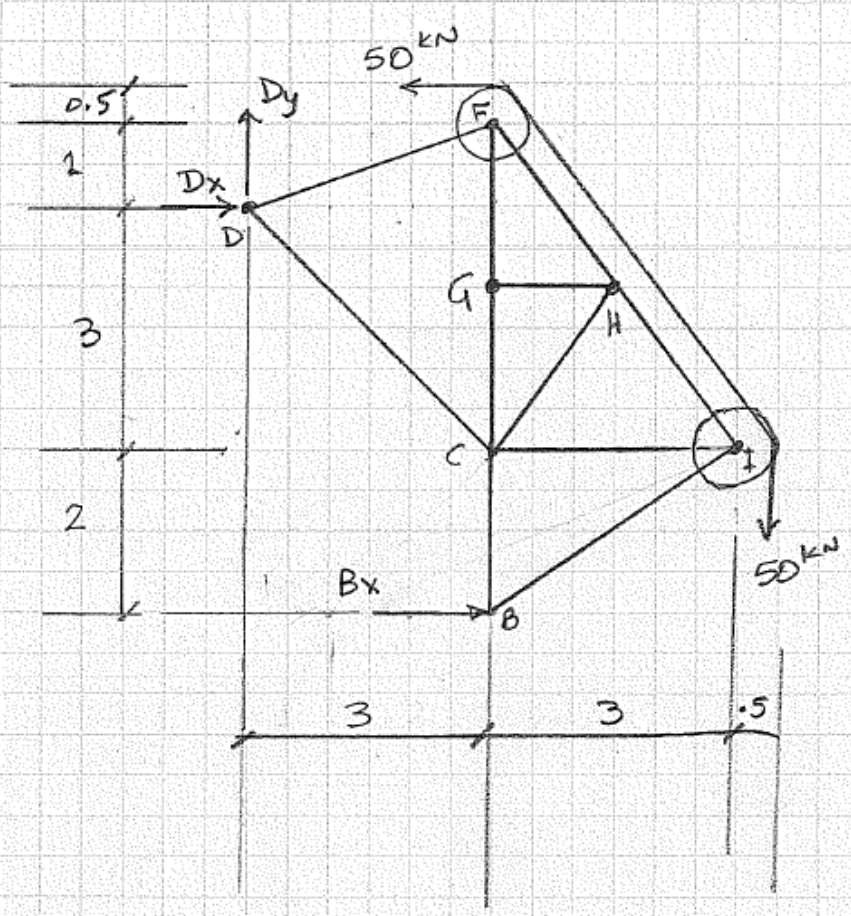
Engineering Statics Assignment #5 SOLUTION Name: ----------
DUE MARCH 8 Group:----------

1)



$(\Sigma F_x = 0)$ $D_x + B_x - 50 = 0$ $D_x + B_x = 50$

$(\Sigma F_y = 0)$ $D_y - 50 = 0$ $D_y = 50$ kN

$+\circlearrowleft(\Sigma M_B = 0)$ $-(3)(D_y) - (5)(D_x) + 6.5(50) - 3.5(50) = 0$

$-150 - 5D_x + 150 = 0$

$D_x = 0$ kN

$\therefore$ $B_x = 50$ kN

Engineering Statics Assignment #5 SOLUTION Name: ----------
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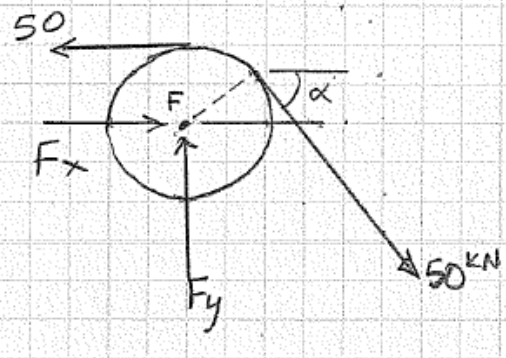
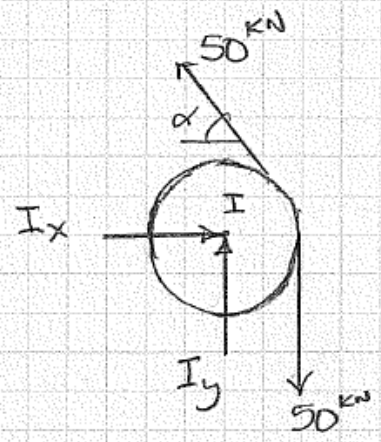


