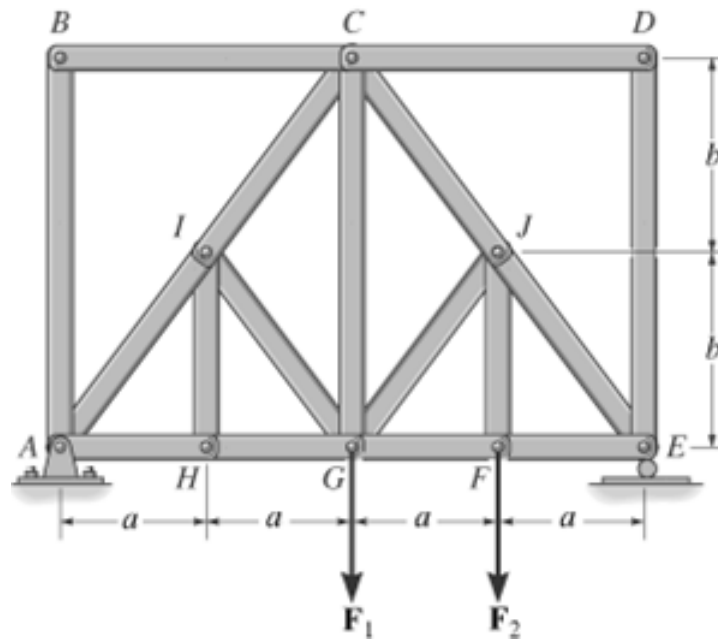


Question Five (5 marks)

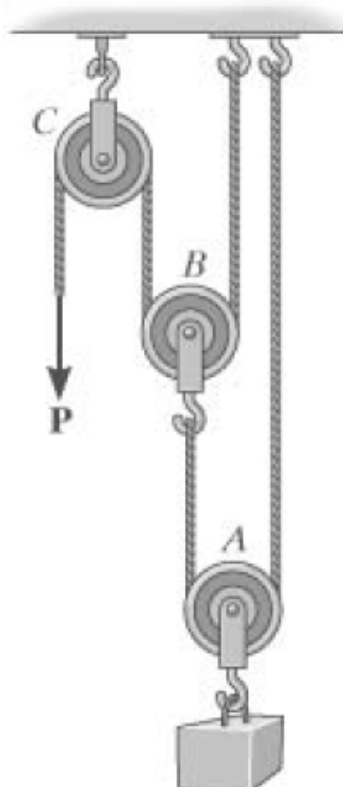
Find zero-force members in the shown truss.



Zero-force members are:
AB, BC, CD, DE, IH, IG.

Question six (5 marks)

Determine the force P needed to hold the block of mass 5kg in equilibrium.



Given:

$$F = 20 \text{ lb}$$

Solution:

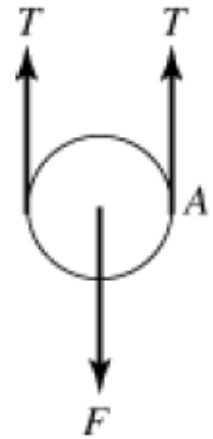
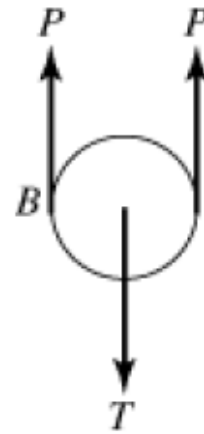
Pulley *B*: $\Sigma F_y = 0; \quad 2P - T = 0$

Pulley *A*: $\Sigma F_y = 0; \quad 2T - F = 0$

$$T = \frac{1}{2}F \quad T = 10 \text{ lb}$$

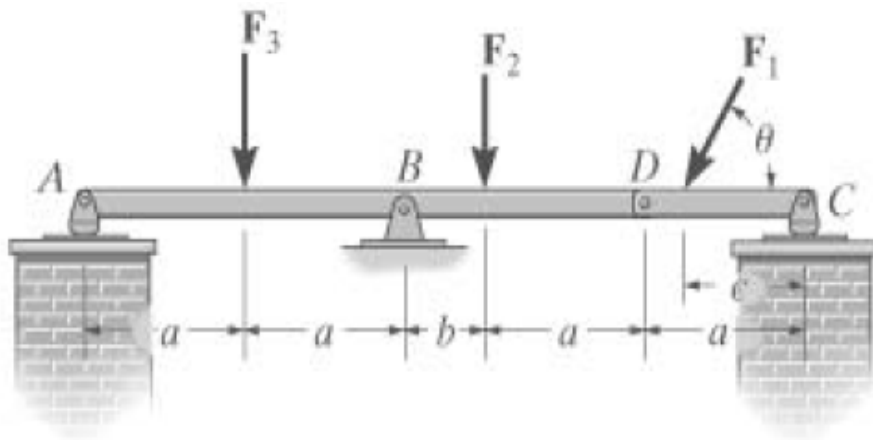
$$2P = T \quad P = \frac{1}{2}T$$

$$P = 5 \text{ lb}$$



Question seven (10 marks)

The compound beam is pin supported at B and supported by rockers at A and C. There is a pin at D. Determine the reactions at the supports.



Given:

$$F_1 = 7 \text{ kN} \quad a = 4 \text{ m}$$

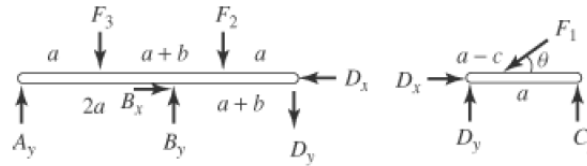
$$F_2 = 6 \text{ kN} \quad b = 2 \text{ m}$$

$$F_3 = 16 \text{ kN} \quad c = 3 \text{ m}$$

$$\theta = 60 \text{ deg} \quad d = 4 \text{ m}$$

Solution:

Member DC :



$$\Sigma M_D = 0; \quad -F_1 \sin(\theta)(a - c) + C_y a = 0$$

$$C_y = F_1 \sin(\theta) \frac{a - c}{a} \quad C_y = 1.52 \text{ kN}$$

$$\Sigma F_y = 0; \quad D_y - F_1 \sin(\theta) + C_y = 0$$

$$D_y = F_1 \sin(\theta) - C_y \quad D_y = 4.55 \text{ kN}$$

$$\Sigma F_x = 0; \quad D_x - F_1 \cos(\theta) = 0$$

$$D_x = F_1 \cos(\theta) \quad D_x = 3.5 \text{ kN}$$

Member ABD :

$$\Sigma M_A = 0; \quad -F_3 a - F_2(2a + b) - D_y(3a + b) + B_y 2a = 0$$

$$B_y = \frac{F_3 a + F_2(2a + b) + D_y(3a + b)}{2a} \quad B_y = 23.5 \text{ kN}$$

$$\Sigma F_y = 0; \quad A_y - F_3 + B_y - F_2 - D_y = 0$$

$$A_y = D_y + F_3 - B_y + F_2 \quad A_y = 3.09 \text{ kN}$$

$$\Sigma F_x = 0; \quad B_x - F_1 \cos(\theta) = 0$$

$$B_x = F_1 \cos(\theta) \quad B_x = 3.5 \text{ kN}$$