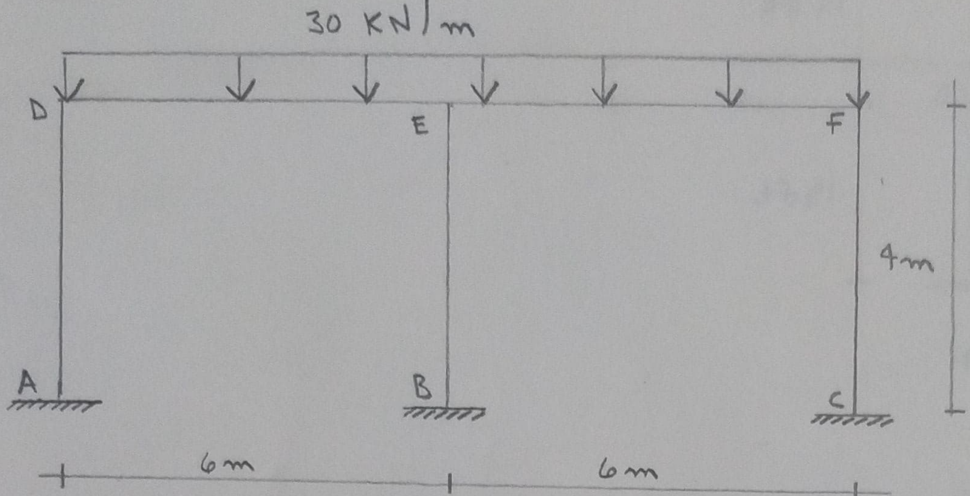
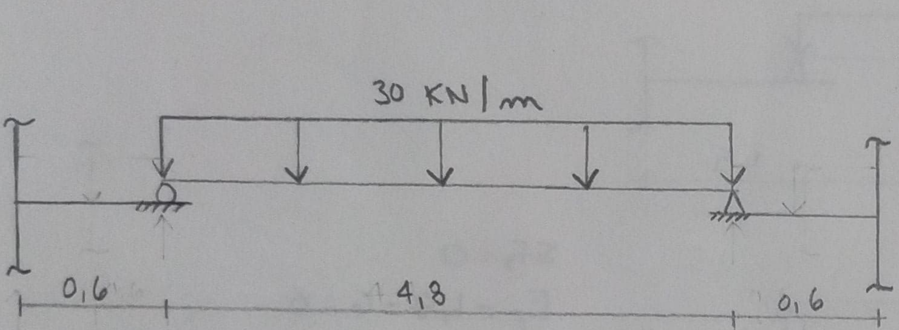
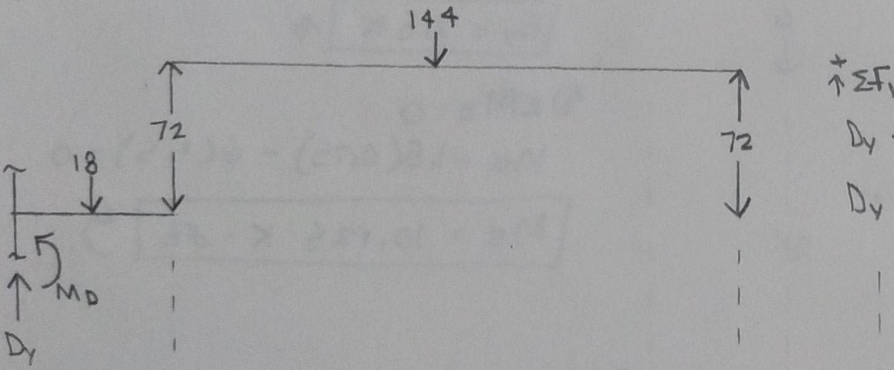
TAREA # 1