$\tan\alpha = \frac{4}{3}$ $\alpha = 53.13^\circ$

$(\Sigma F_x = 0)$ $F_x - 50 + 50\cos\alpha = 0$ $F_x = 20.0^{KN}$

$(\Sigma F_y = 0)$ $F_y - 50\sin\alpha = 0$ $F_y = 40.0^{KN}$



$(\Sigma F_x = 0)$ $I_x - 50\cos\alpha = 0$

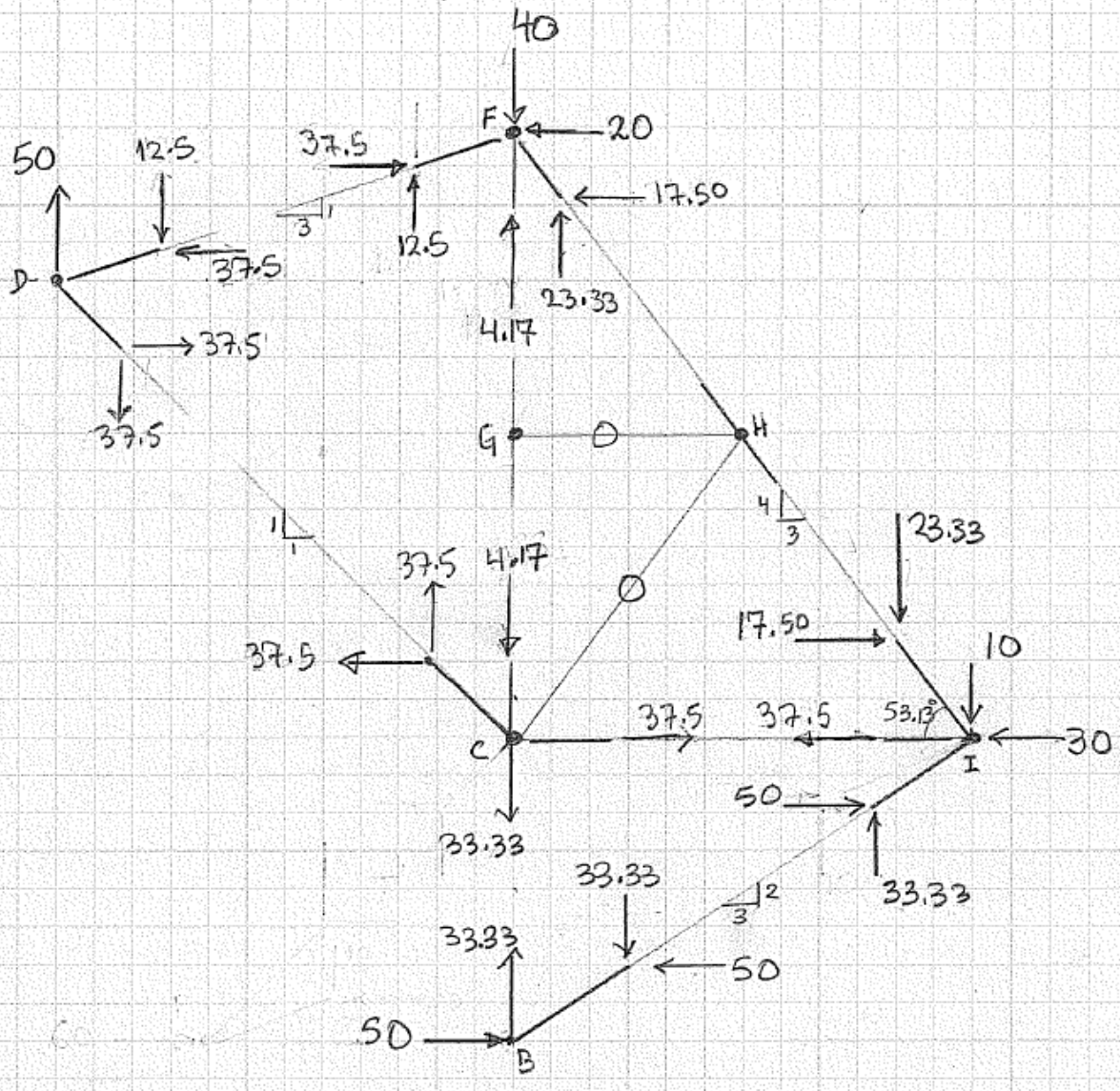
$I_x = 30^{KN}$

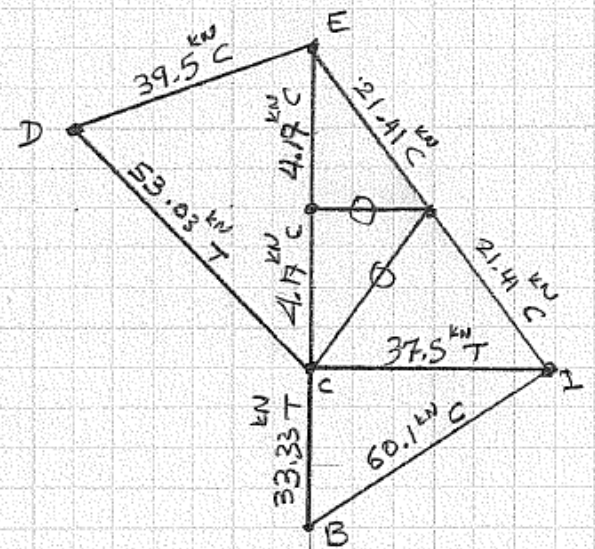
