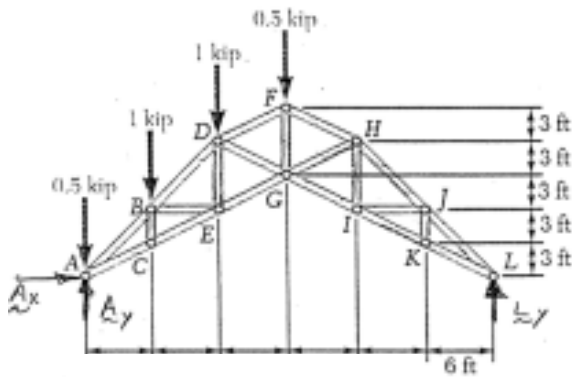
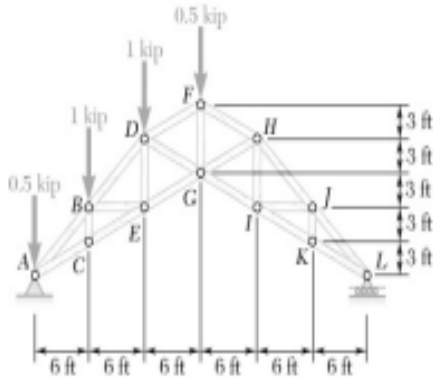


6.20



$$\sum M_A = 0 : (6\text{ft})[6L_y - 3(0.5 \text{ kip}) - 2(1 \text{ kip}) - 1(1 \text{ kip})] = 0$$

$$L_y = 0.75 \text{ kip}$$

Inspection of joints K, J, and I, in order, shows that

$$F_{JK} = 0$$

$$F_{IJ} = 0$$

$$F_{HI} = 0$$

And that

$$F_{KI} = F_{KL}; F_{JH} = F_{JL} \text{ and } F_{GI} = F_{IK}$$

$$\frac{0.75}{1} = \frac{F_{JL}}{\sqrt{8}} = \frac{F_{KL}}{\sqrt{5}} \quad F_{JL} = 2.1213 \text{ KIPS}$$

And, from above:

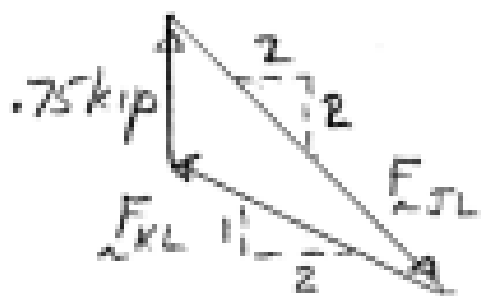
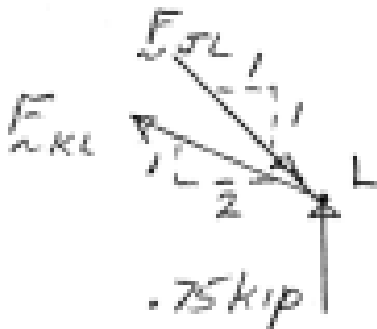
$$F_{KL} = 1.6771 \text{ kips } T \quad \blacksquare$$

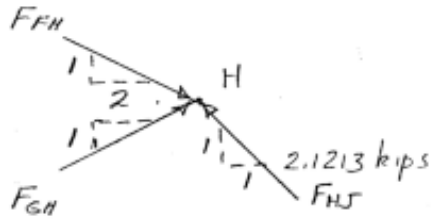
$$F_{HJ} = 2.12 \text{ kips } C \quad \blacksquare$$

$$F_{GI} = F_{IK} = 1.677 \text{ kip } T \quad \blacksquare$$

$$\rightarrow \sum F_x = 0 : \frac{2}{\sqrt{5}}(F_{FH} + F_{GH}) - \frac{1}{\sqrt{2}}(2.1213 \text{ kips}) = 0$$

$$\uparrow \sum F_y = 0 : \frac{1}{\sqrt{5}}(F_{GH} + F_{FH}) + \frac{1}{\sqrt{2}}(2.1213 \text{ kips}) = 0$$





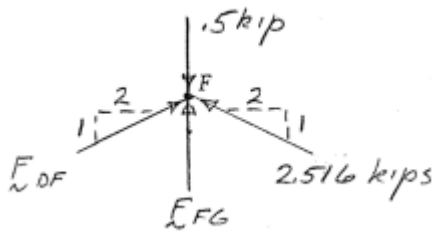
Solving:

$$F_{FH} = 2.516 \text{ kips}$$

$$F_{GH} = -0.8383 \text{ kips}$$

$$F_{FH} = 2.52 \text{ kips C} \quad \blacksquare$$

$$F_{GH} = 0.8383 \text{ kips T} \quad \blacksquare$$

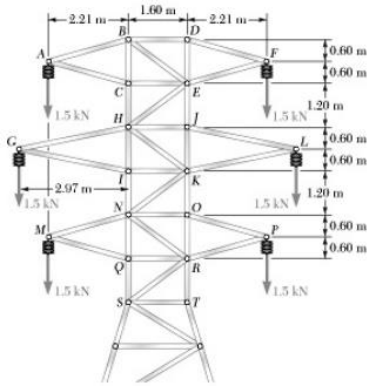


$$\rightarrow \sum F_x = 0: \frac{2}{\sqrt{5}}(F_{DF} - 2.516 \text{ kips}) = 0$$