DIBUJE LOS DIAGRAMAS DE CORTANTE Y MOMENTO APROXIMADO PARA LAS VIGAS DE LOS MARCOS MOSTRADOS

1







$+\uparrow \Sigma F_Y = 0$

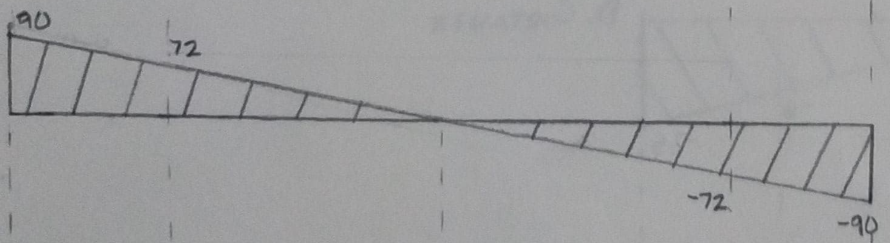
$D_Y - 18 - 72 = 0$

$D_Y = 90\ KN$

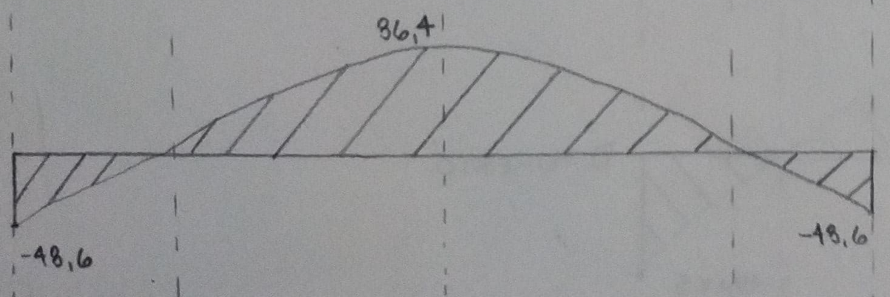
$\Sigma M_D = 0$

$M_D - 18(0,3) - 72(0,6) = 0$

$M_D = 48,6\ KN \cdot m$

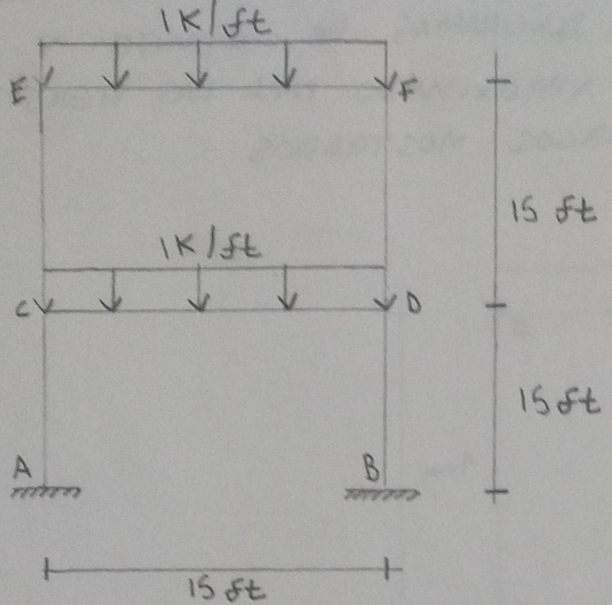


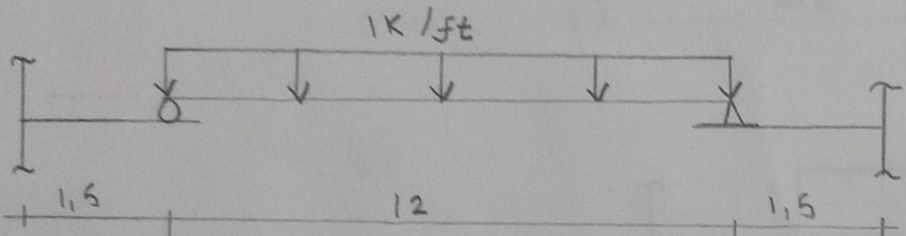
D. CORTANTE

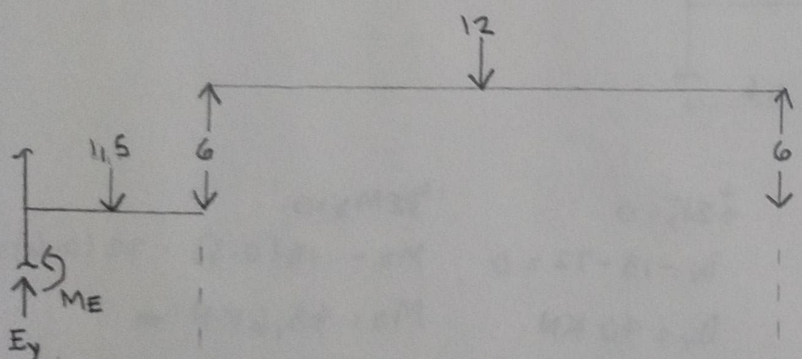


D. MOMENTO

②







$\Sigma F_y = 0$

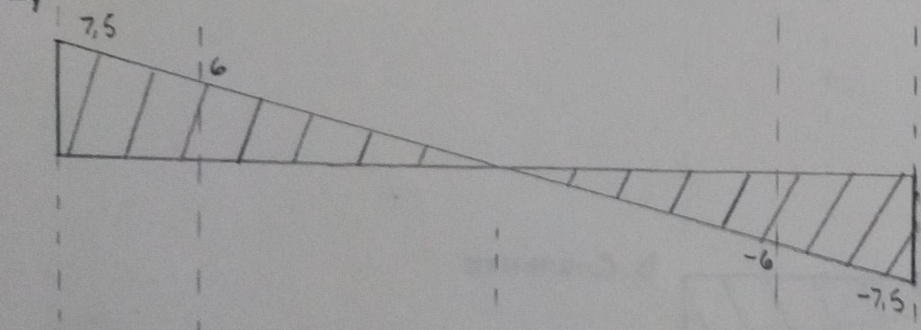
$E_y - 1{,}5 - 6 = 0$

$\boxed{E_y = 7{,}5\ K} \uparrow$

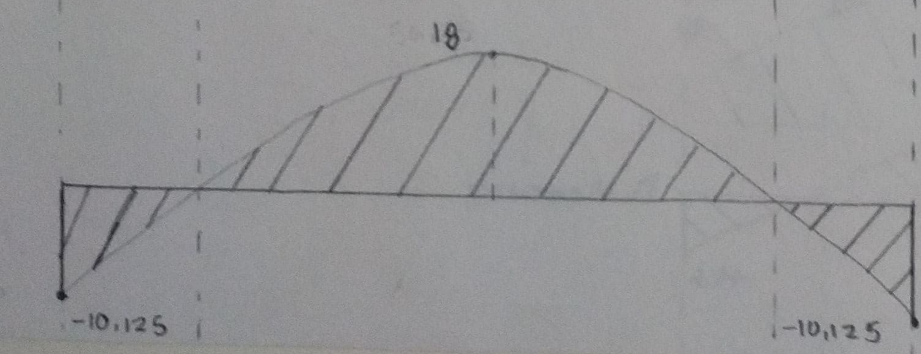
$\circlearrowleft \Sigma M_E = 0$

$M_E - 1{,}5(0{,}75) - 6(1{,}5) = 0$

$\boxed{M_E = 10{,}125\ K \cdot ft} \circlearrowleft$

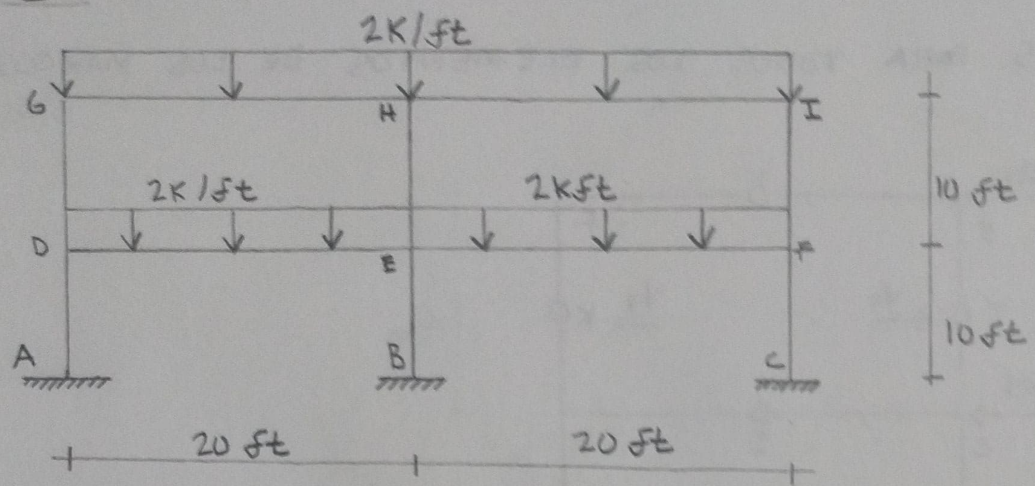


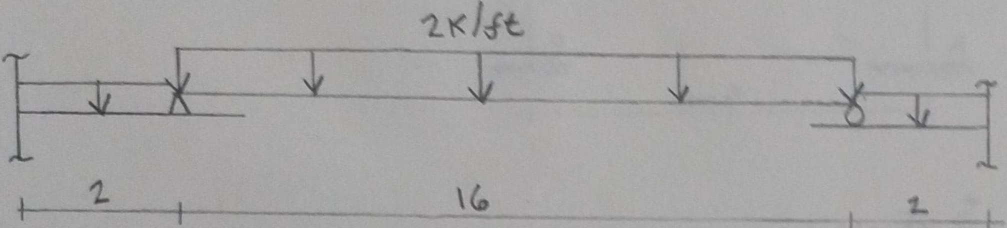
D. CORTANTE

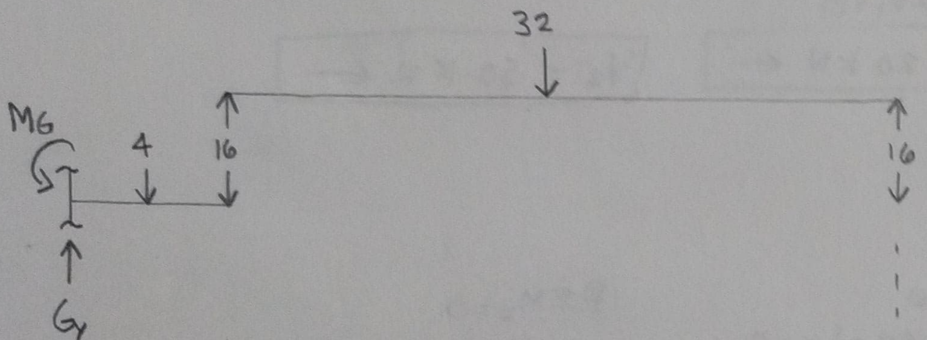


D. MOMENTO

3







$\Sigma F_y = 0$

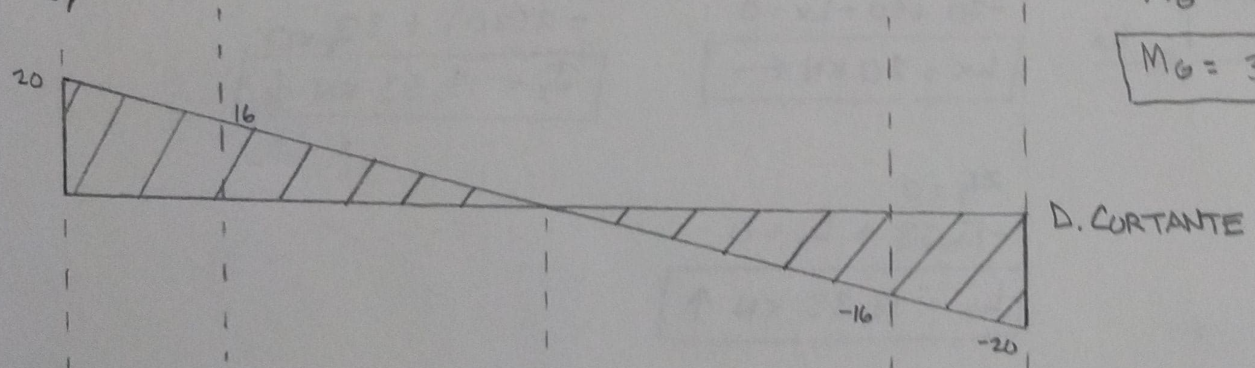
$G_y - 4 - 16 = 0$

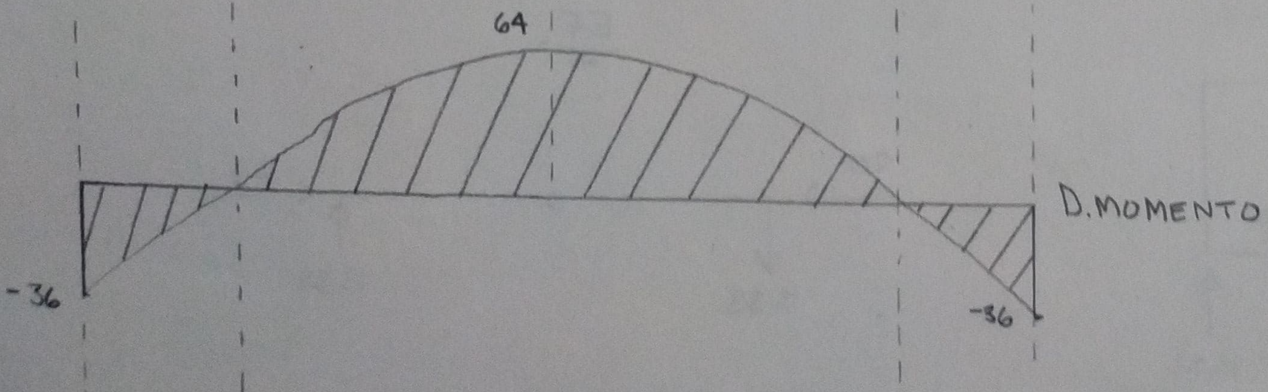
$\boxed{G_y = 20\ K}$ ↑

$\Sigma M_G = 0$

$M_G - 4(1) - 16(2) = 0$

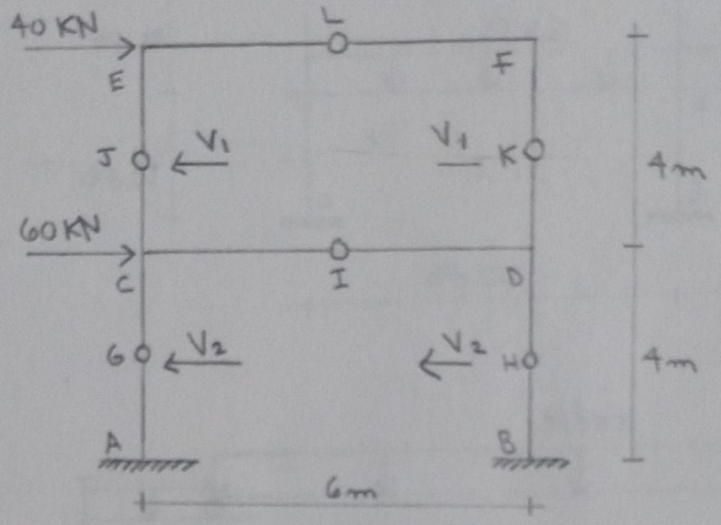
$\boxed{M_G = 36\ K\cdot ft}$

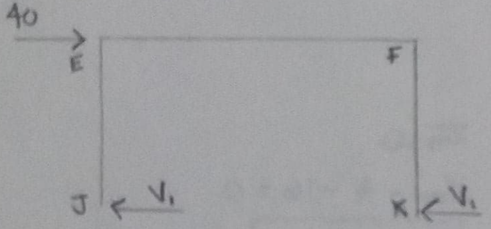




DETERMINE LAS FUERZAS AXIALES, LOS CORTANTES Y LOS MOMENTOS APROXIMADOS PARA TODOS LOS ELEMENTOS DE LOS MARCOS.

