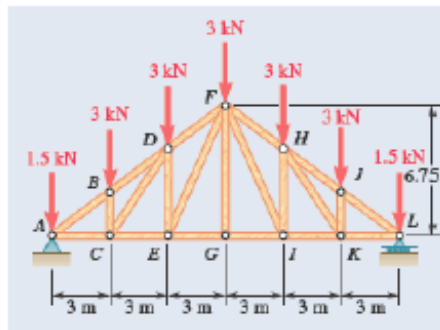


GNG1105D Engineering Mechanics – QUIZ # 6ii  
 Wednesday, November 13, 2019



**PROBLEM 6.55**

A Pratt roof truss is loaded as shown. Determine the force in members *CE*, *DE*, and *DF*.

**SOLUTION**

Free body: Entire truss

$$\sum F_x = 0: A_x = 0$$

$$\begin{aligned} \text{Total load} &= 5(3 \text{ kN}) + 2(1.5 \text{ kN}) \\ &= 18 \text{ kN} \end{aligned}$$



By symmetry:

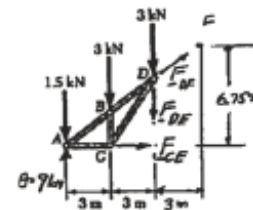
$$A_y = L = \frac{1}{2}(18 \text{ kN})$$

$$A = L = 9 \text{ kN}$$

Free body: Portion ACD

Note: Slope of *ABDF* is

$$\frac{6.75}{9.00} = \frac{3}{4} \quad \frac{F}{4} = 3$$



Force in *CE*:

$$+\circlearrowleft \sum M_D = 0: F_{CE} \left( \frac{2}{3} \times 6.75 \text{ m} \right) - (9 \text{ kN})(6 \text{ m}) + (1.5 \text{ kN})(6 \text{ m}) + (3 \text{ kN})(3 \text{ m}) = 0$$

$$F_{CE} (4.5 \text{ m}) - 36 \text{ kN} \cdot \text{m} = 0$$

$$F_{CE} = +8 \text{ kN}$$

$$F_{CE} = 8.00 \text{ kN } T \blacktriangleleft$$

Force in *DE*:

$$+\circlearrowleft \sum M_A = 0: F_{DE} (6 \text{ m}) + (3 \text{ kN})(6 \text{ m}) + (3 \text{ kN})(3 \text{ m}) = 0$$

$$F_{DE} = -4.5 \text{ kN}$$

$$F_{DE} = 4.50 \text{ kN } C \blacktriangleleft$$

PROBLEM 6.55 (CONTINUED)

Force in  $DF$ :

Sum moments about  $E$  where  $F_{CE}$  and  $F_{DE}$  intersect.

$$+\circlearrowleft \Sigma M_E = 0: (1.5 \text{ kN})(6 \text{ m}) - (9 \text{ kN})(6 \text{ m}) + (3 \text{ kN})(3 \text{ m}) + \frac{4}{5}F_{CE} \left( \frac{2}{3} \times 6.75 \text{ m} \right) = 0$$

$$\frac{4}{5}F_{CE}(4.5 \text{ m}) - 36 \text{ kN}\cdot\text{m}$$

$$F_{CE} = -10.00 \text{ kN}$$

$$F_{CE} = 10.00 \text{ kN } C \blacktriangleleft$$