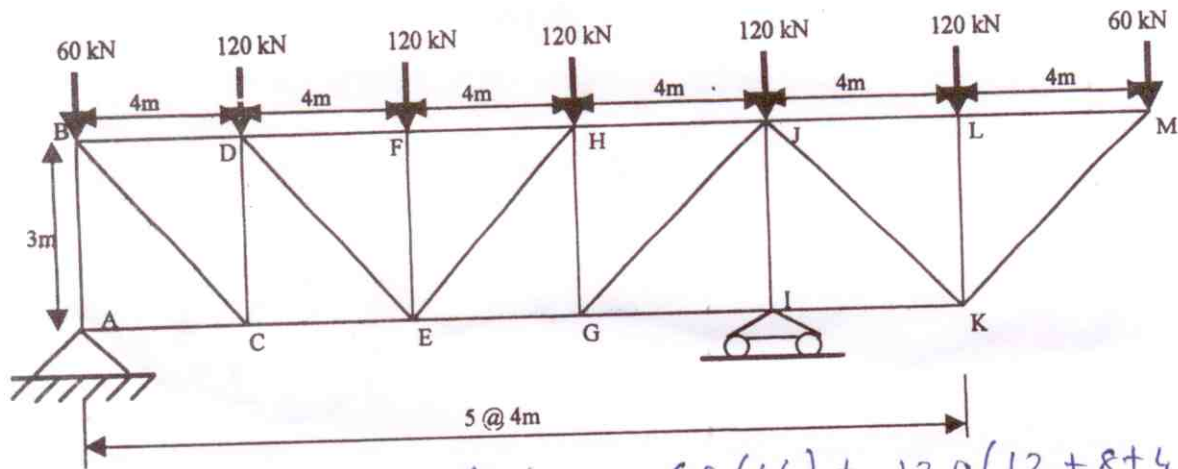1. Determine the forces in members FH, EH, EG, LM, MK, and LK.

$$A_x = 0 \quad ; \quad \sum M_I : \quad -A_y(16) + 60(16) + 120(12+8+4-4) - 60(8) = 0$$

$$\Rightarrow A_y = 180 \, kN$$

Left FBD :

$$\sum M_H = 0 \Rightarrow -A_y(12) + 60(12) + 120(8+4) + F_{EG}(3) = 0$$

$$\Rightarrow F_{EG} = 0 \blacktriangleleft$$

$$\sum M_E = 0 \Rightarrow -A_y(8) + 60(8) + 120(4) - F_{FH}(3) = 0$$

$$\Rightarrow F_{FH} = -160 = 160 \, (C) \, kN \blacktriangleleft$$

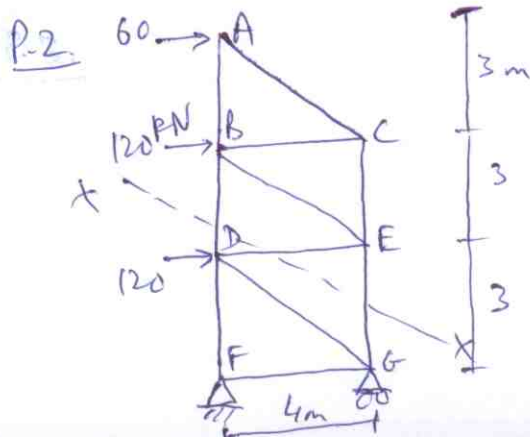$$\sum F_x = 0 \Rightarrow F_{FH} + F_{EH}\left(\frac{4}{5}\right) = 0 \Rightarrow F_{EH} = 200 \, (T) \, kN$$

Check: $\sum F_y = 0 \Rightarrow A_y - 60 - 120*2 + F_{EH}\left(\frac{3}{5}\right) \overset{?}{=} 0$

$$0 = 0 \checkmark$$

Joint M : $F_{MK}\left(\frac{3}{5}\right) + 60 = 0 \Rightarrow F_{MK} = -100 = 100 \, (C) \, kN.$