4



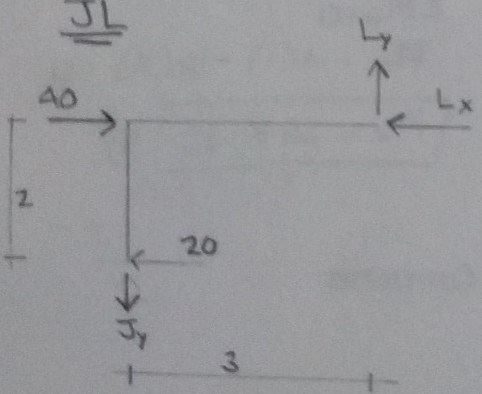


$\xrightarrow{+} \Sigma F_x = 0$

$40 - 2V_1 = 0$

$\boxed{V_1 = 20\ KN \leftarrow}$ $\boxed{V_2 = 50\ KN \leftarrow}$

JL



$\Sigma F_x = 0$

$-20 + 40 - L_x = 0$

$\boxed{L_x = 20\ KN \leftarrow}$

$\circlearrowright \Sigma M_L = 0$

$-2(20) + 3J_y = 0$

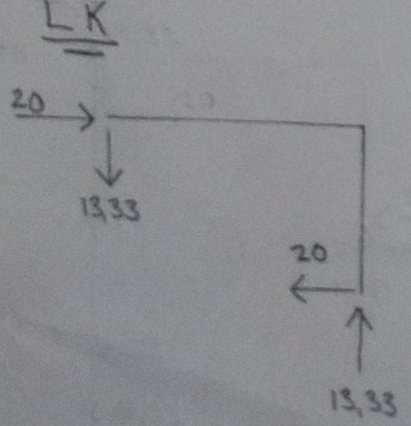
$\boxed{J_y = 13{,}33\ KN \downarrow}$

$\Sigma F_y = 0$

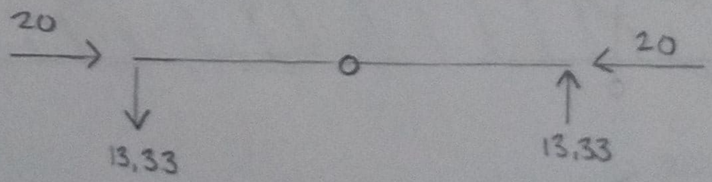
$-13{,}33 + L_y = 0$

$\boxed{L_y = 13{,}33\ KN \uparrow}$

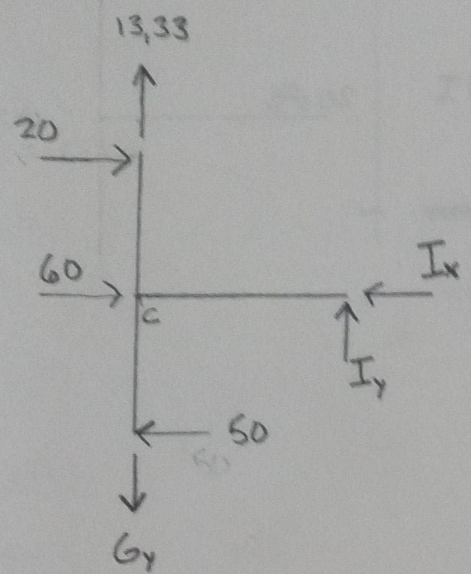
LK



EF



JGI



$\Sigma F_x = 0$

$20 + 60 - 50 - I_x = 0$

$\boxed{I_x = 30\ KN \leftarrow}$

$\Sigma F_y = 0$

$13,33 - 60 + I_y = 0$

$\boxed{I_y = 46,67\ KN \uparrow}$

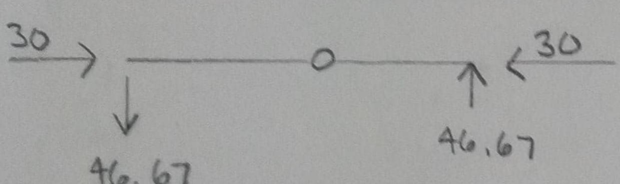
$\Sigma M_I = 0$

$-20(2) - 3(13,33) - 50(2) + 3G_y = 0$

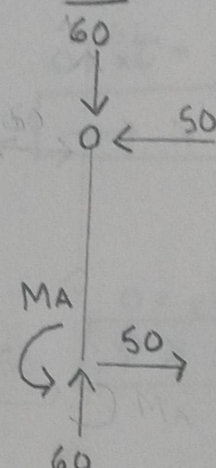
$-40 - 40 - 100 + 3G_y = 0$

$\boxed{G_y = 60\ KN \downarrow}$

CD



CA

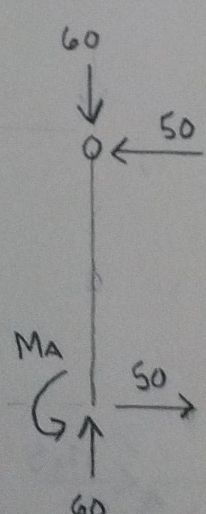


$\Sigma M_C = 0$

$-2(50) + M_A = 0$

$\boxed{M_A = 100\ KN \cdot m\ (+)}$

DB

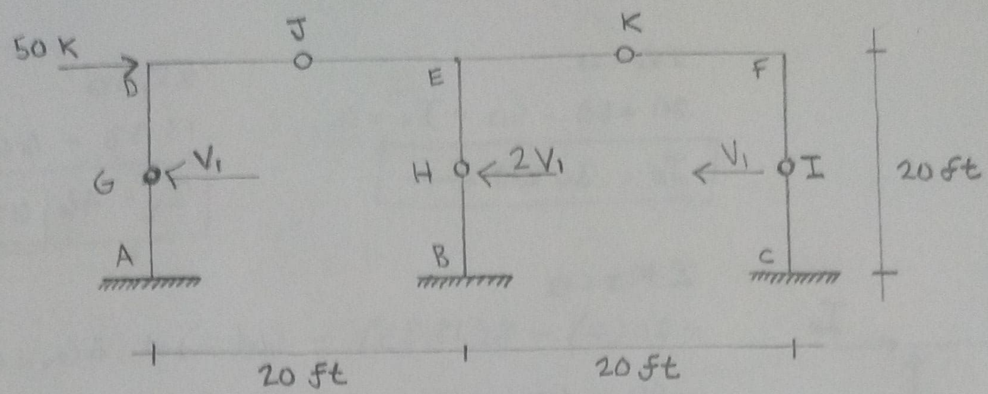


$\Sigma M_C = 0$

$M_A - 2(50) = 0$

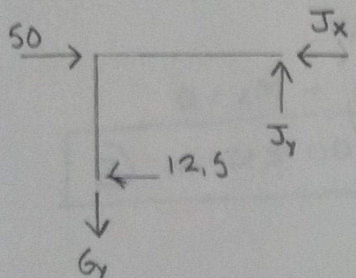
$\boxed{M_A = 100\ KN \cdot m\ (+)}$

5



$\boxed{V_1 = 12{,}5 \text{ K} \leftarrow}$

GJ



$\Sigma F_x = 0$

$-12{,}5 + 50 - J_x = 0$

$\boxed{J_x = 37{,}5 \text{ K} \leftarrow}$

$\Sigma F_y = 0$

$-12{,}5 + J_y = 0$

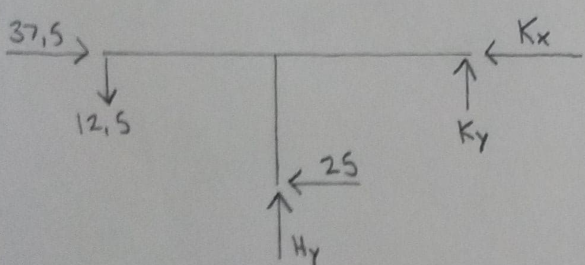
$\boxed{J_y = 12{,}5 \text{ K} \uparrow}$

$\circlearrowleft \Sigma M_J = 0$

$-10(12{,}5) + 10\,G_y = 0$

$\boxed{G_y = 12{,}5 \text{ K} \downarrow}$

JKH



$\Sigma F_x = 0$

$37{,}5 - 25 - K_x = 0$

$\boxed{K_x = 12{,}5 \text{ K} \leftarrow}$

$\Sigma F_y = 0$

$-12{,}5 + K_y = 0$

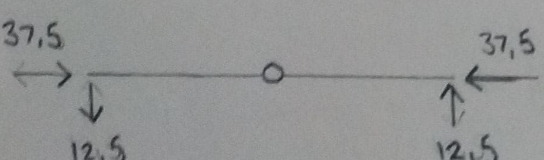
$\boxed{K_y = 12{,}5 \text{ K} \uparrow}$

$\circlearrowleft \Sigma M_K = 0$

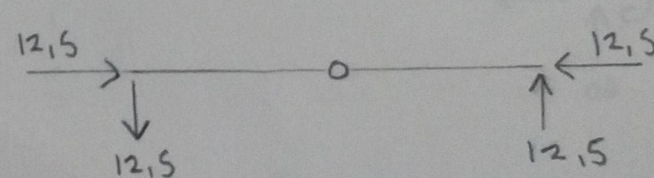
$20(12{,}5) - 10(25) - 10\,H_y = 0$

$\boxed{H_y = 0}$

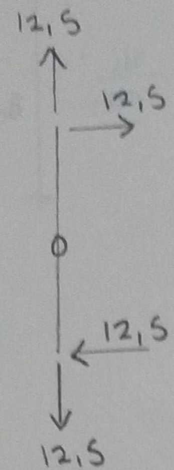
DE



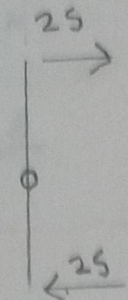
EF



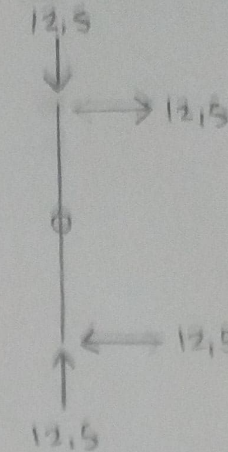
AD



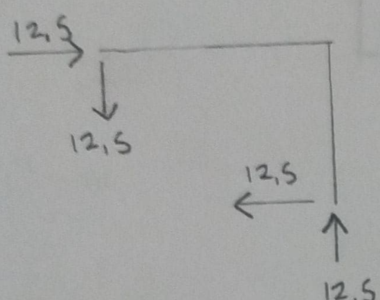
BE



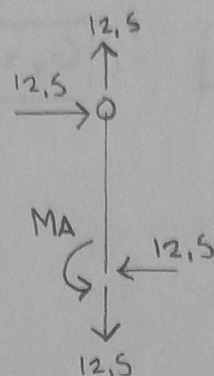
CF



KI



AG

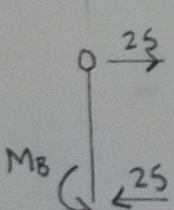


$$\circlearrowleft^{+}\ \Sigma M_G = 0$$

$$M_A - 10(12{,}5) = 0$$

$$\boxed{M_A = 125\ \text{K}\cdot\text{ft}\ \circlearrowleft}$$

BH

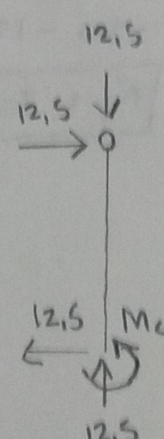


$$\circlearrowleft^{+}\ \Sigma M_B = 0$$

$$M_B - 10(25) = 0$$

$$\boxed{M_B = 250\ \text{K}\cdot\text{ft}\ \circlearrowleft}$$

CI

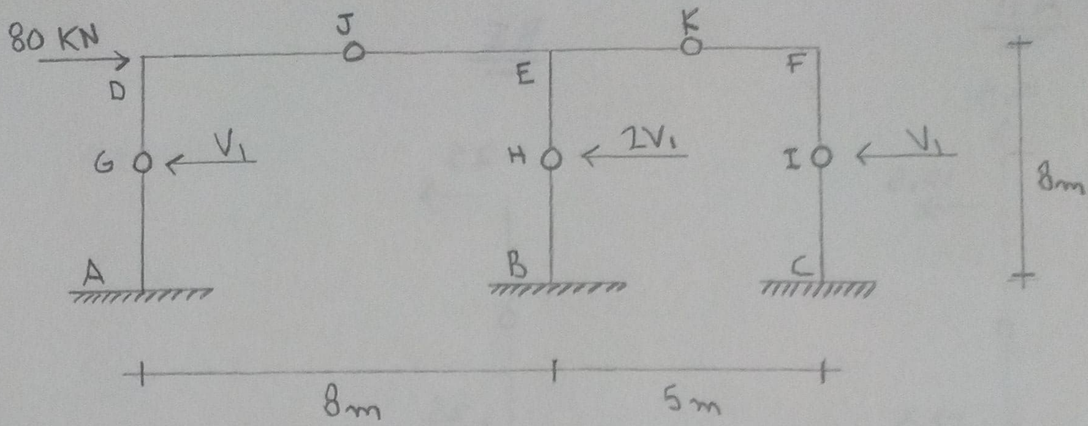


$$\circlearrowleft^{+}\ \Sigma M_C = 0$$

$$M_C - 10(12{,}5) = 0$$

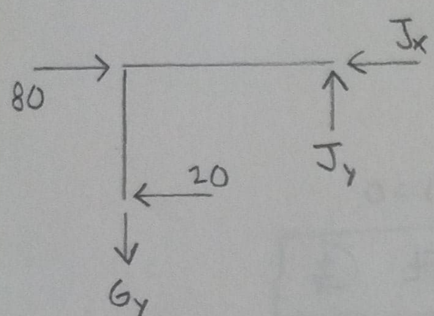
$$\boxed{M_C = 125\ \text{K}\cdot\text{ft}\ \circlearrowleft}$$

⑥



$$\boxed{V_1 = 20\ KN \leftarrow}$$

GF



$\Sigma F_x = 0$

$80 - 20 - J_x = 0$

$$\boxed{J_x = 60\ KN \leftarrow}$$

$\circlearrowleft \Sigma M_J = 0$

$-4(20) + 4G_y = 0$

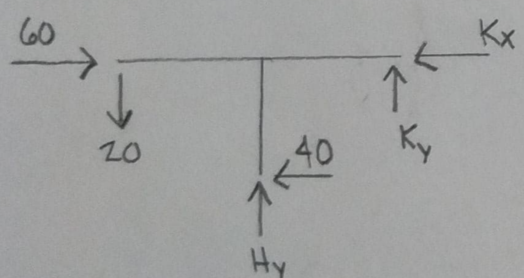
$$\boxed{G_y = 20\ KN \downarrow}$$

$\Sigma F_y = 0$

$-20 + J_y = 0$

$$\boxed{J_y = 20\ KN \uparrow}$$

JKH



$\Sigma F_x = 0$

$60 - 40 - K_x = 0$

$$\boxed{K_x = 20\ KN \leftarrow}$$

$\circlearrowleft \Sigma M_K = 0$

$6.5(20) - 4(40) - 2.5\,H_y = 0$

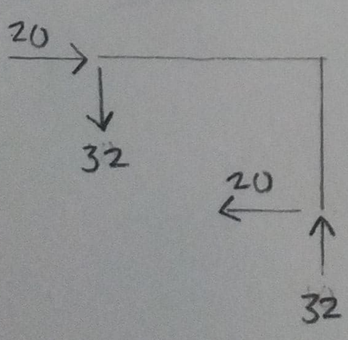
$$\boxed{H_y = -12\ KN \downarrow}$$

$\Sigma F_y = 0$

$-20 - 12 + K_y = 0$

$$\boxed{K_y = 32\ KN \uparrow}$$

KI



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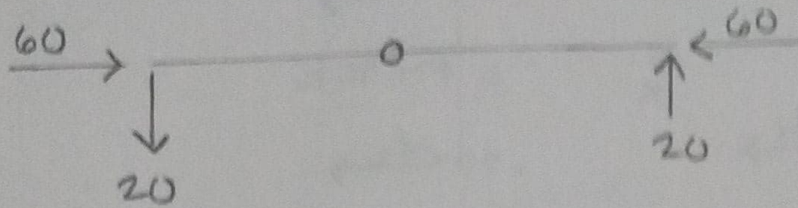

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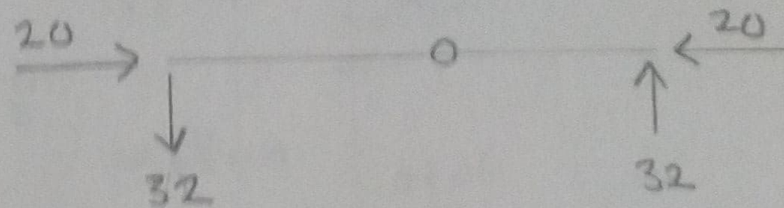

