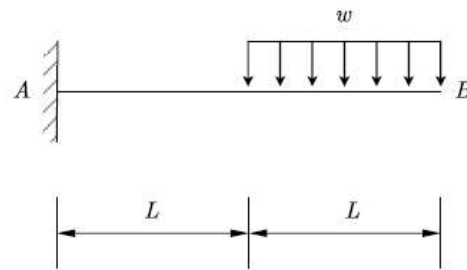
- a). Use the method of moment area to show that the end rotation at A (measured clockwise) is:

$$\theta_A = \frac{PL^2}{EI} \quad (3)$$

- b). Use the method of moment area to show that the vertical beam deflection at B is:

$$\Delta_B = \frac{13 PL^3}{12 EI} \quad (4)$$

Question 2: (5 points)



Use the *method of moment-area* to calculate the vertical displacement at point B , assuming the EI is constant along the beam.

Question 3: (6 points)

The three-pinned arch structure carries a uniformly distributed load W (N/m) across its 6m span.

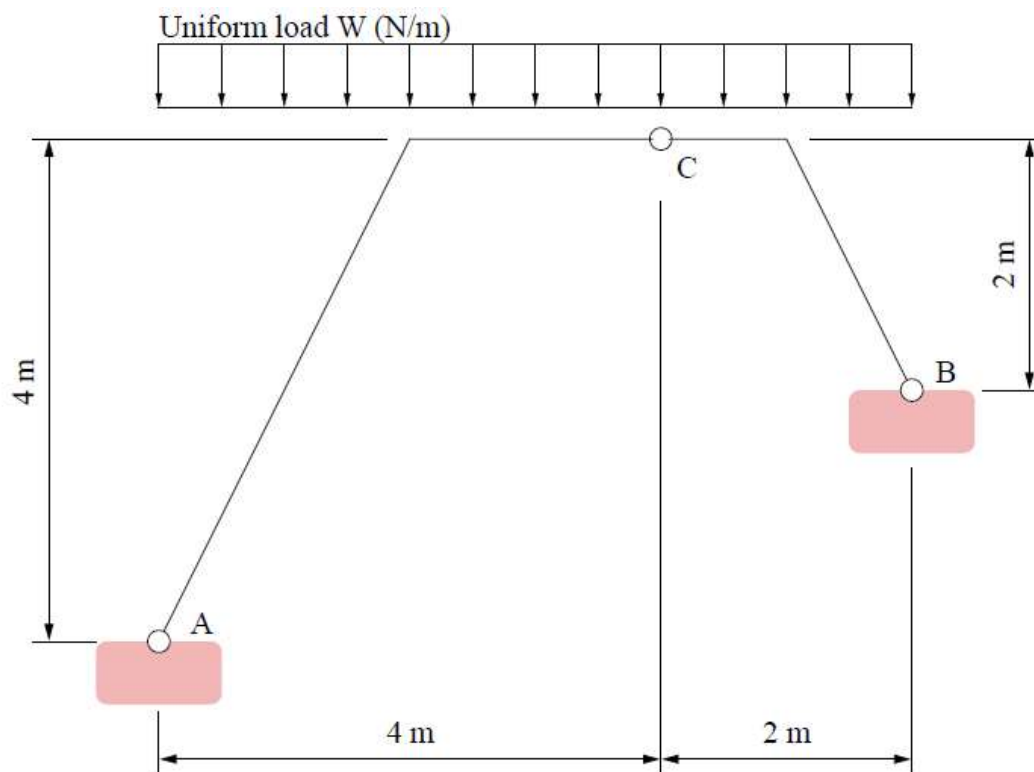
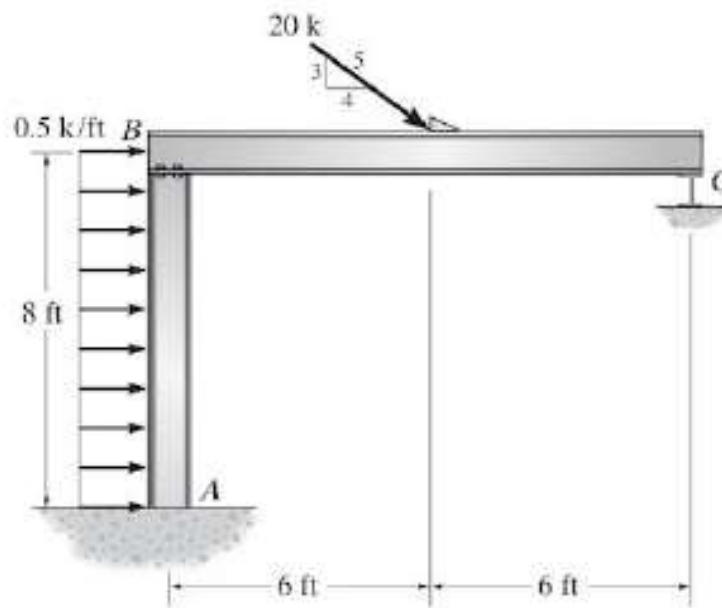


Figure 1: Elevation view of a three-pinned arch structure carrying a uniformly distributed load.

[1a] Compute the vertical and horizontal components of reaction force at supports A and B .

Question 4: (4 points)

4-42. Draw the shear and moment diagrams for each member of the frame. Assume A is fixed, the joint at B is a pin, and support C is a roller.

**Prob. 4-42**