$(\Sigma F_y = 0)$ $I_y + 50\sin\alpha - 50 = 0$

$I_y = 10^{KN}$

Engineering Statics Assignment #5 SOLUTION Name: ----------
DUE MARCH 8 Group:----------

(All forces kN)





Engineering Statics Assignment #5 SOLUTION Name: ----------
DUE MARCH 8 Group:----------

2)

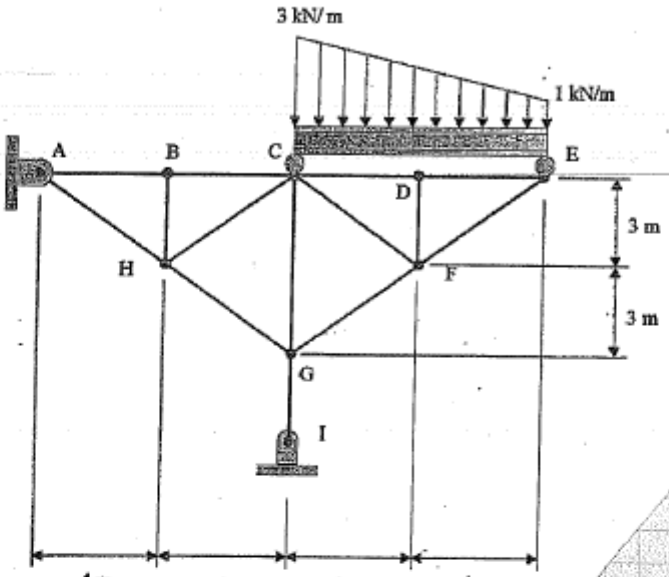
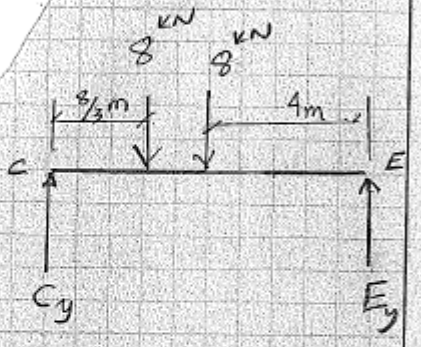