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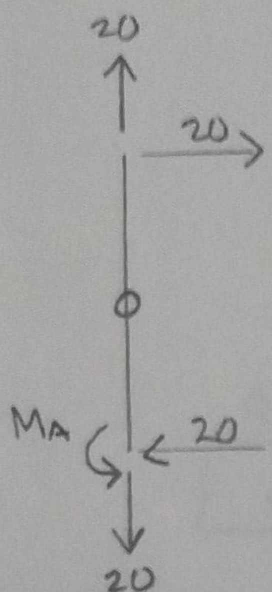

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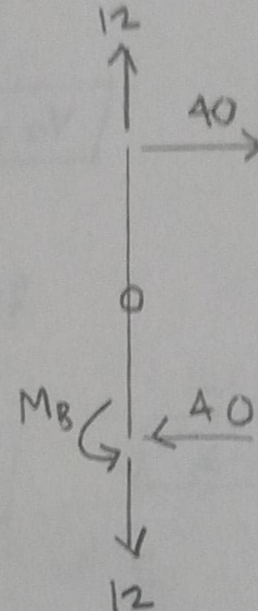
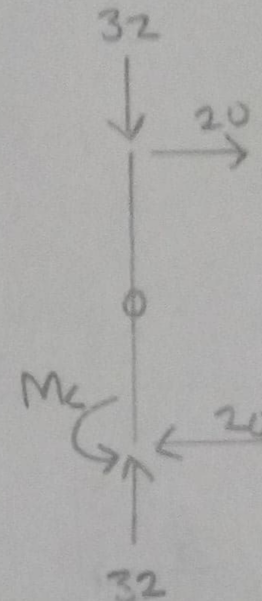


CF



$\circlearrowleft + \Sigma M_A = 0$

$M_A - 4(20) = 0$

$\boxed{M_A = 80 \text{ KN} \cdot \text{m} \circlearrowleft}$

$\circlearrowleft + \Sigma M_B = 0$

$M_B - 4(40) = 0$

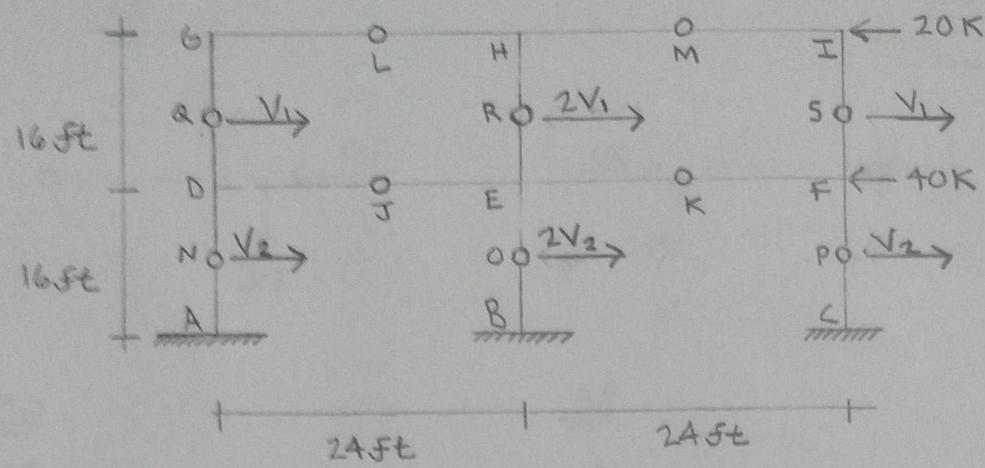
$\boxed{M_B = 160 \text{ KN} \cdot \text{m} \circlearrowleft}$

$\circlearrowleft + \Sigma M_C = 0$

$M_C - 4(20) = 0$

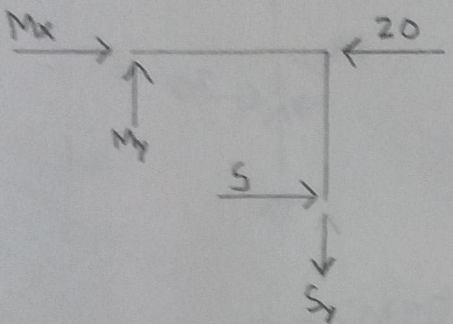
$\boxed{M_C = 80 \text{ KN} \cdot \text{m} \circlearrowleft}$

7



$\boxed{V_1 = 5\text{ K} \rightarrow}$ $\boxed{V_2 = 15\text{ K} \rightarrow}$

MS



$\Sigma F_x = 0$

$M_x + 5 - 20 = 0$

$\boxed{M_x = 15\text{ K} \rightarrow}$

$\circlearrowleft + \Sigma M_M = 0$

$8(5) - 12 S_y = 0$

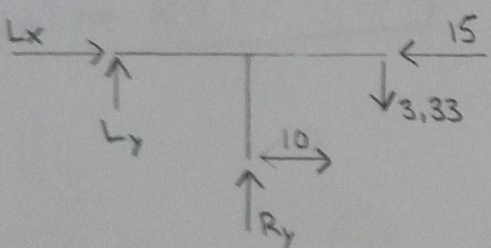
$\boxed{S_y = 3{,}33\text{ K} \downarrow}$

