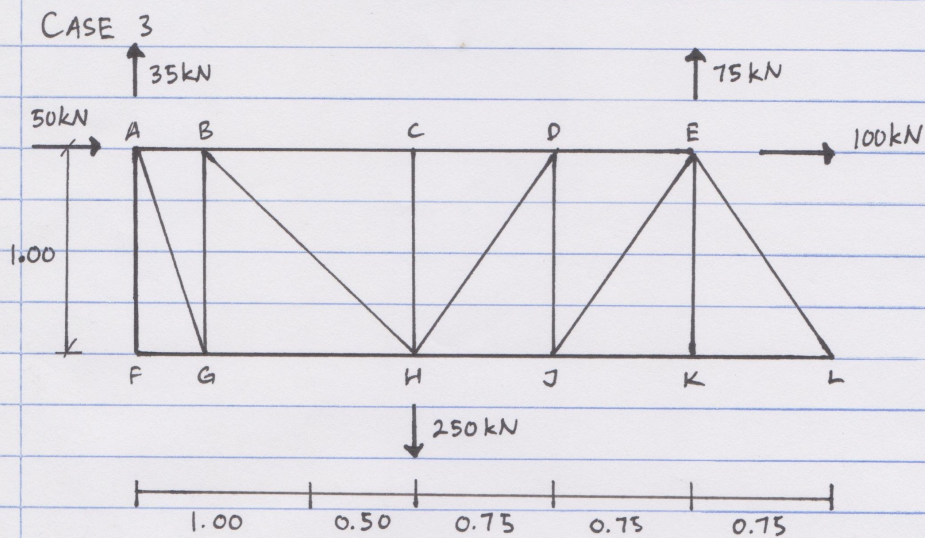




1 DETERMINE PERFECT TRUSS

$$m = 2j - 3$$

$$m + 3 = 2j$$

$$19 + 3 = 2(11)$$

$$22 = 22$$

∴ EQUAL SIDES THUS IT IS A PERFECT TRUSS

2 DETERMINE EXTERNAL FORCES

$$\sum F_x = \sum F_y = \sum M = 0$$

$$a) \sum F_x = 0$$

$$+ 50 \text{ kN} + 100 \text{ kN} - R_x(L) = 0$$

$$150 \text{ kN} - R_x(L) = 0$$

$$R_x(L) = 150 \text{ kN}$$

$$b) \sum F_y = 0$$

$$+ 35 \text{ kN} + 75 \text{ kN} + R_y(L) - 250 \text{ kN} + R_y(F) = 0$$

$$R_y(L) + R_y(F) - 140 \text{ kN} = 0$$

$$R_y(L) + R_y(F) = 140 \text{ kN} \quad \text{--- (1)}$$

$$c) \text{ Moment, } \sum M = 0 = \text{FORCE (F)} \times \text{DISTANCE (D)}$$

refer to next page →

$$35(3.75) + 75(0.75) + (-250)(2.25) + 50(1) + 100(1) + R_y(F)(3.75) = 0$$

$$131.25 + 56.25 - 562.5 + 50 + 100 + R_y(F) 3.75 = 0$$

$$R_y(F) = \frac{225}{3.75}$$

$$R_y(F) = 60 \text{ kN} \quad \text{--- (2)}$$

Sub (2) into (1)

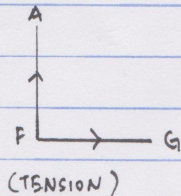
$$R_y(L) + R_y(F) = 140 \text{ kN}$$

$$R_y(L) + 60 = 140$$

$$R_y(L) = 80 \text{ kN}$$

3 DETERMINE INTERNAL FORCES

JOINT F



$$\Sigma F_y = 0$$

$$+60 + F_{FA} = 0$$

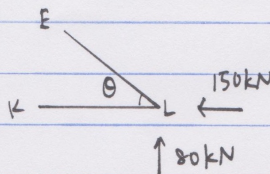
$$F_{FA} = -60$$

(COMPRESSION)

$$\Sigma F_x = 0$$

$$F_{FG} = 0$$

JOINT L



$$\tan \theta = \frac{1}{0.75}$$

$$\theta = 53.13^\circ$$

$$\Sigma F_y = 0$$

$$+80 + F_{LE} \sin 53.13 = 0$$

$$F_{LE} = -100$$

(COMPRESSION)

$$\Sigma F_x = 0$$

$$-150 + (-F_{LE} \cos 53.13) -$$

$$F_{LK} = 0$$

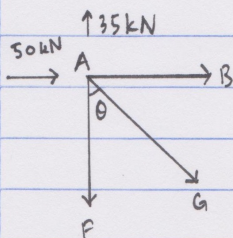
$$-150 - (-100 \cos 53.13)$$

$$-F_{LK} = 0$$

$$F_{LK} = -90$$

(COMPRESSION)

JOINT A



$$\tan \theta = \frac{0.5}{1}$$

$$\theta = 26.57^\circ$$

$$\Sigma F_x = 0$$

$$50 + F_{AB} + 106.22 \cos 63.43^\circ = 0$$

$$F_{AB} = -97.51$$

(COMPRESSION)

$$\Sigma F_y = 0$$

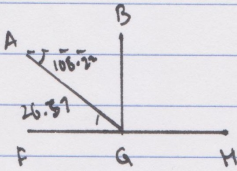
$$35 + 60 + \cos 26.57 (-F_{AG}) = 0$$

$$95 - F_{AG} \cos 26.57 = 0$$

$$F_{AG} = 106.22 \text{ kN}$$

(TENSION)