Figure 2

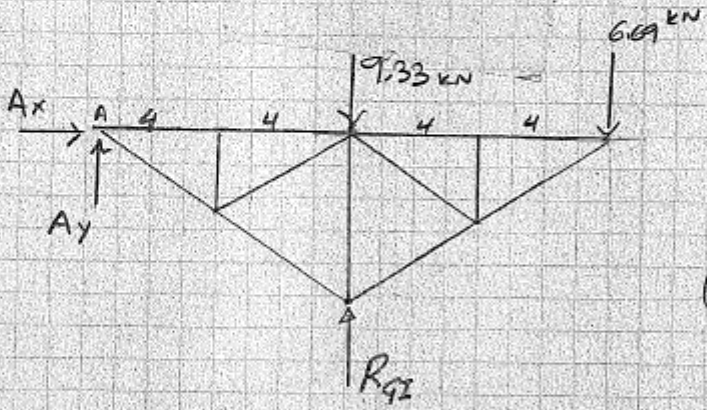


$(\Sigma M_C=0)\quad -4(8)-\frac{8}{3}(8)+8E_y=0$

$E_y = 6.69\ kN$

$(\Sigma M_I=0)\quad C_y-8-8+E_y=0$

$C_y = 9.33\ kN$



$(\Sigma M_A=0)\quad 8R_{GI}-8(9.33)-16(6.69)=0$

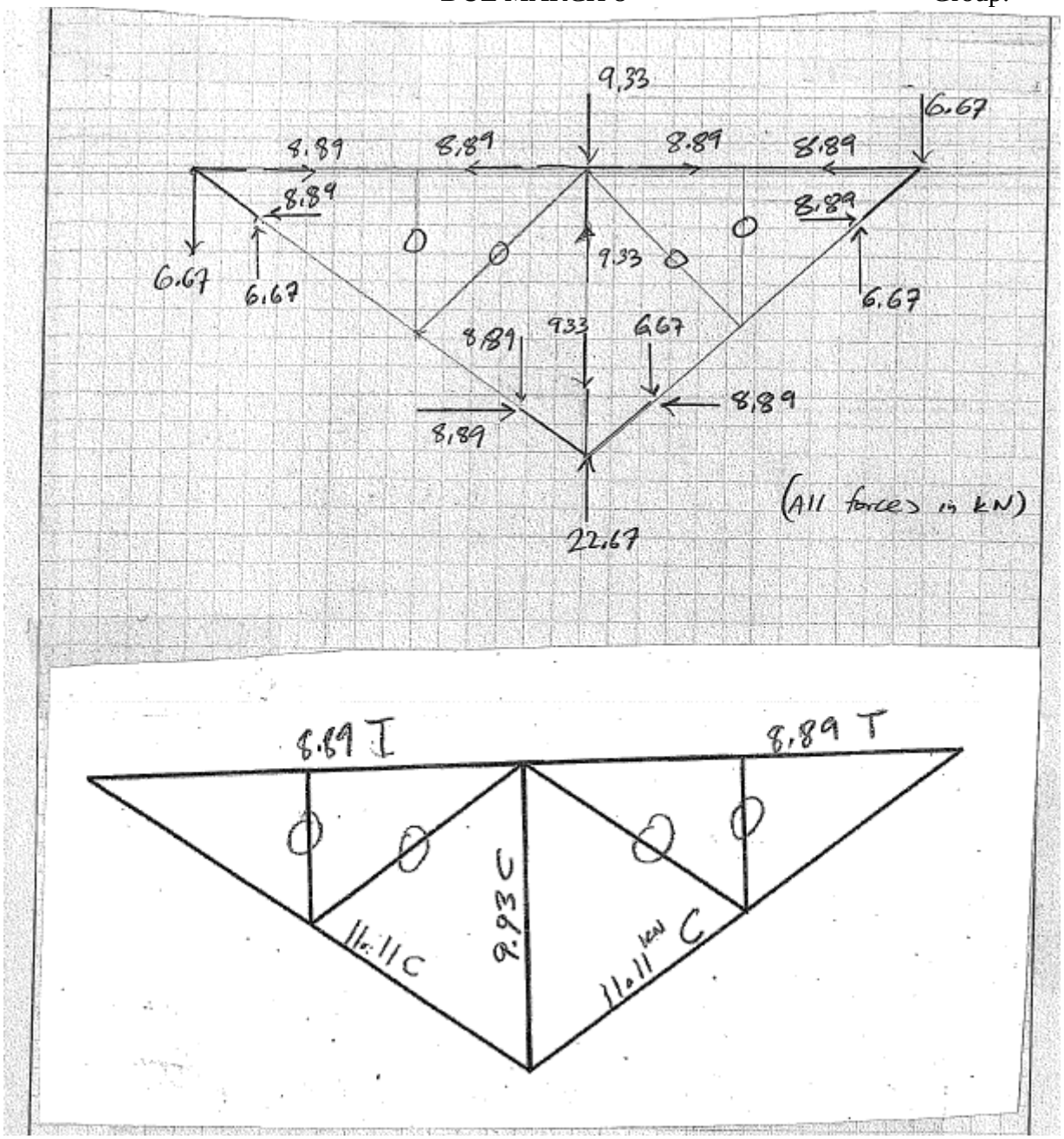
$R_{GI} = 22.67\ kN$

$(\Sigma F_x=0)\quad A_x=0$

$(\Sigma F_y=0)\quad A_y-9.33+R_{GI}-6.69=0$