$\Sigma F_y = 0$

$M_y - 3{,}33 = 0$

$\boxed{M_y = 3{,}33\text{ K} \uparrow}$

LMR



$\Sigma F_x = 0$

$L_x + 10 - 15 = 0$

$\boxed{L_x = 5\text{ K} \rightarrow}$

$\circlearrowleft + \Sigma M_L = 0$

$-24(3{,}33) + 12 R_y + 8(10) = 0$

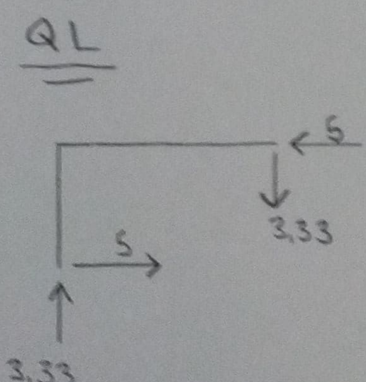
$\boxed{R_y = 0}$

$\Sigma F_y = 0$

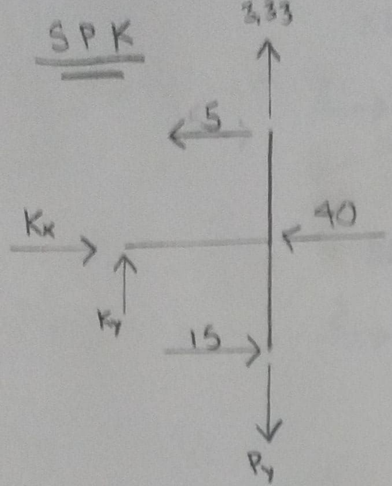
$L_y - 3{,}33 = 0$

$\boxed{L_y = 3{,}33\text{ K} \uparrow}$

QL



SPK



$\Sigma F_x = 0$

$K_x - 5 - 40 + 15 = 0$

$\boxed{K_x = 30\ K \longrightarrow}$

$\circlearrowleft \Sigma M_K = 0$

$8(5) + 12(3{,}33) + 8(15) - 12P_y = 0$

$40 + 40 + 120$

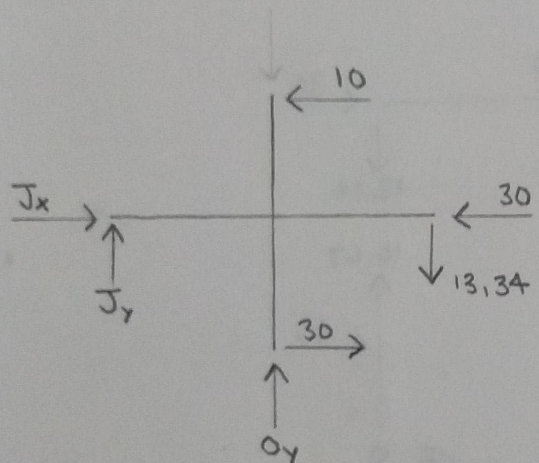
$\boxed{P_y = 16{,}67\ K \downarrow}$

$\Sigma F_y = 0$

$K_y + 3{,}33 - 16{,}67 = 0$

$\boxed{K_y = 13{,}34\ K \uparrow}$

RKOJ



$\Sigma F_x = 0$

$J_x - 10 - 30 + 30 = 0$

$\boxed{J_x = 10\ K \longrightarrow}$

$\Sigma F_y = 0$

$J_y - 13{,}34 = 0$

$\boxed{J_y = 13{,}34\ K \uparrow}$

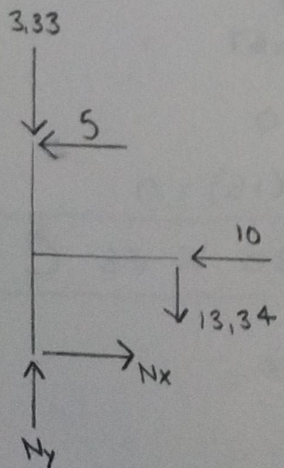
$\circlearrowleft \Sigma M_J = 0$

$8(10) - 24(13{,}34) + 8(30) + 12\,O_y = 0$

$80 - 320 + 240 + 12O_y = 0$

$\boxed{O_y = 0}$

QJN



$\Sigma F_x = 0$

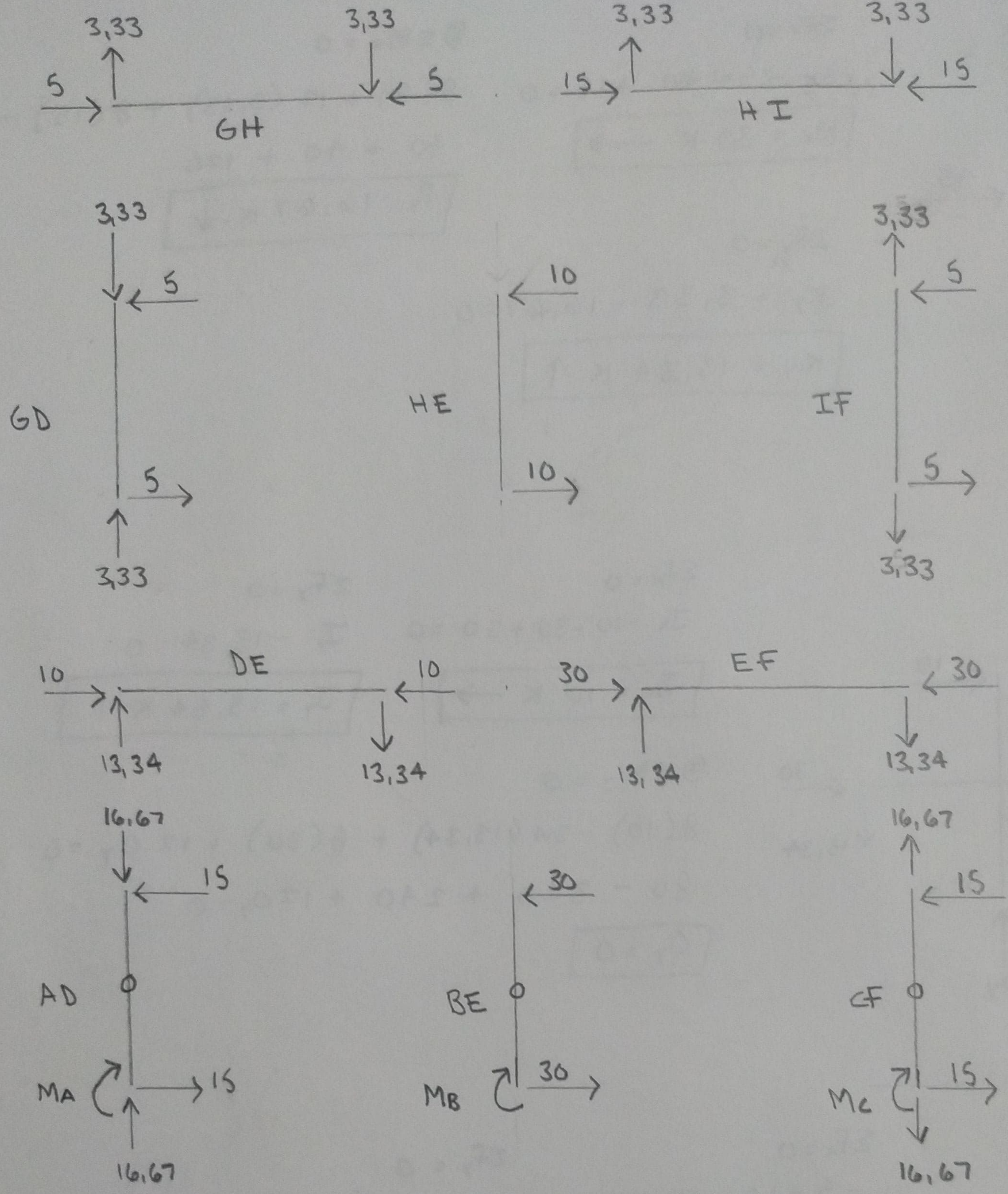
$-5 - 10 + N_x = 0$

$\boxed{N_x = 15\ K \longrightarrow}$

$\Sigma F_y = 0$

$-3{,}33 - 13{,}34 + N_y = 0$

$\boxed{N_y = 16{,}67\ K \uparrow}$



$\circlearrowright \Sigma M_A = 0$

$-M_A + 8(15) = 0$

$\boxed{M_A = 120 \text{ K}\cdot\text{ft} \circlearrowright}$

$\circlearrowright \Sigma M_B = 0$

$-M_B + 8(30) = 0$

$\boxed{M_B = 240 \text{ K}\cdot\text{ft} \circlearrowright}$

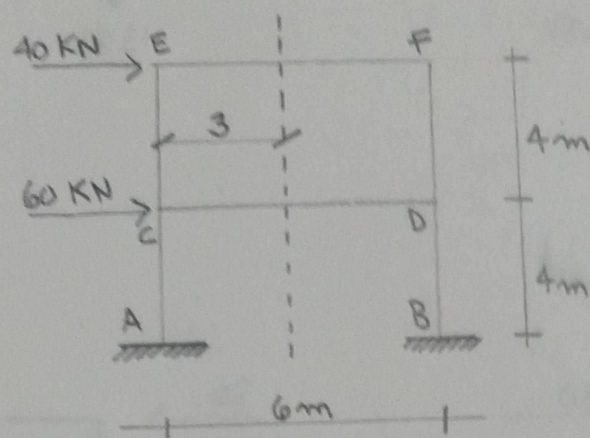
$\circlearrowright \Sigma M_c = 0$

$-M_c + 8(15) = 0$

$\boxed{M_c = 120 \text{ K}\cdot\text{ft} \circlearrowright}$

DETERMINE LAS FUERZAS AXIALES, LOS CORTANTES Y LOS MOMENTOS APROXIMADOS PARA LOS ELEMENTOS DE LOS MARCOS USANDO EL METODO DEL CANTILIVER.

8

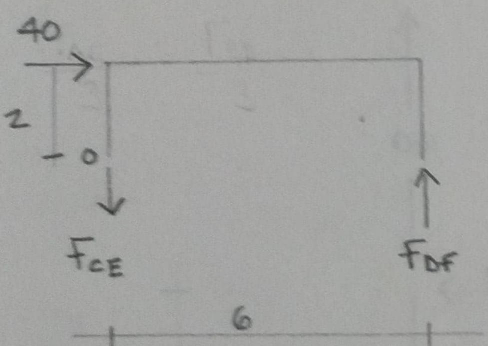


NIVEL 1

$$\frac{F_{AC}}{3} = \frac{F_{BD}}{3}$$

NIVEL 2

$$\frac{F_{CE}}{3} = \frac{F_{DF}}{3}$$



$\curvearrowright \Sigma M_0 = 0$

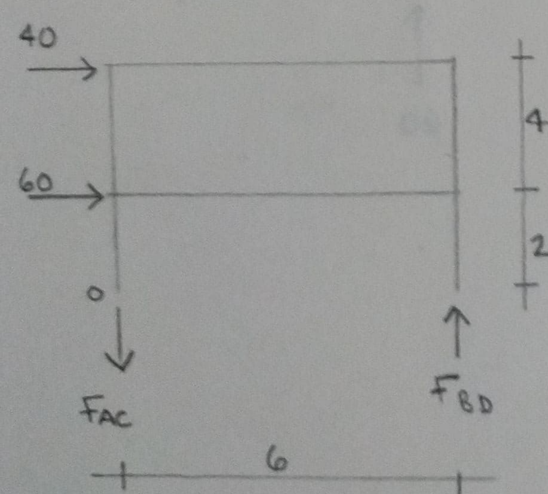
$6F_{DF} - 2(40) = 0$

$\boxed{F_{DF} = 13,33 \text{ KN} \uparrow}$

$\Sigma F_y = 0$

$-F_{CE} + 13,33 = 0$

$\boxed{F_{CE} = 13,33 \text{ KN} \downarrow}$



$\curvearrowright M_0 = 0$

$-2(60) - 6(40) + 6F_{BD} = 0$

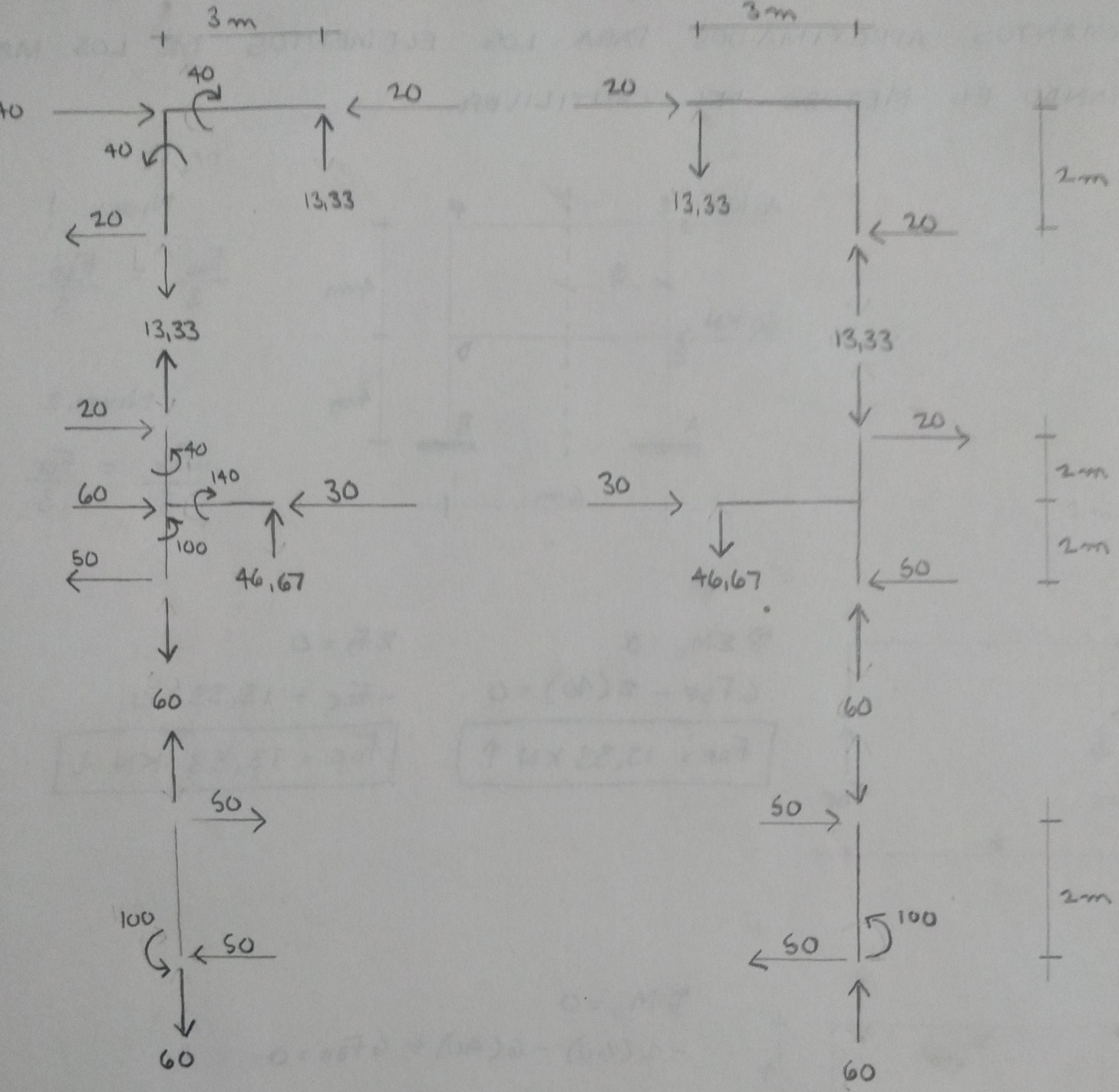
$-120 - 240 + 6F_{BD} = 0$

$\boxed{F_{BD} = 60 \text{ KN} \uparrow}$

$\Sigma F_y = 0$

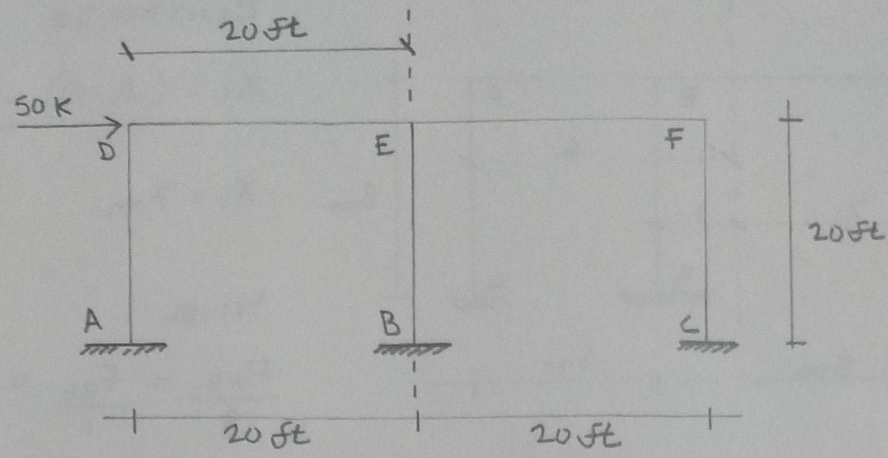
$-F_{AC} + 60 = 0$

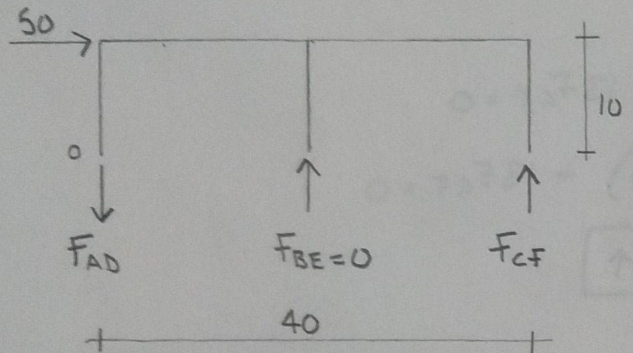
$\boxed{F_{AC} = 60 \text{ KN} \downarrow}$



3 m
40
40
20
40
13,33
20
13,33
20
40
140
60
30
100
50
46,67
60
50
100
50
60
3 m
20
13,33
2 m
20
13,33
20
30
2 m
2 m
46,67
50
60
50
2 m
100
50
60