$$F_{DF} = 2.52 \text{ kips C}$$

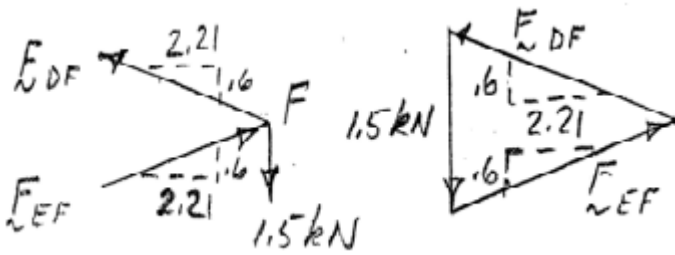
$$\uparrow \sum F_{FG} = 0: F_{FG} - 0.5 \text{ kip} + \frac{1}{\sqrt{5}}(2)(2.516 \text{ kips}) = 0$$

$$F_{FG} = 1.750 \text{ kips T}$$



6.21

Joint FBDs:



$$\frac{F_{DF}}{2.29} = \frac{F_{EF}}{2.29} = \frac{1.5 \text{ kN}}{1.2}$$

$$F_{DF} = F_{EF} = 2.8625 \text{ kN}$$

$$F_{DF} = 2.86 \text{ kN T}$$

$$F_{EF} = 2.86 \text{ kN C}$$

$$\frac{F_{DB}}{2.21} = \frac{F_{DE}}{0.6} = \frac{2.8625 \text{ kN}}{2.29} = 1.25 \text{ kN}$$

$$F_{BD} = 2.7625 \text{ kN}$$

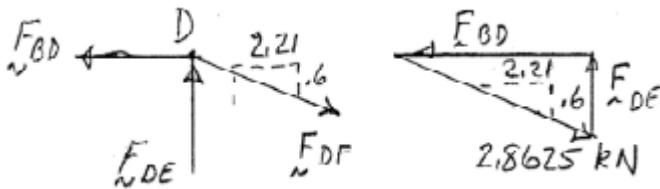
$$F_{BD} = 2.76 \text{ kN T}$$

$$F_{DE} = 0.750 \text{ C}$$

$$F_{AB} = 2.86 \text{ kN T}$$

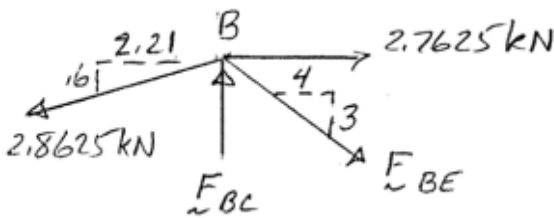
$$F_{AC} = 2.86 \text{ T}$$

By symmetry of joint A vs. joint F



$$\rightarrow \Sigma F_x = 0: 2.7625 \text{ kN} - \frac{2.21}{2.29} (2.8625 \text{ kN}) + \frac{4}{5} F_{BE} = 0$$

$$F_{BE} = 0$$

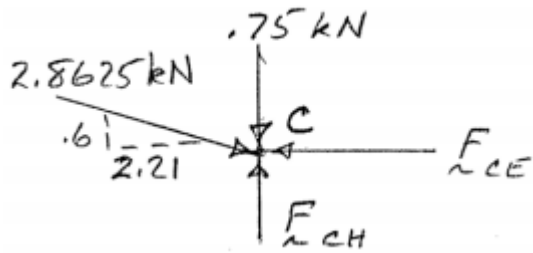


$$\uparrow \Sigma F_y = 0: F_{BC} - \frac{0.6}{2.29} (2.8625 \text{ kN}) = 0$$

$$F_{BC} = 0.750 \text{ kN C}$$

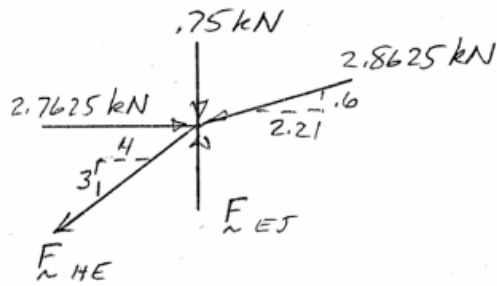
$$\rightarrow \Sigma F_x = 0: \frac{2.21}{2.29} (2.8625 \text{ kN}) - F_{CE} = 0$$

$$F_{CE} = 2.76 \text{ kN C}$$



$$\uparrow \Sigma F_y = 0: F_{CH} - 0.75 \text{ kN} - \frac{0.6}{2.21} (2.8625 \text{ kN}) = 0$$