$A_y=-6.67\ kN$

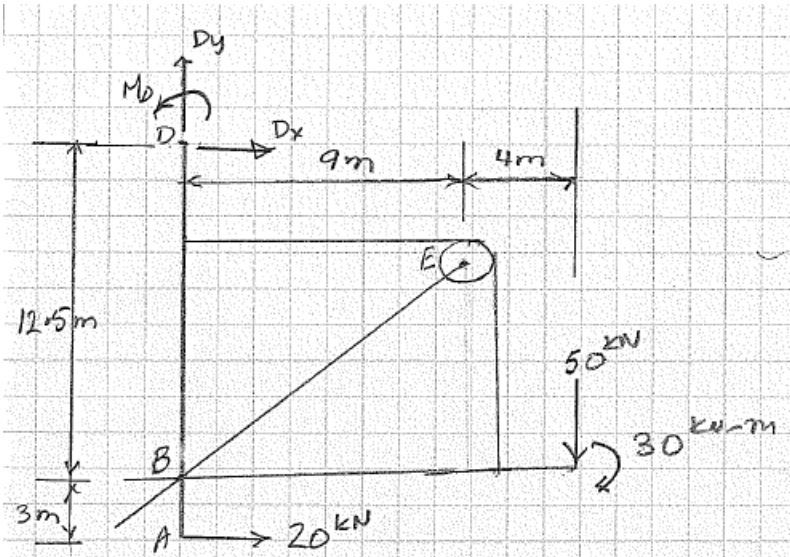
Engineering Statics Assignment #5 SOLUTION Name: ----------
DUE MARCH 8 Group:----------



Engineering Statics Assignment #5 SOLUTION Name: ----------
DUE MARCH 8 Group:----------

3)

Engineering Statics Assignment #5 SOLUTION Name: ----------
DUE MARCH 8 Group:----------