JOINT G



$$\sum F_y = 0$$

$$F_{GB} + F_{GA} \cos 26.57^\circ = 0$$

$$F_{GB} + 106.22 \cos 26.57^\circ = 0$$

$$F_{GB} = -95 \text{ kN (COMPRESSION)}$$

$$\begin{aligned} \alpha &= 90^\circ - 26.57^\circ \\ &= 63.43^\circ \end{aligned}$$

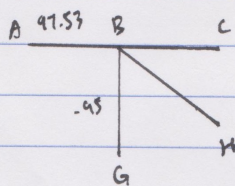
$$\sum F_x = 0$$

$$F_{GB} + F_{GH} - F_{GA} \cos 63.43^\circ = 0$$

$$0 + F_{GH} - 106.22 \cos 63.43^\circ = 0$$

$$F_{GH} = 47.51 \text{ kN (TENSION)}$$

JOINT B



$$\sum F_y = 0$$

$$-(-95) - \left(\frac{1}{1.4142} \right) F_{BH} = 0$$

$$F_{BH} (-0.70711) = -95$$

$$F_{BH} = 134.35 \text{ kN (TENSION)}$$

$$\sin 45^\circ = \frac{1}{BH}$$

$$BH = 1.4142$$

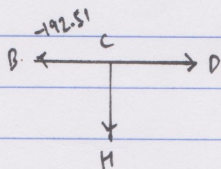
$$\sum F_x = 0$$

$$-(-97.51) + F_{BC} + \left(\frac{1}{1.4142} \right) F_{BH} = 0$$

$$97.51 + F_{BC} + \left(\frac{1}{1.4142} \right) (134.35) = 0$$

$$F_{BC} = -192.51 \text{ kN (COMPRESSION)}$$

JOINT C



$$\sum F_y = 0$$

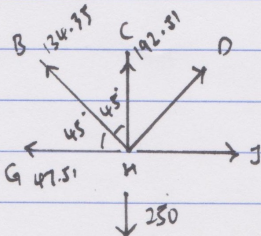
$$\sum F_{CH} = 0$$

$$\sum F_x = 0$$

$$-(-192.51) + F_{CD} = 0$$

$$F_{CD} = -192.51 \text{ kN (COMPRESSION)}$$

JOINT H

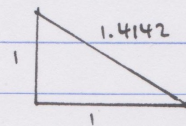
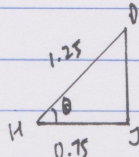


$$\tan \theta = \frac{1}{0.75}$$

$$\theta = 53.13^\circ$$

$$\cos 53.13^\circ = \frac{0.75}{HD}$$

$$HD = 1.25$$



$$\sum F_y = 0$$

$$-250 + F_{CH} + F_{HB} + F_{HD} = 0$$

$$-250 + 0 + \left(\frac{1}{1.4142} \right) 134.35 + \left(\frac{1}{1.25} \right) F_{HD} = 0$$

$$\frac{F_{HD}}{1.25} = 155$$

$$F_{HD} = 193.75 \text{ kN (TENSION)}$$

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$$\sum F_x = 0$$

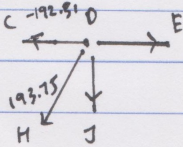
$$-47.51 + F_{HJ} - \left(\frac{1}{1.4142}\right) 134.35 + \left(\frac{0.75}{1.25}\right) 193.75 = 0$$

$$-47.51 - 95 + 116.25 + F_{HJ} = 0$$

$$F_{HJ} - 26.26 = 0$$

$$F_{HJ} = 26.26 \text{ kN (TENSION)}$$

JOINT D



$$\sum F_y = 0$$

$$-F_{DJ} - \left(\frac{1}{1.25}\right) 193.75 = 0$$

$$F_{DJ} = -155 \text{ kN (COMPRESSION)}$$

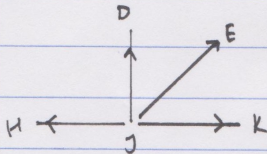
$$\sum F_x = 0$$

$$-(-192.51) + F_{DE} - \left(\frac{0.75}{1.25}\right) 193.75 = 0$$

$$192.51 - 116.25 + F_{DE} = 0$$

$$F_{DE} = -76.26 \text{ (COMPRESSION)}$$

JOINT J



$$\sum F_y = 0$$

$$-155 + \left(\frac{1}{1.25}\right) F_{JE} = 0$$

$$F_{JE} = 193.75 \text{ kN (TENSION)}$$

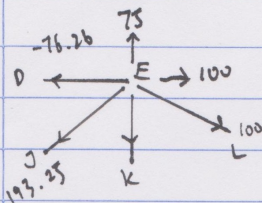
$$\sum F_x = 0$$

$$-26.26 + F_{JK} + \left(\frac{0.75}{1.25}\right) (193.75) = 0$$

$$(193.75) = 0$$

$$F_{JK} = -90 \text{ (COMPRESSION)}$$

JOINT E

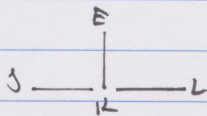


$$\sum F_y = 0$$

$$75 + 0 + -\left(\frac{1}{1.25}\right) (193.75) - \left(\frac{1}{1.25}\right) (-100) = 0$$

$$75 - 155 + 80 = 0 \text{ (PROVEN)}$$

JOINT K



$$\sum F_y = 0$$

$$F_{BK} = 0$$

$$\sum F_x = 0$$

$$100 - (-76.25) - \left(\frac{0.75}{1.25}\right) (193.75) + \left(\frac{0.75}{1.25}\right) (-100) = 0$$

$$100 + 76.25 - 116.25 - 60 = 0 \text{ (PROVEN)}$$