$$F_{CH} = 1500 \text{ kN C}$$



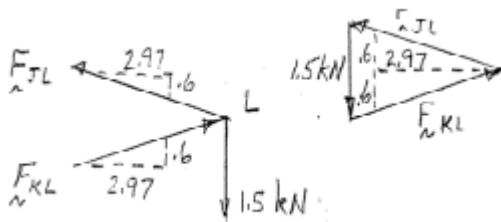
$$\rightarrow \Sigma F_x = 0: 2.7625 \text{ kN} - \frac{2.21}{2.29} (2.8625 \text{ kN}) - \frac{4}{5} F_{HE} = 0$$

$$F_{HE} = 0$$

$$\uparrow \Sigma F_y = 0: F_{EJ} - 0.75 \text{ kN} - \frac{0.6}{2.29} (2.8625 \text{ kN}) = 0$$

$$F_{EJ} = 1.500 \text{ kN}$$

6.22



$$\frac{1.5 \text{ kN}}{1.2} = \frac{F_{JL}}{3.03} = \frac{F_{KL}}{3.03}$$

$$F_{JL} = F_{KL} = 3.7875$$

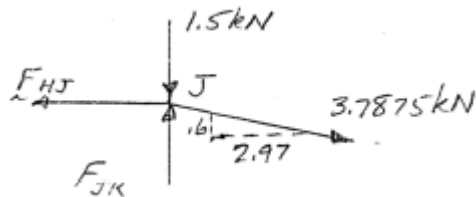
$$F_{JL} = 3.79 \text{ kN T}$$

By symmetry:

$$F_{KL} = 3.79 \text{ kN C}$$

$$F_{GH} = 3.79 \text{ kN T}$$

$$F_{GI} = 3.79 \text{ kN C}$$



$$\rightarrow \Sigma F_X = 0: \frac{2.97}{3.03} = (3.7875 \text{ kN}) - F_{HJ} = 0$$

$$F_{HJ} = 3.7125 \text{ kN}$$

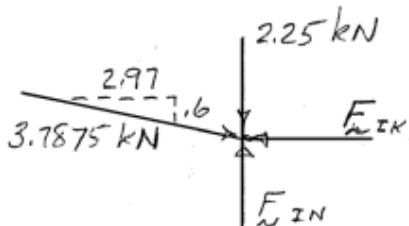
$$\uparrow \Sigma F_Y = 0: F_{JK} - \frac{0.6}{3.03} (3.7875 \text{ kN}) - 1.5 \text{ kN} = 0$$

$$F_{JK} = 2.25 \text{ kN C}$$

Knowing $F_{HE} = 0$; by symmetry

$$F_{HK} = 0$$

$$F_{HI} = 2.25 \text{ kN C}$$



$$\rightarrow \Sigma F_X = 0: \frac{2.97}{3.03} (3.7875 \text{ kN}) - F_{IK} = 0$$

$$F_{IK} = 3.7125$$

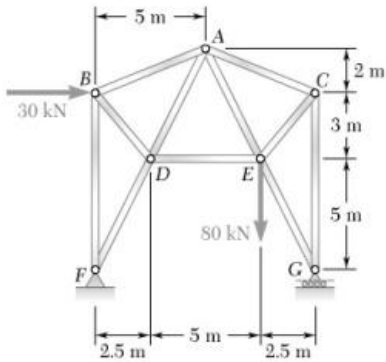
$$\uparrow \Sigma F_Y = 0: F_{IN} - 2.25KN - \frac{0.6}{3.03}(3.7875KN) = 0$$

$$F_{IN} = 3.00 KN \ C$$

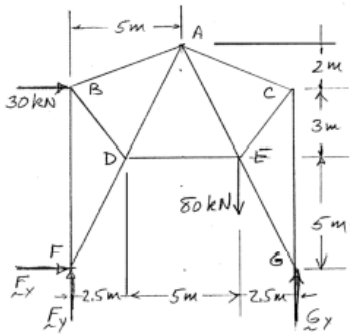
$$F_{KO} = 3.00 KN \ C$$

Knowing that $F_{HK} = 0$, by symmetry

$$F_{KN} = 0$$



6.23



$$\curvearrowright \Sigma M_F = 0: (10m)G_Y - (7.5m)(80kn) - (8m)(30kn) = 0$$

$$G_Y = 84KN \uparrow$$

$$\rightarrow \Sigma F_X = 0: -F_X + 30 KN = 0$$

$$F_X = 30 KN$$

$$\uparrow \Sigma F_Y = 0: F_Y + 84 KN - 80KN = 0$$

$$F_Y = 4 KN$$

By inspection of G:

$$F_{EG} = 0$$

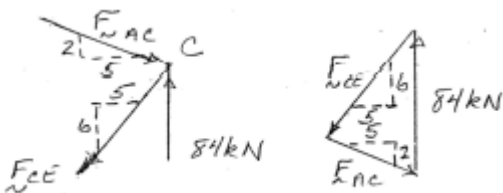
$$F_{CG} = 84 KN \ C$$

$$\frac{84 KN}{8} = \frac{F_{CE}}{\sqrt{61}} = \frac{F_{AC}}{\sqrt{29}} = 10.5 KN$$

$$F_{CE} = 82.0 KN \ T$$

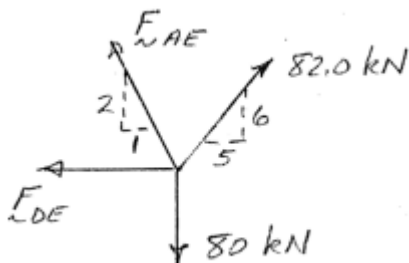
$$F_{AC} = 56.5 KN \ C$$

Joint FBDs:



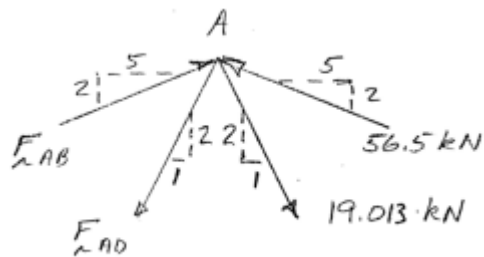
$$\uparrow \Sigma F_Y = 0: \frac{2}{\sqrt{5}} F_{AE} + \frac{6}{\sqrt{61}} (82.0 KN) - 80 KN = 0$$

$$F_{AE} = 19.013 KN \ T$$



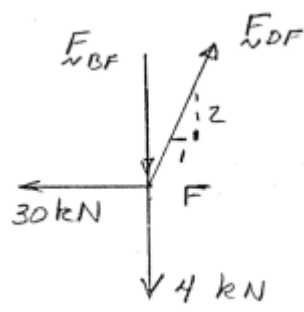
$$\rightarrow \Sigma F_X = 0: -F_{DE} - \frac{1}{\sqrt{5}} (19.013KN) + \frac{5}{\sqrt{61}} (82.0KN) = 0$$

$$F_{DE} = 44.0 KN \ T$$



$$\rightarrow \Sigma F_x = 0: \frac{1}{\sqrt{4}} F_{DF} - 30 \text{ kN} = 0$$

$$F_{DF} = 67.1 \text{ kN T}$$

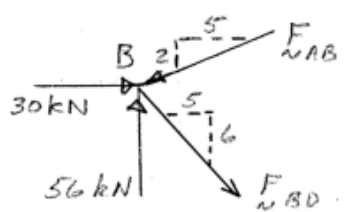


$$\uparrow \Sigma F_y = 0: \frac{2}{\sqrt{5}} (67.082 \text{ kN}) - F_{BF} - 4 \text{ kN} = 0$$

$$F_{BF} = 56.0 \text{ kN C}$$

$$\rightarrow \Sigma F_x = 0: 30 \text{ kN} + \frac{5}{\sqrt{61}} F_{BD} - \frac{5}{\sqrt{29}} F_{AB} = 0$$

$$\uparrow \Sigma F_y = 0: 56 \text{ kN} - \frac{6}{\sqrt{61}} F_{BD} - \frac{3}{\sqrt{29}} F_{AB} = 0$$



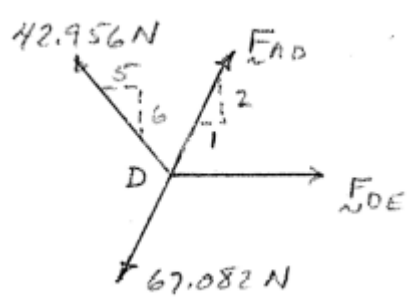
Solving:

$$F_{BD} = 42.956 \text{ kN}$$

$$F_{BD} = 43.0 \text{ kN T}$$

$$F_{AB} = 61.929 \text{ kN}$$

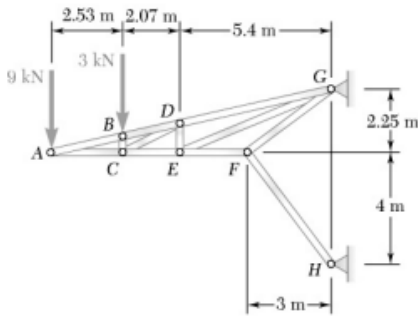
$$F_{AB} = 61.9 \text{ kN C}$$



$$\uparrow \Sigma F_y = 0: \frac{6}{\sqrt{61}} (42.956 \text{ N}) + \frac{2}{\sqrt{5}} (F_{AD} - 67.082 \text{ N}) = 0$$

$$F_{AD} = 30.157 \text{ kN}$$

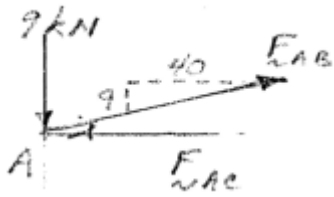
$$F_{AD} = 30.2 \text{ kN T}$$



6.24

$$\frac{9 \text{ KN}}{9} = \frac{F_{AC}}{40} = \frac{F_{AB}}{41}$$

By inspection of joint B:

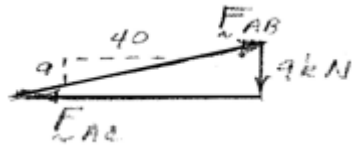


$$F_{AB} = 41.0 \text{ KN T}$$

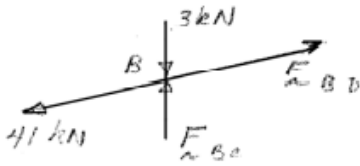
$$F_{AC} = 40.0 \text{ KN C}$$

$$F_{BD} = 41.0 \text{ KN T}$$

$$F_{BC} = 3.00 \text{ KN C}$$

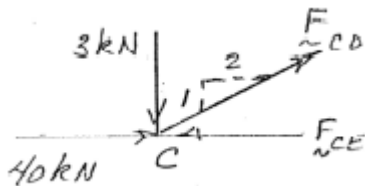


Note: to determine slope of CD: $DE = \frac{4.6}{10.0} (2.25\text{m}) = 1.035\text{m}$



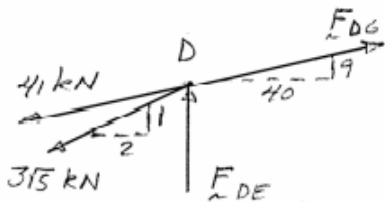
$$\uparrow \Sigma F_Y = 0: \frac{1}{\sqrt{5}} F_{CD} - 3 \text{ KN} = 0$$

$$F_{CD} = 3\sqrt{5} \text{ KN} = 6.71 \text{ KN T}$$



$$\rightarrow \Sigma F_X = 0: \frac{2}{\sqrt{5}} (3\sqrt{5} \text{ KN}) + 40 \text{ K} - F_{CE} = 0$$

$$F_{CE} = 46.0 \text{ KN C}$$

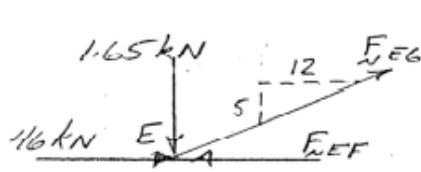


$$\rightarrow \Sigma F_X = 0: \frac{40}{41} (F_{DG} - 41 \text{ KN}) - \frac{2}{\sqrt{5}} (3\sqrt{5} \text{ KN}) = 0$$

$$F_{DG} = 47.15 \text{ KN}$$

$$\uparrow \Sigma F_Y = 0: F_{DE} + \frac{9}{41} (47.15 \text{ KN} - 41 \text{ KN}) - \frac{1}{\sqrt{5}} (3\sqrt{5} \text{ KN}) = 0$$

$$F_{DE} = 1.650 \text{ KN C}$$



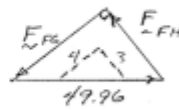
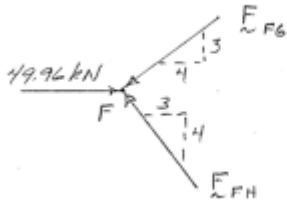
$$\uparrow \Sigma F_Y = 0: \frac{5}{13} F_{EG} - 1.65 \text{ KN} = 0$$

$$F_{EG} = 4.29 \text{ KN T}$$

$$\rightarrow \Sigma F_X = 0: 46 \text{ KN} + \frac{12}{13} (4.29 \text{ KN}) - F_{EF} = 0$$

$$F_{EF} = 49.96 \text{ KN}$$

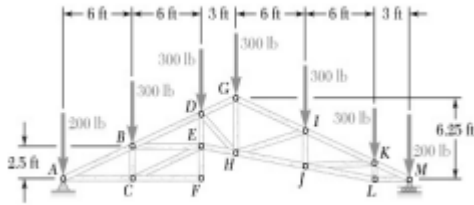
$$F_{EF} = 50.0 \text{ KN C}$$



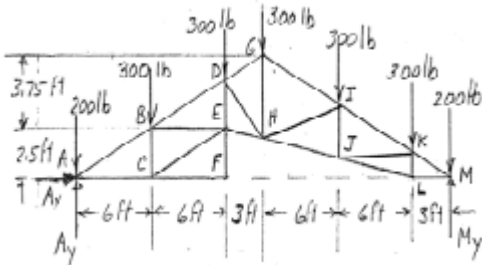
$$\frac{49.96 \text{ KN}}{5} = \frac{F_{FG}}{4} = \frac{F_{FH}}{3}$$

$$F_{FG} = 40.0 \text{ KN C}$$

$$F_{FH} = 30.0 \text{ KN C}$$



6.25



$$\curvearrowright \Sigma F_M = 0: (3ft)(300lb) + (9ft)(300lb) + (15ft)(300lb) - (18ft)(300lb) + (24ft)(300lb) + (30ft)(300lb) - (30ft)(A_Y) = 0$$

$$A_Y = 890 \text{ lb } \uparrow$$

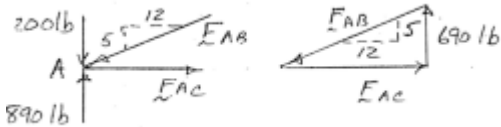
$$\rightarrow \Sigma F_X = 0: A_X = 0$$

$$\frac{690 \text{ lb}}{5} = \frac{F_{AC}}{12} = \frac{F_{AB}}{13}$$

$$F_{AB} = 1794 \text{ lb } C$$

$$F_{AC} = 1656 \text{ lb } T$$

Joint FBDs:



By inspection of joint F:

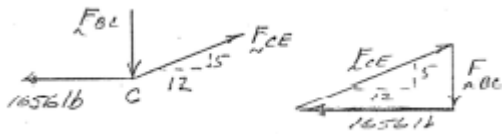
$$F_{CF} = 0$$

$$F_{EF} = 0$$

$$\frac{1665 \text{ lb}}{12} = \frac{F_{CE}}{13} = \frac{F_{CB}}{5}$$

$$F_{CE} = 1794 \text{ lb } T$$

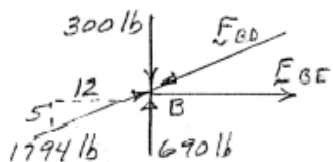
$$F_{BC} = 890 \text{ lb } C$$



$$\uparrow \Sigma F_Y = 0: \frac{5}{13}(1794 \text{ lb} - F_{BD}) + 690 \text{ lb} - 300 \text{ lb} = 0$$

$$F_{BD} = 2808 \text{ lb}$$

$$F_{BD} = 2.81 \text{ lb}$$

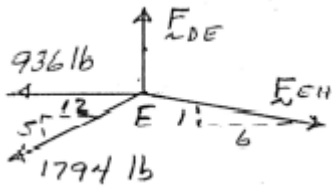


$$\rightarrow \Sigma F_X = 0: F_{BE} + \frac{12}{13}(1794 \text{ lb} - 2808 \text{ lb}) = 0$$

$$F_{BE} = 936 \text{ lb } T$$

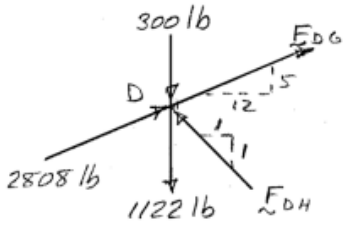
$$\rightarrow \Sigma F_X = 0: \frac{6}{\sqrt{37}}F_{EH} - 936 \text{ lb} - \frac{12}{13}1794 \text{ lb} = 0$$

$$F_{EH} = 432\sqrt{37} \text{ lb} = 2.36 \text{ kip } T$$



$$\uparrow \Sigma F_Y = 0: F_{DE} - \frac{5}{13}(1794 \text{ lb}) - \frac{1}{\sqrt{37}}(432\sqrt{37} \text{ lb}) = 0$$

$$F_{DE} = 1122 \text{ lb T}$$

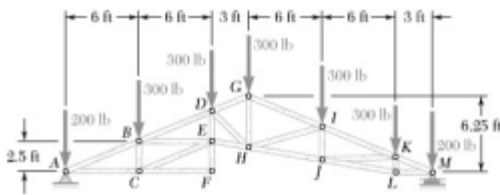


$$\rightarrow \Sigma F_X = 0: \frac{5}{13}(2808 \text{ lb} + F_{DH}) + \frac{1}{\sqrt{2}}F_{DH} - 300 \text{ lb} - 1122 \text{ lb} = 0$$

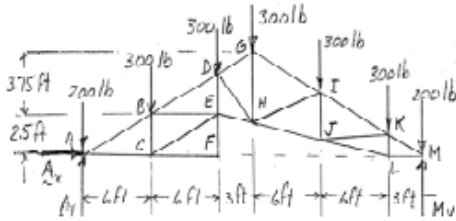
Solving:

$$F_{DG} = 1721 \text{ lb T}$$

$$F_{DH} = 1419 \text{ lb C}$$



6.26

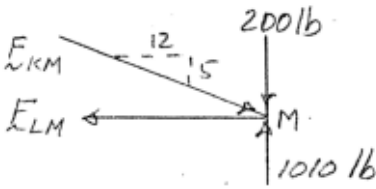


$$\begin{aligned} \curvearrowright \Sigma M_A = 0: & (30ft)M_Y - (30ft)(200lb) - (27ft)(300lb) \\ & - (21ft)(300lb) - (15ft)(300lb) \\ & - (12ft)(300lb) - (6ft)(300lb) = 0 \end{aligned}$$

$$M_A = 1010 lb \uparrow$$

$$\frac{810 lb}{5} = \frac{F_{LM}}{12} = \frac{F_{KM}}{13}$$

Joint FBDs:

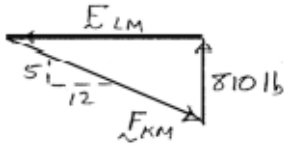


$$F_{KM} = 2106 lb$$

$$F_{KM} = 211 kip C$$

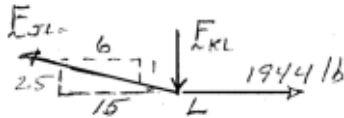
$$F_{LM} = 1944 lb$$

$$F_{LM} = 1.944 kip T$$



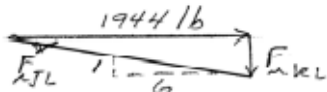
$$\frac{F_{JL}}{\sqrt{37}} = \frac{F_{KL}}{1} = \frac{1944 lb}{6}$$

$$F_{KL} = 324 lb C$$



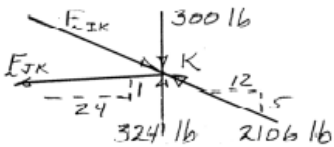
$$F_{JL} = 1970.8 lb$$

$$F_{JL} = 1.971 kip T$$



$$\rightarrow \Sigma F_x = 0: \frac{12}{13}(F_{IK} - 2106 lb) + \frac{24}{\sqrt{577}}F_{JK} = 0$$

$$\uparrow \Sigma F_y = 0: \frac{5}{13}(-F_{IK} + 2106 lb) - \frac{1}{\sqrt{577}}F_{JK} + 24 lb = 0$$



Solving:

$$F_{IK} = 2162.7 lb$$

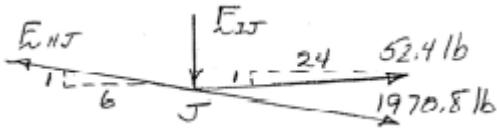
$$F_{IK} = 2.16 kip C$$

$$F_{JK} = 52.4 lb T$$

$$\rightarrow \Sigma F_x = 0: \frac{6}{\sqrt{37}}(1970.8 lb - F_{HJ}) + \frac{24}{\sqrt{577}}(52.4 lb) = 0$$

$$F_{HJ} = 2024 lb$$

$$F_{HJ} = 2.02 \text{ kip } T$$



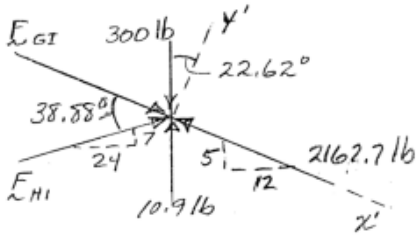
$$\uparrow \Sigma F_Y = 0: \frac{1}{\sqrt{37}}(2024 \text{ lb} - 1970.8 \text{ lb}) + \frac{1}{\sqrt{577}}(52.4 \text{ lb}) - F_{IJ} = 0$$

$$F_{IJ} = 10.90 \text{ lb } C$$

$$\nearrow \Sigma F_{Y'} = 0: F_{HI} \sin 38.88 + (10.9 \text{ lb} - 300 \text{ lb}) \cos 22.62 = 0$$

$$F_{HJ} = 425.1 \text{ lb}$$

$$F_{HI} = 425 \text{ lb } C$$



$$\searrow \Sigma F_{X'} = 0: F_{GI} + F_{HI} \cos 38.88 + (300 \text{ lb} - 10.9 \text{ lb}) \sin 22.62 - 2163 \text{ lb} = 0$$

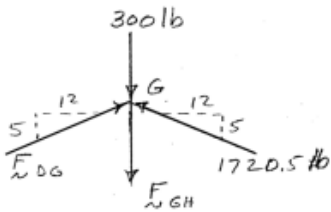
$$F_{GI} = 1720.5 \text{ lb} = 1.721 \text{ kip } C$$

By symmetry:

$$\uparrow \Sigma F_Y = 0: \frac{5}{13} 2(1720.5 \text{ lb}) - 300 \text{ lb} - F_{GH} = 0$$

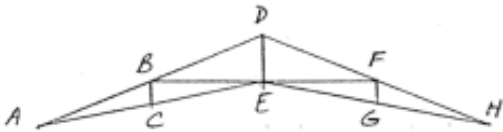
$$F_{GH} = 1023.46 \text{ lb}$$

$$F_{GH} = 1.023 \text{ kip } T$$

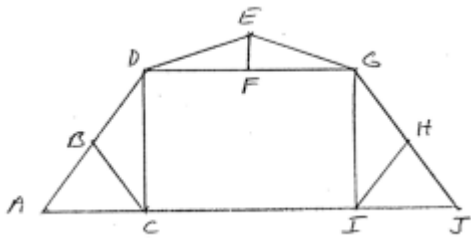


6.27

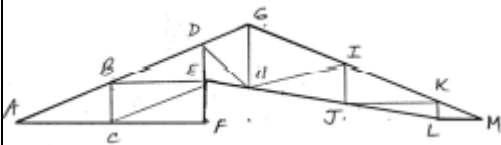
Truss of 6.13:



Truss of 6.14:

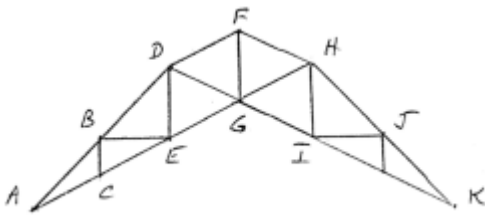


Truss of 6.25:

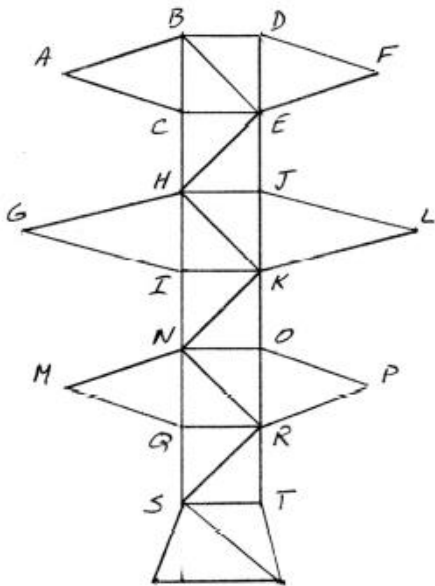


6.28

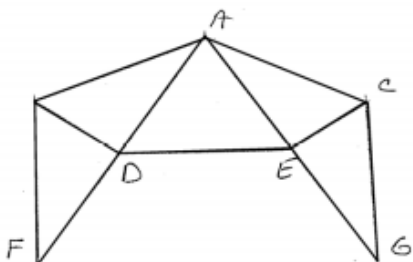
Truss of 6.19:



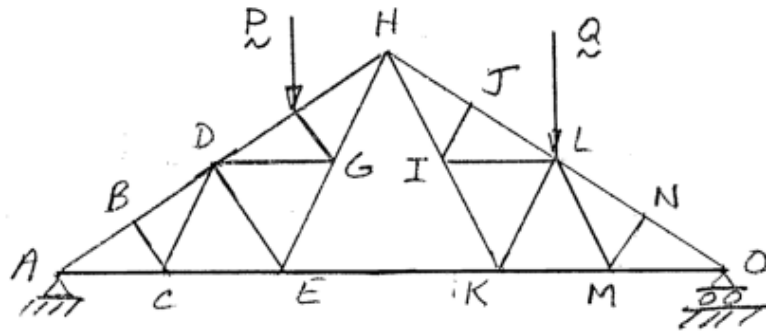
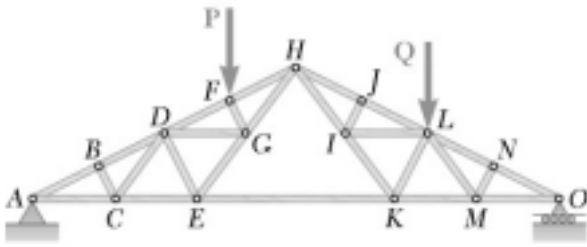
Truss of 6.21:



Truss of 6.23:



6.29



By inspection of joint : B

$$F_{BC} = 0$$

Then by inspection of joint : C

$$F_{CD} = 0$$

By inspection of joint : J

$$F_{IJ} = 0$$

Then by inspection of joint : I

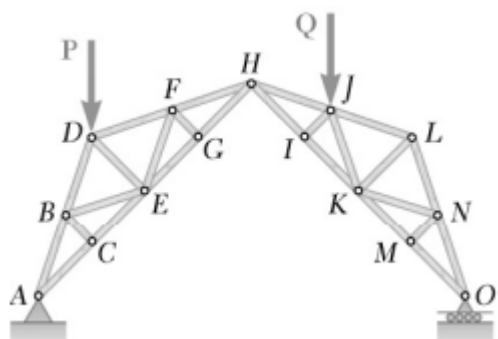
$$F_{IL} = 0$$

By inspection of joint : N

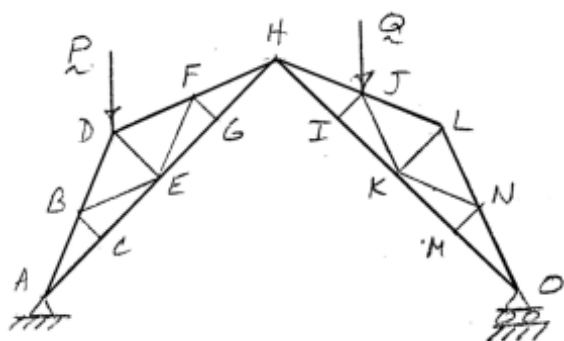
$$F_{MN} = 0$$

Then by inspection of joint : M

$$F_{LM} = 0$$



6.30



By inspection of joint : C

$$F_{BC} = 0$$

Then by inspection of joint : B

$$F_{BE} = 0$$

By inspection of joint : G

$$F_{FG} = 0$$

Then by inspection of joint : F

$$F_{EF} = 0$$

Then by inspection of joint : E

By inspection of joint : M

Then by inspection of joint : N

By inspection of joint : I