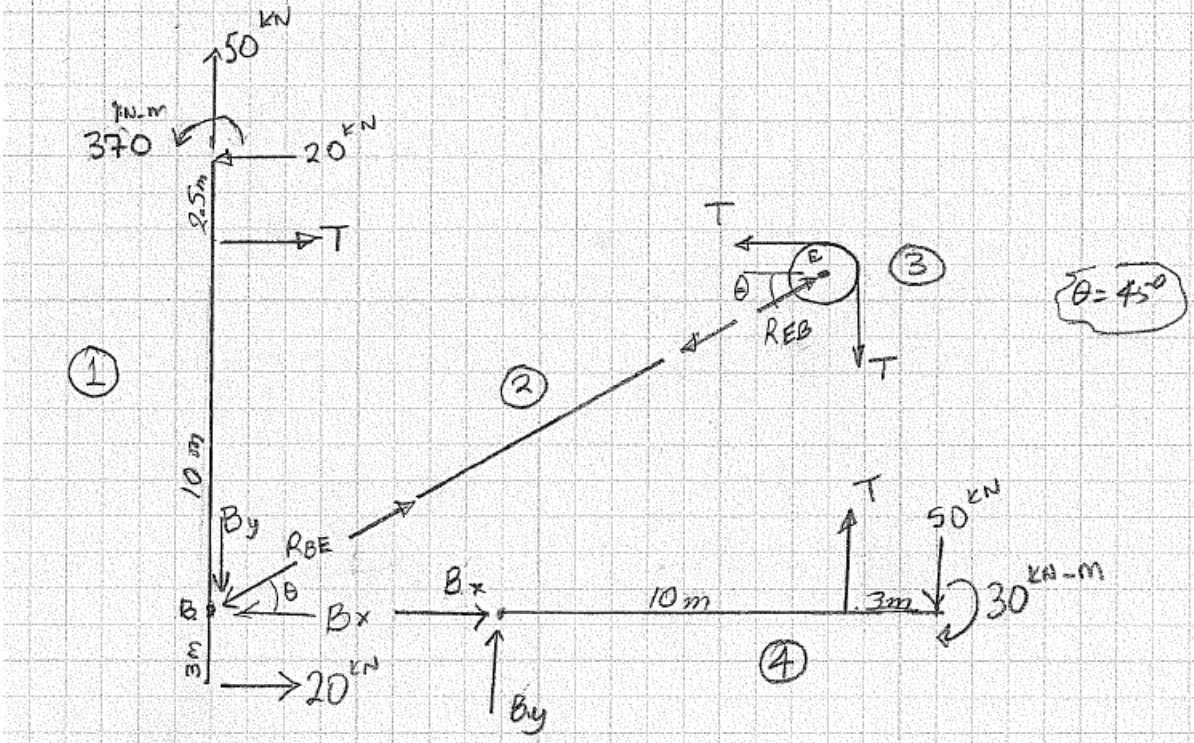


$(\Sigma F_x = 0)$ $D_x + 20 = 0$ $\quad D_x = -20\ KN$

$(\Sigma F_y = 0)$ $D_y - 50 = 0$ $\quad D_y = 50\ KN$

$+\circlearrowleft (\Sigma M_A = 0)$ $-D_x(12.5) + M_D - 13(50) - 30 + 3(20) = 0$

$M_D = 370\ KN\text{-}m$



FBD (4)

$(\Sigma M_A = 0)$ $10T - 13(50) - 30 = 0$

$T = 68\,kN$

$(\Sigma F_x = 0)$ $B_x = 0$

$(\Sigma F_y = 0)$ $B_y + T - 50 = 0$ $B_y = -18\,kN$

FBD (3) (Pulley)