9





$\Sigma M_O = 0$

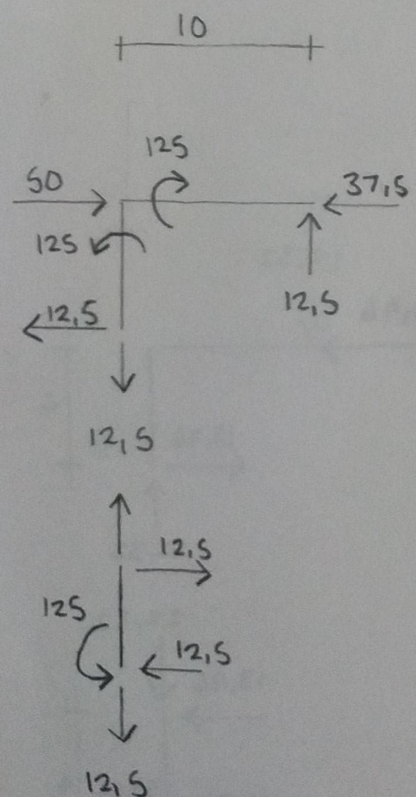
$-10(50) + 40 F_{CF} = 0$

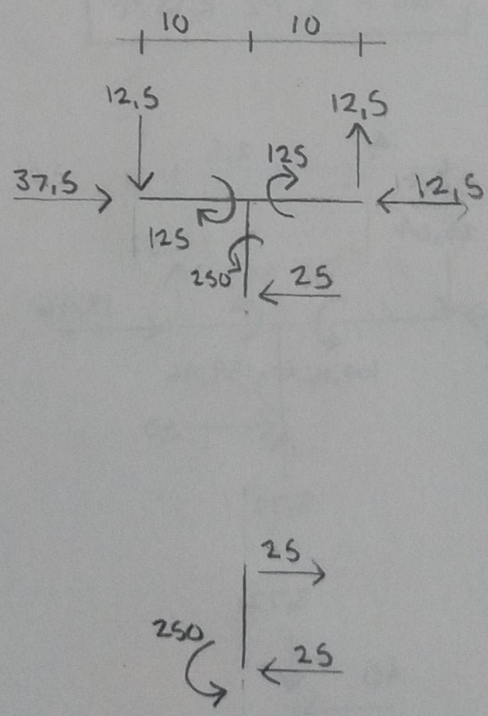
$\boxed{F_{CF} = 12{,}5\ K \downarrow}$

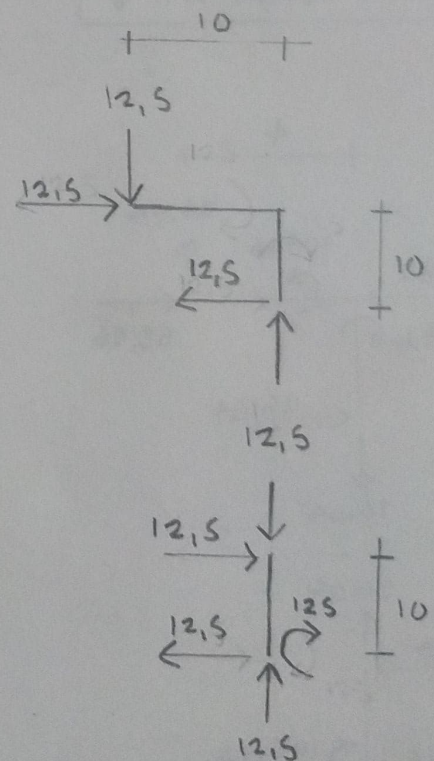
$\Sigma F_y = 0$

$-F_{AD} + 12{,}5 = 0$

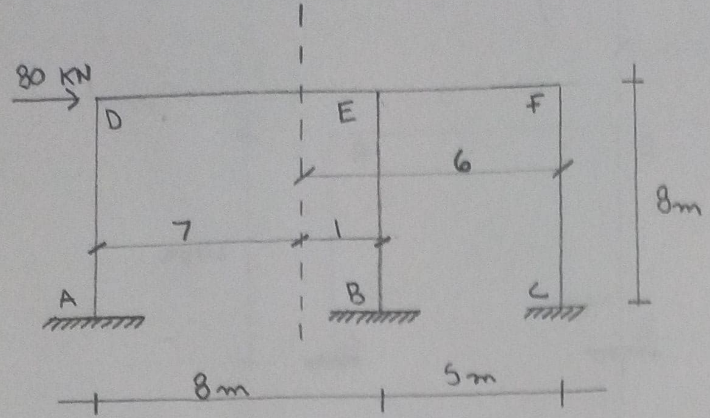
$\boxed{F_{AD} = 12{,}5\ K \uparrow}$







(10)



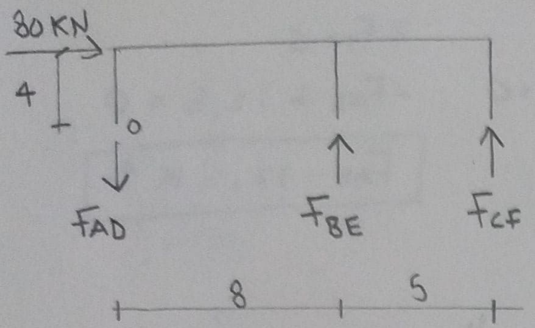
CENTROIDE

$$X_c = \frac{(A\cdot 0) + (A\cdot 8) + (A\cdot 13)}{3A}$$

$$X_c = 7\,m$$

NIVEL 1

$$\frac{F_{AD}}{8} = \frac{F_{BE}}{1} = \frac{F_{CF}}{6}$$



$$\circlearrowleft\!\Sigma M_O = 0$$

$$-80(4) + 8F_{BE} + 13F_{CF} = 0$$

$$-320 + 8\left(\tfrac{1}{6}F_{CF}\right) + 13F_{CF} = 0$$

$$\boxed{F_{CF} = 22{,}32\ KN \uparrow}$$

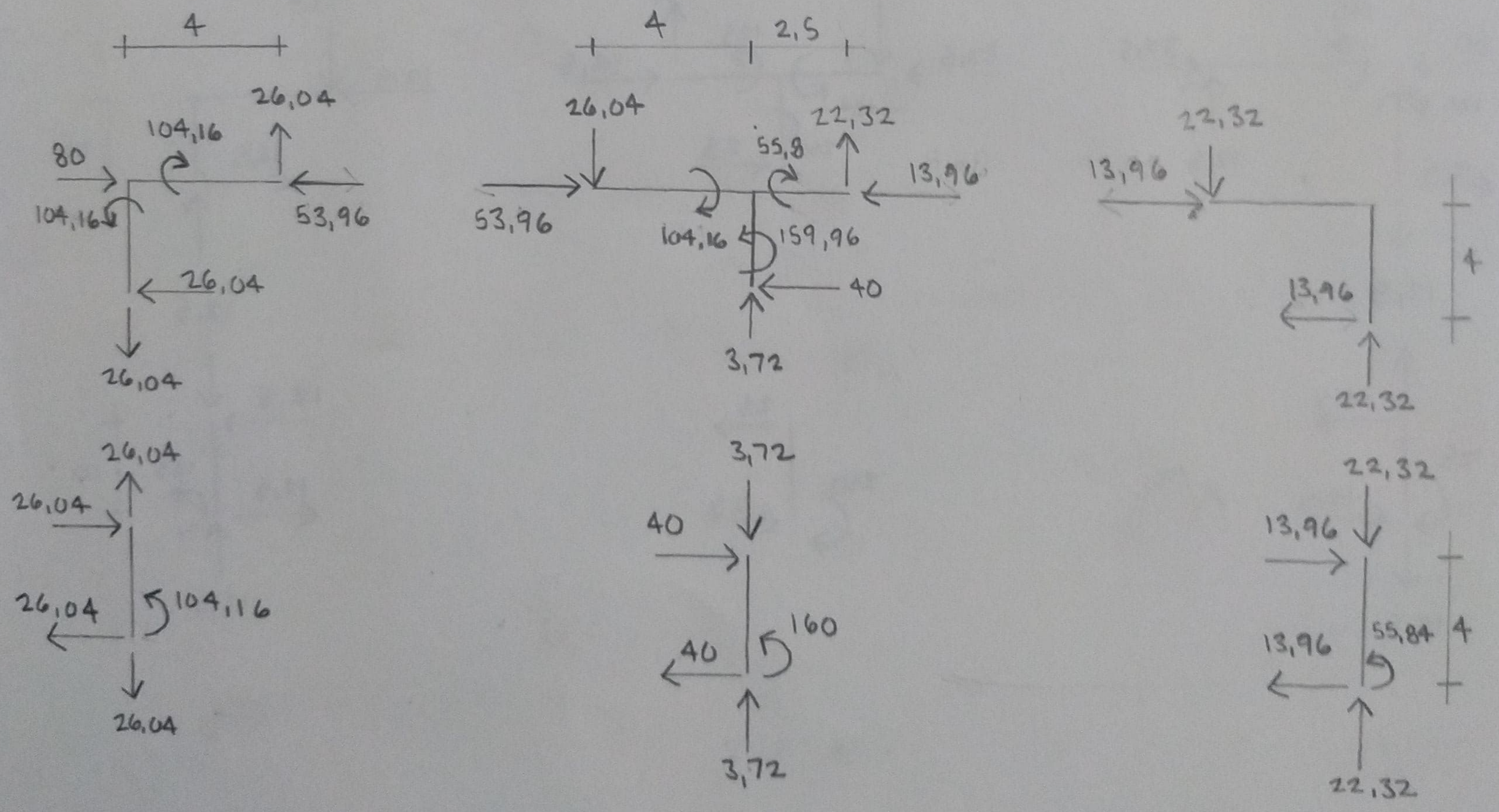
$$-320 + 8F_{BE} + 13(6F_{BE}) = 0$$

$$\boxed{F_{BE} = 3{,}72\ KN \uparrow}$$

$$\Sigma F_y = 0$$

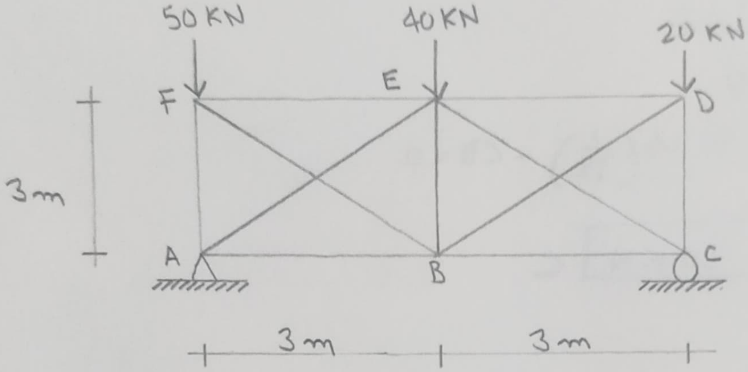
$$-F_{AD} + 22{,}32 + 3{,}72 = 0$$

$$\boxed{F_{AD} = 26{,}04\ KN \downarrow}$$



TAREA #2

① DETERMINE EN FORMA APROXIMADA LA FUERZA DE CADA ELEMENTO DE LA ARMADURA. SUPONGA QUE LAS DIAGONALES PUEDEN SOPORTAR UNA FUERZA DE TENSIÓN O DE COMPRESIÓN.



