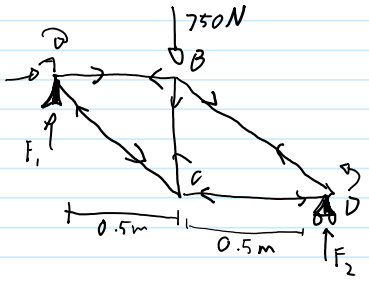
Statics | problem sheet 2

19 October 2021 08:14

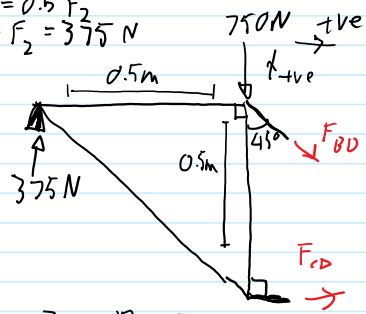
1)



$F_1 + F_2 = 750$

$0.5F_1 = 0.5F_2$

$F_1 = F_2 = 375\ N$



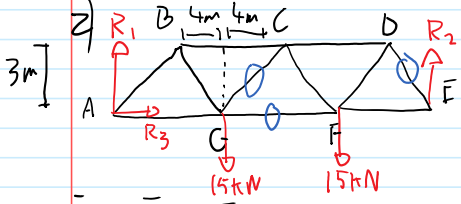
(B): $375 \times 0.5 = 0.5 \times F_{CD}$

$F_{CD} = 375\ N$ ✓

$F_{BD}\cos 45 + F_{CD} = 0$

$\frac{-375}{\cos 45} = F_{BD} = -530\ N$ ✓

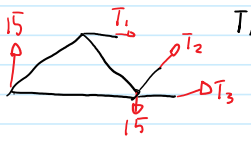
2)



$R_1 + R_2 = 30$ $R_3 = 0$

$R_2 \times 24 = 15 \times 8 + 15 \times 16$

$R_2 = 15$ $R_1 = 15$



$T_1 + T_3 = 0$ ✓

$T_2 = 0$ ✓

G: $8 \times 15 + T_1 \times 3 = 0$

$T_1 = -40$

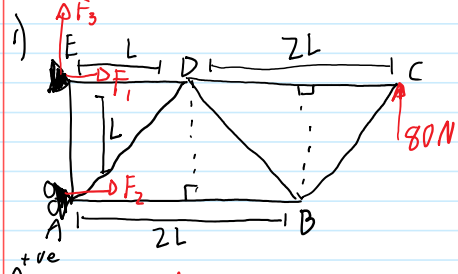
$T_3 = 40$ ✓

$15 + \frac{3}{5}T_5 = 0$ $T_4 + \frac{4}{5}T_5 = 0$

$T_5 = -25$ ✓

Additional

1)



L=3m Find force in bar AB

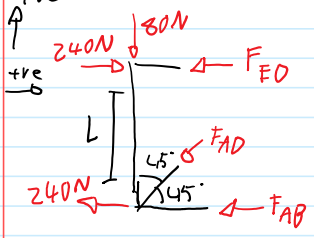
$F_1 + F_2 = 0$ $F_3 + 80 = 0$

$F_3 = -80$

E: $3L80 + LF_2 = 0$

$F_2 = -240$

$F_1 = 240$



$240 = F_{ED} + F_{AB} + 240 + F_{AD}\sin 45$

$F_{ED} + F_{AB} + F_{AD}\sin 45 = 0$

A: $L240 + LF_{ED} = 0$

$F_{ED} = -240$

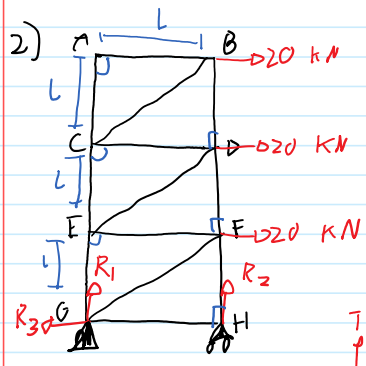
$240 = F_{AB} + F_{AD}\sin 45$

$80 + F_{AD}\sin 45 = 0$

$F_{AD} = \frac{-80}{\sin 45} = -113.1\ N$

$240 - F_{AD}\sin 45 = F_{AB} = 320\ N$ ✗ ?

2)



Find forces in BD, DF, FH

$R_3 = 20 \times 3$

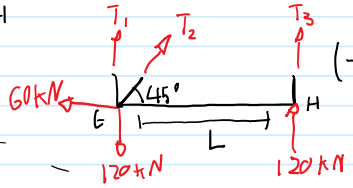
$R_3 = 60\ kN$

$R_1 + R_2 = 0$

G: $3L20 + 2L20 + L20 + LR_1 = 0$

$-120 = R_1$

$R_2 = 120$



$(\rightarrow)$: $60 = \sin 45 \times T_2$

$T_2 = 84.85\ kN$

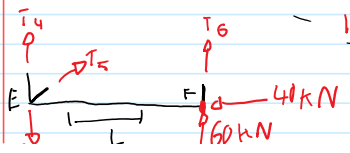
GF: $LT_3 = -120L$

$T_3 = -120$ ✓

(↑): $T_1 + T_2\sin 45 + T_3 + 120 = 120$

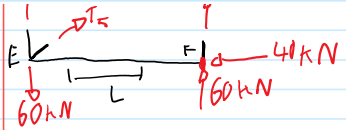
$T_1 = -T_3 - T_2\sin 45$

$T_1 = 60$



$(\rightarrow)$: $T_5\sin 45 = 40$

(↑): $T_4 + T_5\sin 45 + T_6 + 60 - 60 = 0$



$\rightarrow$: $T_5 \sin 45 = 40$

$\circlearrowleft E$: $L60 + LT_6 = 0$

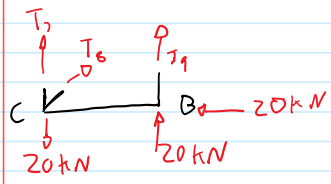
$T_6 = -60$ ✓

$\uparrow$: $T_4 + T_5 \sin 45 + T_6 + 60 - 60 = 0$

$T_1 = 60$

$T_4 = -T_5 \sin 45 - T_6$

$= 20$



$\rightarrow$: $T_8 \sin 45 = 20$

$\circlearrowleft C$: $T_9 = -20$ ✓