$(\Sigma F_x = 0)$ $R_{EB}\cos\theta - T = 0$ $R_{EB} = 96.19\,kN$

$(\Sigma F_y = 0)$ $R_{EB}\sin\theta - T = 0$ $R_{EB} = 96.17\,kN$

FBD 1

$\Sigma F_x = 20 - B_x + R_{BE}\cos\theta + T - 20$

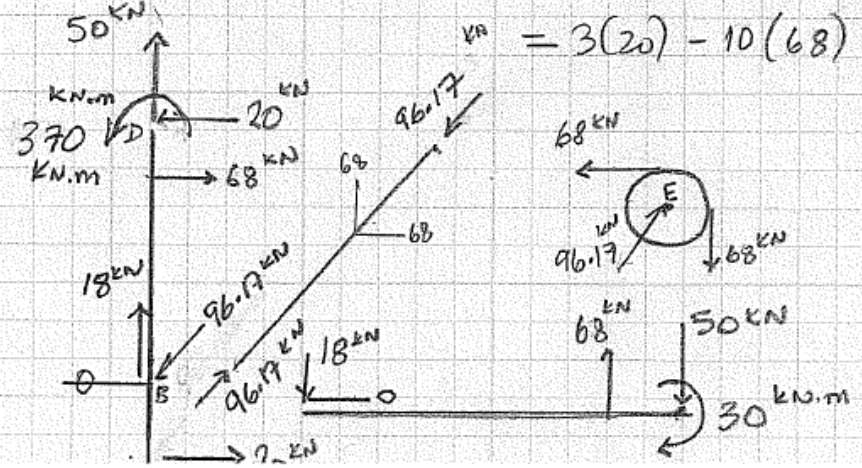
$= 20 - 0 - 96.17\cos 45° + 68 - 20 = 0$ ✓

$\Sigma F_y = -B_y - R_{BE}\sin\theta + 50$

$= -(-18) - 96.17\sin 45° + 50 = 0$ ✓

$(\Sigma M_B = 0)$ $3(20) - 10(T) + 12.5(20) + 370$

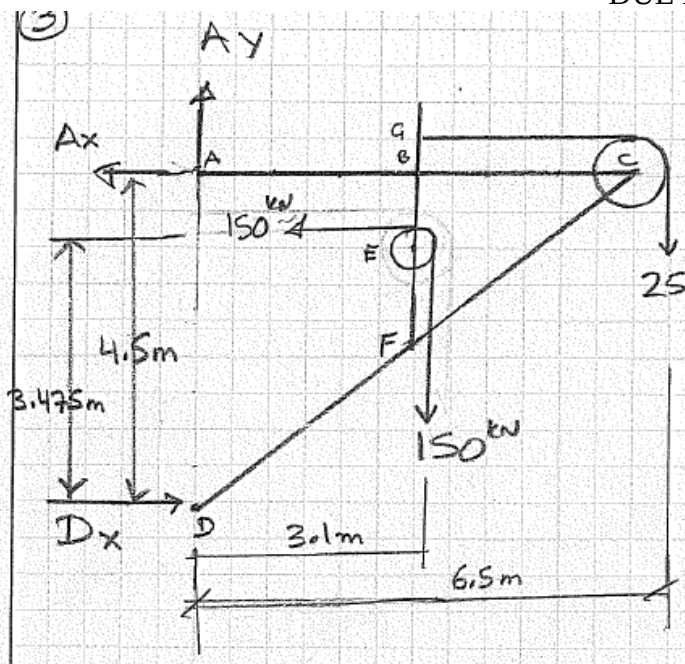
$= 3(20) - 10(68) + 12.5(20) + 370 = 0$ ✓



Engineering Statics Assignment #5 SOLUTION Name: ----------
DUE MARCH 8 Group:----------

4)

Engineering Statics Assignment #5 SOLUTION Name: ----------
DUE MARCH 8 Group:----------



$\circlearrowleft [\Sigma M_D = 0] \quad (A_x)4.5 - 3.1(150) - 6.5(250) + 3.475(150) = 0$