$\circlearrowleft + \Sigma M_A = 0$

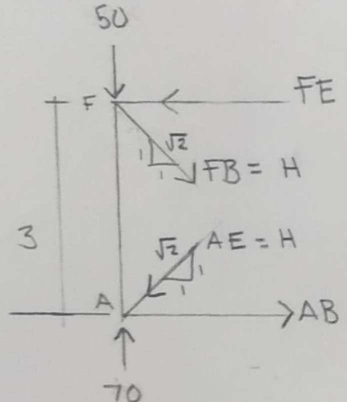
$-3(40) - 6(20) + 6C_y = 0$

$\boxed{C_y = 40 \text{ KN} \uparrow}$

$\Sigma F_y = 0$

$A_y - 50 - 40 - 20 + 40$

$\boxed{A_y = 70 \text{ KN} \uparrow}$



$\Sigma F_y = 0$

$-50 + 70 - 2H\left(\frac{1}{\sqrt{2}}\right) = 0$

$\boxed{H = 14{,}14 \text{ KN}}$

$\circlearrowleft + \Sigma M_F = 0$

$3AB - \frac{1}{\sqrt{2}}(3)(14{,}14) = 0$

$\boxed{AB = 10 \text{ KN} \rightarrow}$ T

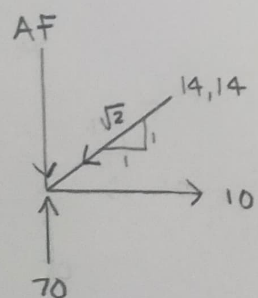
$\circlearrowleft + \Sigma M_A = 0$

$3FE - \frac{1}{\sqrt{2}}(3)(14{,}14) = 0$

$\boxed{FE = 10 \text{ KN} \leftarrow}$ C

$\boxed{FB = 14{,}14 \text{ KN} \quad T}$

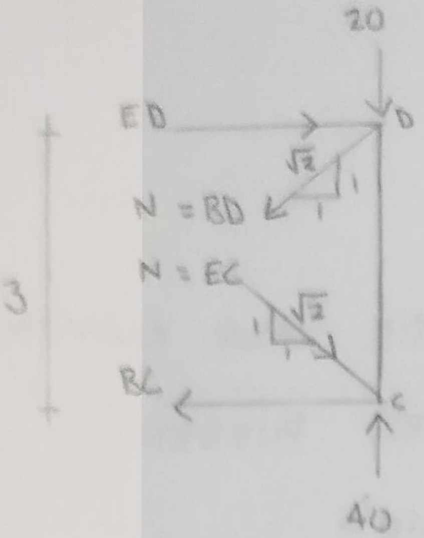
$\boxed{AE = 14{,}14 \text{ KN} \quad C}$



$\Sigma F_y = 0$

$-AF + 70 - \frac{1}{\sqrt{2}}(14{,}14) = 0$

$\boxed{AF = 60 \text{ KN}}$ C



$\Sigma F_y = 0$

$-20 + 40 - 2N\left(\frac{1}{\sqrt{2}}\right) = 0$

$\boxed{N = 14{,}14\ KN}$

$\boxed{BD = 14{,}14\ KN}$ T

$\boxed{EC = 14{,}14\ KN}$ C

$\circlearrowright \Sigma M_C = 0$

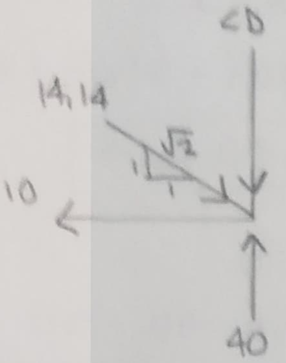
$-3ED + \frac{1}{\sqrt{2}}(3)(14{,}14) = 0$

$\boxed{ED = 10\ KN}$ C

$\circlearrowright \Sigma M_D = 0$

$-3BC + \frac{1}{\sqrt{2}}(3)(14{,}14) = 0$

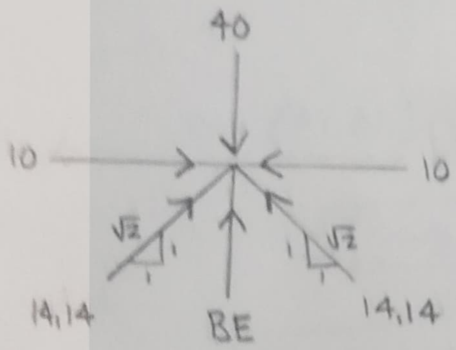
$\boxed{BC = 10\ KN}$ T



$\Sigma F_y = 0$

$40 - 14{,}14\left(\frac{1}{\sqrt{2}}\right) - CD = 0$

$\boxed{CD = 30\ KN}$ C

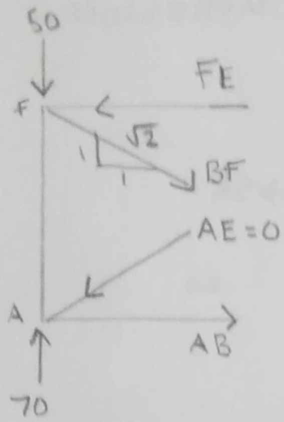


$\Sigma F_y = 0$

$BE - 40 + 2\left(\frac{1}{\sqrt{2}}\right)(14{,}14) = 0$

$\boxed{BE = 20\ KN}$ C

② RESUELVA EL PROBLEMA ANTERIOR SUPONIENDO QUE LAS DIAGONALES NO PUEDEN SOPORTAR UNA FUERZA DE COMPRESIÓN.



$\Sigma F_y = 0$

$-BF\left(\frac{1}{\sqrt{2}}\right) - 50 + 70 = 0$

$\boxed{BF = 28{,}28\ KN}$ T

$\circlearrowleft \Sigma M_A = 0$

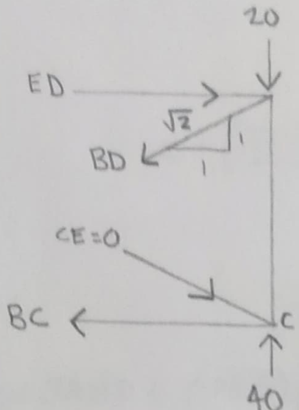
$3FE - 3(28{,}28)\left(\frac{1}{\sqrt{2}}\right) = 0$

$\boxed{FE = 20\ KN}$ C

$\Sigma F_x = 0$

$AB - 20 + 28{,}28\left(\frac{1}{\sqrt{2}}\right) = 0$

$\boxed{AB = 0}$



$\Sigma F_y = 0$

$40 - 20 - BD\left(\frac{1}{\sqrt{2}}\right) = 0$

$\boxed{BD = 28{,}28\ KN}$ T

$\circlearrowleft \Sigma M_C = 0$

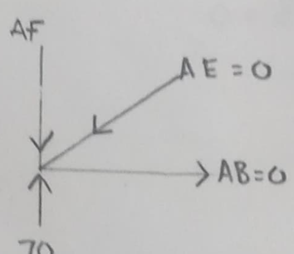
$-3ED + 3(28{,}28)\left(\frac{1}{\sqrt{2}}\right) = 0$

$\boxed{ED = 20\ KN}$ C

$\Sigma F_x = 0$

$20 - 28{,}28\left(\frac{1}{\sqrt{2}}\right) - BC = 0$

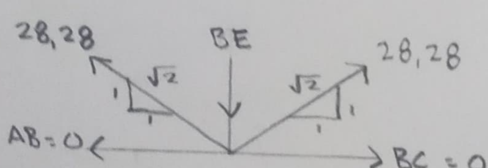
$\boxed{BC = 0}$



$\Sigma F_y = 0$

$-AF + 70 = 0$

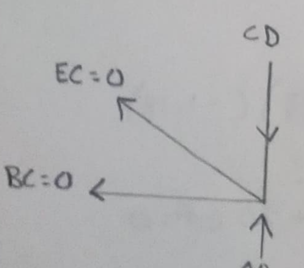
$\boxed{AF = 70\ KN}$ C



$\Sigma F_y = 0$

$-BE + 2(28{,}28)\left(\frac{1}{\sqrt{2}}\right) = 0$

$\boxed{BE = 40\ KN}$ C



$\Sigma F_y = 0$

$-CD + 40 = 0$

$\boxed{CD = 40\ K}$ C

③ DETERMINE EN FORMA APROXIMADA LA FUERZA DE CADA ELEMENTO DE LA ARMADURA. SUPONGA QUE LAS DIAGONALES PUEDEN SOPORTAR UNA FUERZA DE TENSIÓN O DE COMPRESIÓN.

$\circlearrowleft + \Sigma M_A = 0$

$-10(20) - 10(40) - 10(60)$

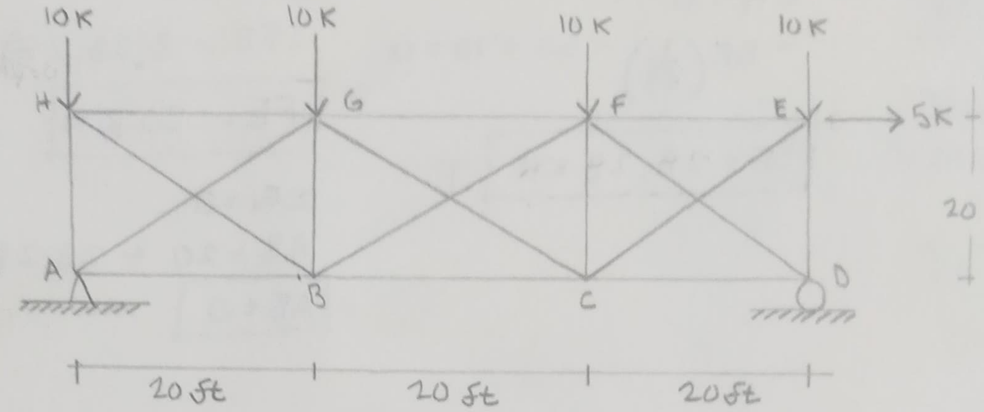
$-20(5) + 60 D_y = 0$

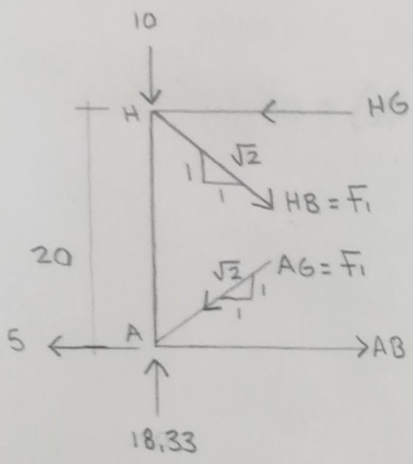
$\boxed{D_y = 21{,}67 \text{ KN} \uparrow}$

$\Sigma F_y = 0$

$-10(4) + 21{,}67 + A_y = 0$

$\boxed{A_y = 18{,}33 \text{ KN} \uparrow}$





$\Sigma F_y = 0$

$18{,}33 - 10 - 2F_1\left(\frac{1}{\sqrt{2}}\right) = 0$

$\boxed{F_1 = 5{,}89 \text{ KN}}$

$\boxed{HB = 5{,}89 \text{ KN}}$ T

$\boxed{AG = 5{,}89 \text{ KN}}$ C

$\circlearrowleft + \Sigma M_A = 0$

$20\,HG - 20(5{,}89)\left(\frac{1}{\sqrt{2}}\right) = 0$

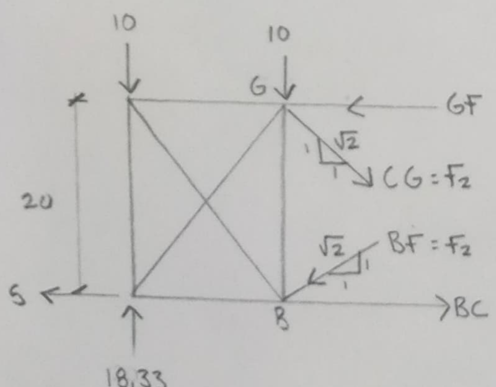
$\boxed{HG = 4{,}16 \text{ KN}}$ C

$\circlearrowleft + \Sigma M_H = 0$

$-5(20) - 20\left(\frac{1}{\sqrt{2}}\right)(5{,}89) + 20AB = 0$

$-100 - 83{,}3 + 20AB = 0$

$\boxed{AB = 9{,}16 \text{ KN}}$ T



$\Sigma F_y = 0$

$-10 - 10 + 18{,}33 - 2F_2\left(\frac{1}{\sqrt{2}}\right) = 0$

$-1{,}67 - \sqrt{2}F_2 = 0$

$\boxed{F_2 = -1{,}18 \text{ KN}}$

$\boxed{CG = 1{,}18 \text{ KN}}$ C

$\boxed{BF = 1{,}18 \text{ KN}}$ T

$\circlearrowleft + \Sigma M_G = 0$

$10(20) - 18{,}33(20) - 5(20) - 20\left(\frac{1}{\sqrt{2}}\right)(-1{,}18)$

$+ 20BC = 0$

$200 - 366{,}6 - 100 + 16{,}69 + 20BC = 0$

$\boxed{BC = 12{,}5 \text{ KN}}$ T

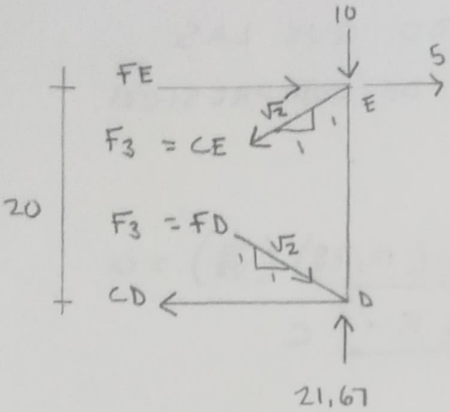
$\circlearrowleft + M_B = 0$

$-20(18{,}33) + 20(10) - 20\left(\frac{1}{\sqrt{2}}\right)(-1{,}18)$

$+ 20GF = 0$

$-366{,}6 + 200 + 16{,}69 + 20GF = 0$

$\boxed{GF = 7{,}5 \text{ KN}}$ C



$\Sigma F_y = 0$

$-10 + 21{,}67 - 2F_3\left(\frac{1}{\sqrt{2}}\right) = 0$

$\boxed{F_3 = 8{,}25 \text{ KN}}$

$\boxed{CE = 8{,}25 \text{ KN}}$ T

$\boxed{FD = 8{,}25 \text{ KN}}$ C

$\circlearrowleft \Sigma M_E = 0$

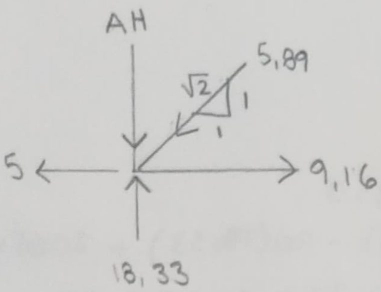
$-20CD + 20(8{,}25)\left(\frac{1}{\sqrt{2}}\right) = 0$