$$F_{LM} + F_{MK}\left(\frac{4}{5}\right) = 0 \Rightarrow F_{LM} = 80 \, (T) \, kN.$$
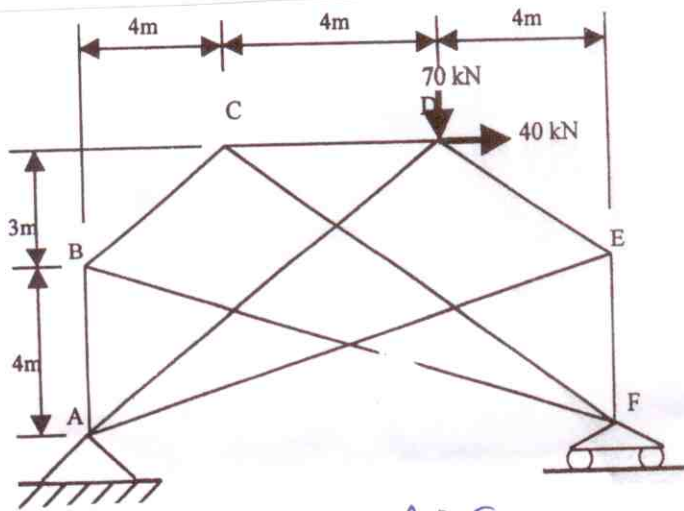
Joint L : $F_{LK} = -120 = 120 \, (C) \, kN.$

P.2 60 → A

Same as class problem (P 35) with data changed.

Upper FBD :

$$\sum F_x : \quad F_{DE} = 60 + 120 = 180 \, (T) \, kN.$$

$$\sum M_E : \quad F_{BD} = \frac{60(6) + 120(3)}{4}$$
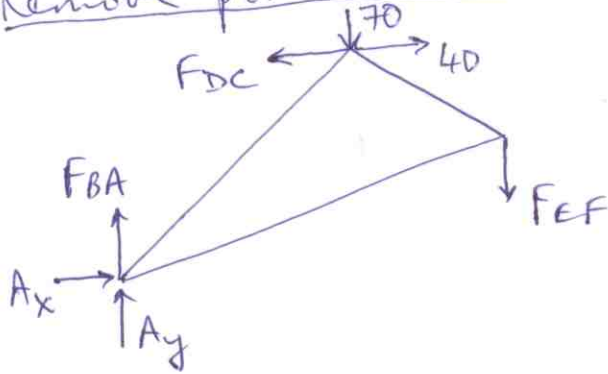
$$= 180 \, kN \, (T).$$

P.3.

$$A_x = -40 \text{ kN}$$

$$\Sigma M_F: \quad A_y(12) + 40(7) - 70(4) = 0$$

$$\Rightarrow A_y = 0 \; !!$$

$$F_y = 70 \text{ kN}.$$

Remove portion ADE

$$\Sigma F_x: \quad \Rightarrow F_{DC} = 0.$$

$$\Sigma M_A: \quad 70(8) + 40(7) + F_{EF}(12) = 0$$

$$\Rightarrow F_{EF} = -70$$

$$\Sigma F_y: \quad 70 + F_{EF} + A_y + F_{BA} = 0$$

$$\Rightarrow F_{BA} = 0.$$

Joint B.

$$\underline{F}_{BC} + \underline{F}_{BF} = 0 \quad \Rightarrow \quad F_{BC} = F_{BF} = 0 \quad \text{since unit vectors}$$

$$\underline{e}_{BC}, \underline{e}_{BF} \text{ are not same.}$$

Joint A

$$\Sigma F_x: \quad A_x^{-40} + F_{AD}\left(\frac{8}{\sqrt{113}}\right) + F_{AE}\left(\frac{12}{\sqrt{160}}\right) = 0$$

$$\Sigma F_y: \quad F_{AD}\left(\frac{7}{\sqrt{113}}\right) + F_{AE}\left(\frac{4}{\sqrt{160}}\right) = 0$$

$$\Rightarrow F_{AD} = 40 \Big/ \left(\frac{8}{\sqrt{113}} - \frac{12}{\sqrt{160}}\frac{7}{\sqrt{113}}\frac{\sqrt{160}}{4}\right) = -32.71 \text{ kN}$$

$$F_{AE} = 68.11 \text{ kN}$$

$$F_{AB} = F_{BC} = 0, \quad F_{AD} = 32.71 \text{ kN (C)}, \quad F_{AE} = 68.11 \text{ kN (T)}$$

$$F_{EF} = 70 \text{ kN (C)}, \quad F_{BF} = 0$$