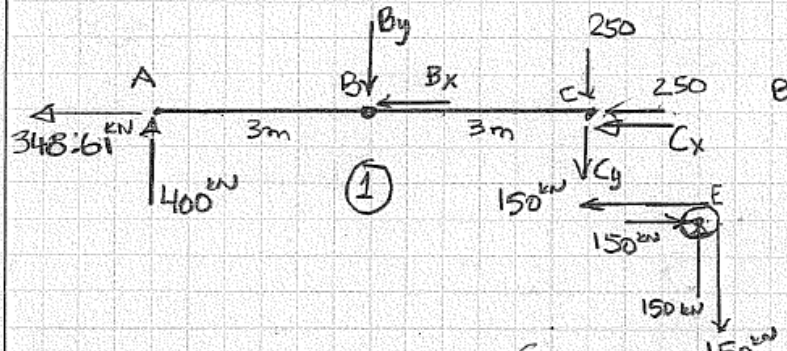
$A_x = 348.61$ kN

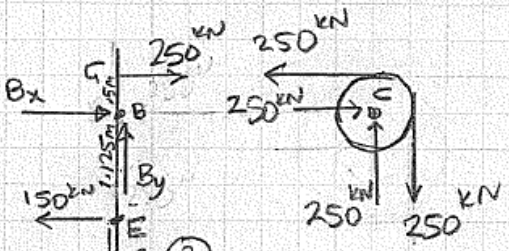
$[\Sigma F_x = 0] \quad D_x - A_x - 150 = 0$

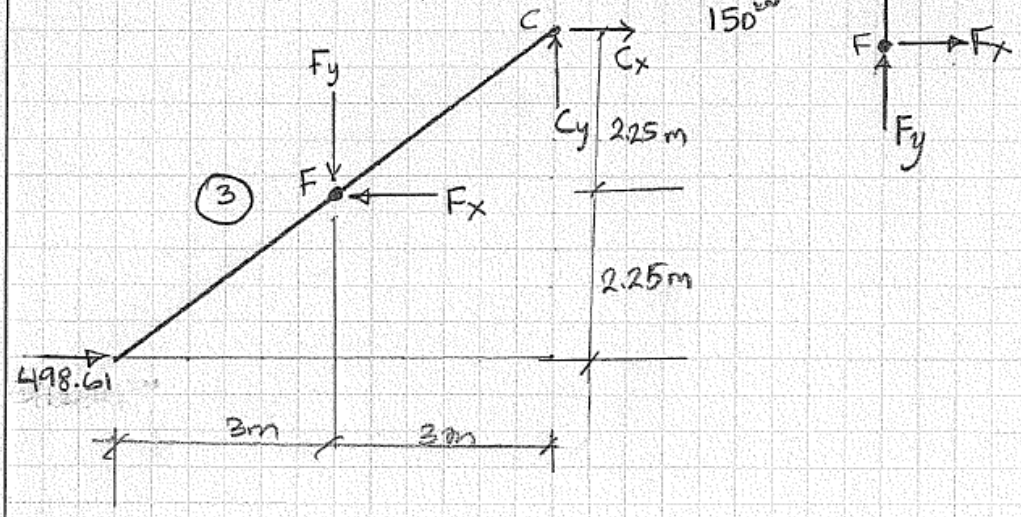
$D_x = 498.61$

$[\Sigma F_y = 0] \quad A_y - 150 - 250 = 0$

$A_y = 400$ kN







From FBD ① $(\Sigma M_B = 0)$ $-3(400) - 3(250) - 3C_y = 0$

$C_y = -650^{kN}$ ✓

$[\Sigma F_y = 0]$ $400 - B_y - 250 - C_y = 0$

$B_y = 800^{kN}$

From FBD ③ $[\Sigma M_F = 0]$ $(498.61)(2.25) + 3C_y - 2.25\,C_x = 0$

$C_x = -368.06\,kN$

$[\Sigma F_x = 0]$ $498.61 - F_x + C_x = 0$

$F_x = 130.55^{kN}$

$[\Sigma F_y = 0]$ $-F_y + C_y = 0$

$F_y = -650^{kN}$

From FBD ① $[\Sigma F_x = 0]$ $-348.61 - B_x - 250 - C_x = 0$

$B_x = -230.55^{kN}$

From FBD ② $\Sigma F_x = 250 + B_x - 150 + F_x =$

$= 250 - 230.55 - 150 + 130.55$

$= 0$ ✓

$\Sigma F_y = F_y - 150 + B_y = -650 - 150 + 800 = 0$ ✓

Engineering Statics Assignment #5 SOLUTION Name: ----------

DUE MARCH 8 Group:----------