$\boxed{CD = 5{,}83 \text{ KN}}$ T

$\circlearrowleft \Sigma M_D = 0$

$-20FE - 20(5) + 20(8{,}25)\left(\frac{1}{\sqrt{2}}\right) = 0$

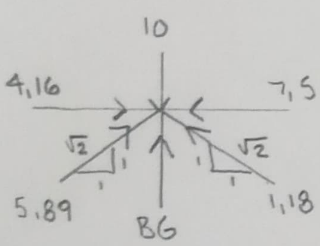
$\boxed{FE = 0{,}83 \text{ KN}}$ C



$\Sigma F_y = 0$

$-AH + 18{,}33 - 5{,}89\left(\frac{1}{\sqrt{2}}\right) = 0$

$\boxed{AH = 14{,}16 \text{ KN}}$ C

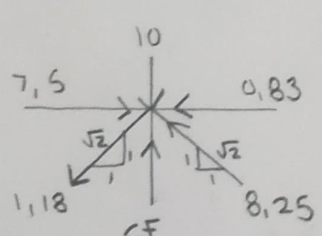


$\Sigma F_y = 0$

$-10 + 5{,}89\left(\frac{1}{\sqrt{2}}\right) + 1{,}18\left(\frac{1}{\sqrt{2}}\right) + BG = 0$

$-10 + 4{,}16 + 0{,}83 + BG = 0$

$\boxed{BG = 5{,}01 \text{ KN}}$ C

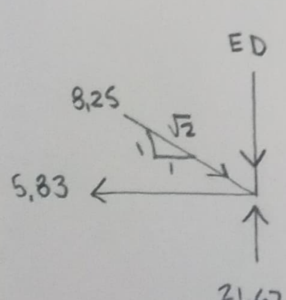


$\Sigma F_y = 0$

$-10 - 1{,}18\left(\frac{1}{\sqrt{2}}\right) + 8{,}25\left(\frac{1}{\sqrt{2}}\right) + CF = 0$

$-10 - 0{,}83 + 5{,}83 + CF = 0$

$\boxed{CF = 5 \text{ KN}}$ C

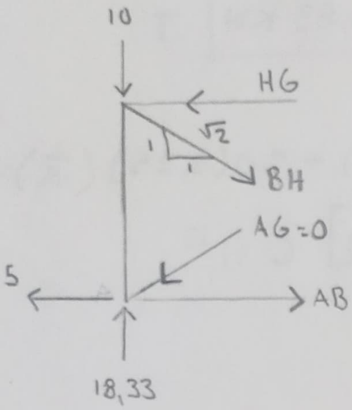


$\Sigma F_y = 0$

$-ED - 8{,}25\left(\frac{1}{\sqrt{2}}\right) + 21{,}67 = 0$

$\boxed{ED = 15{,}84 \text{ KN}}$ C

④ RESUELVA EL PROBLEMA ANTERIOR SUPONIENDO QUE LAS DIAGONALES NO PUEDAN SOPORTAR UNA FUERZA DE COMPRESIÓN.



$\Sigma F_y = 0$

$18{,}33 - 10 - BH\left(\frac{1}{\sqrt{2}}\right) = 0$

$\boxed{BH = 11{,}78\ K}$ T

$\circlearrowleft \Sigma M_A = 0$

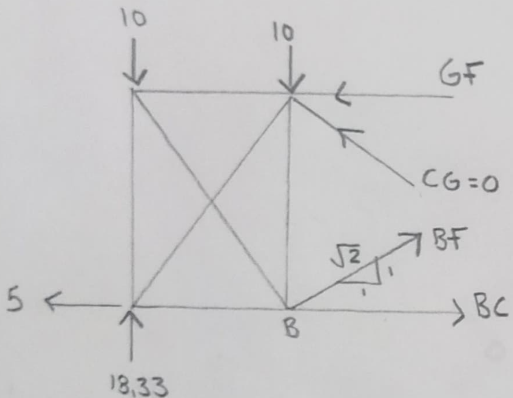
$20\,HG - 20(11{,}78)\left(\frac{1}{\sqrt{2}}\right) = 0$

$\boxed{HG = 8{,}33\ K}$ C

$\Sigma F_x = 0$

$AB - 8{,}33 + 11{,}78\left(\frac{1}{\sqrt{2}}\right) - 5 = 0$

$\boxed{AB = 5K}$ T



$\Sigma F_y = 0$

$-10(2) + 18{,}33 + BF\left(\frac{1}{\sqrt{2}}\right) = 0$

$\boxed{BF = 2{,}36\ K}$ T

$\circlearrowleft \Sigma M_B = 0$

$20(10) - 20(18{,}33) + 20GF = 0$

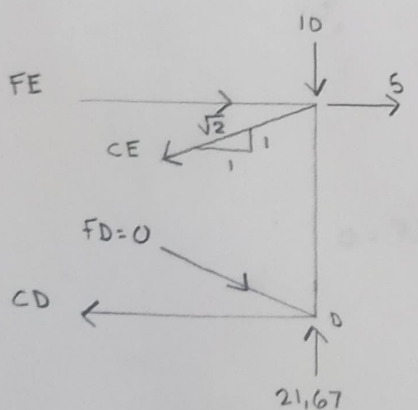
$200 - 366{,}6 + 20\,GF = 0$

$\boxed{GF = 8{,}33\ K}$ C

$\Sigma F_x = 0$

$BC - 8{,}33 + 2{,}36\left(\frac{1}{\sqrt{2}}\right) - 5 = 0$

$\boxed{BC = 11{,}66\ K}$ T



$\Sigma F_y = 0$

$21{,}67 - 10 - CE\left(\frac{1}{\sqrt{2}}\right) = 0$

$\boxed{CE = 16{,}5\ K}$ T

$\circlearrowleft \Sigma M_D = 0$

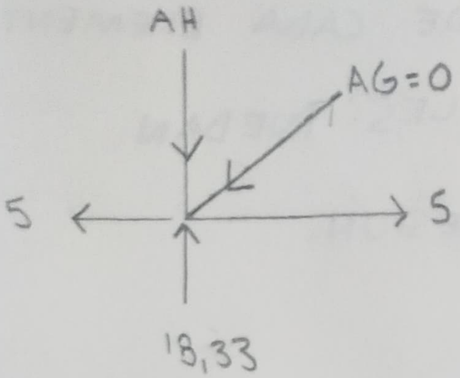
$-5(20) + 20(16{,}5)\left(\frac{1}{\sqrt{2}}\right) - 20\,FE = 0$

$\boxed{FE = 6{,}67\ K}$ C

$\Sigma F_x = 0$

$-CD + 6{,}67 + 5 - 16{,}5\left(\frac{1}{\sqrt{2}}\right) = 0$

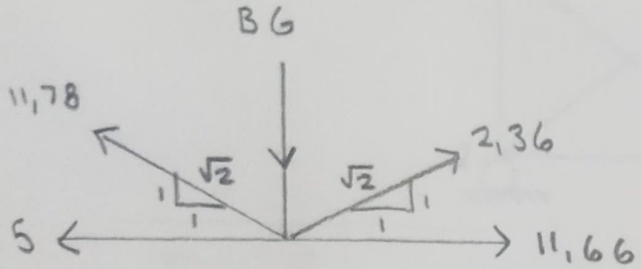
$\boxed{CD = 0}$



$$\Sigma F_y = 0$$

$$-AH + 18,33 = 0$$

$$\boxed{AH = 18,33\ K} \quad C$$

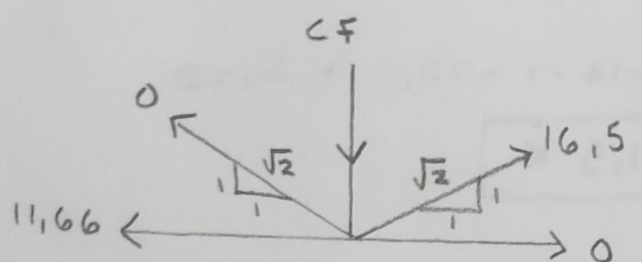


$$\Sigma F_y = 0$$

$$-BG + 11,78\left(\frac{1}{\sqrt{2}}\right) + 2,36\left(\frac{1}{\sqrt{2}}\right) = 0$$

$$-BG + 8,33 + 1,67 = 0$$

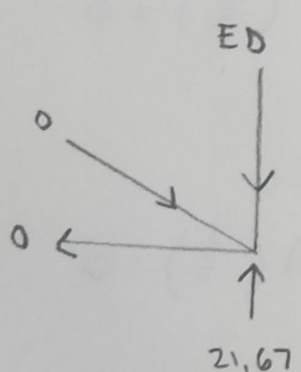
$$\boxed{BG = 10\ K} \quad C$$



$$\Sigma F_y = 0$$

$$-CF + 16,5\left(\frac{1}{\sqrt{2}}\right) = 0$$

$$\boxed{CF = 11,67\ K} \quad C$$

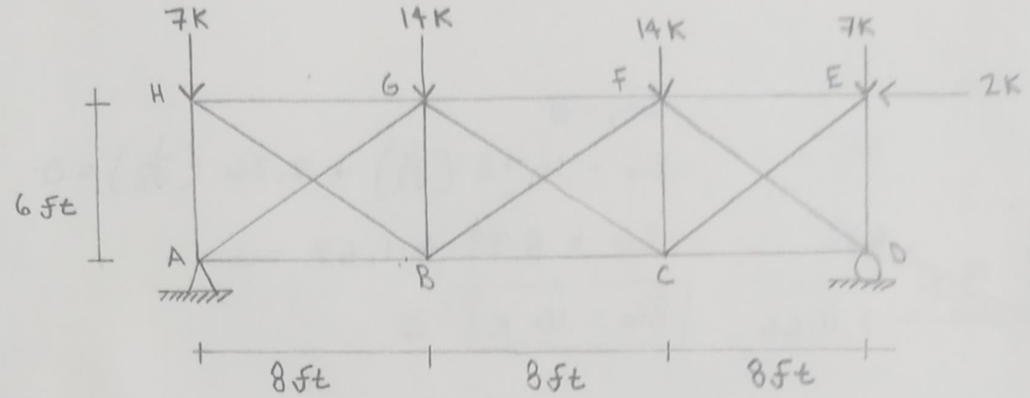


$$\Sigma F_y = 0$$

$$-ED + 21,67 = 0$$

$$\boxed{ED = 21,67\ K} \quad C$$

⑤ DETERMINE EN FORMA APROXIMADA LA FUERZA DE CADA ELEMENTO DE LA ARMADURA. SUPONGA QUE LAS DIAGONALES PUEDAN SOPORTAR UNA FUERZA DE TENSIÓN O COMPRESIÓN.



$\circlearrowleft \Sigma M_A = 0$

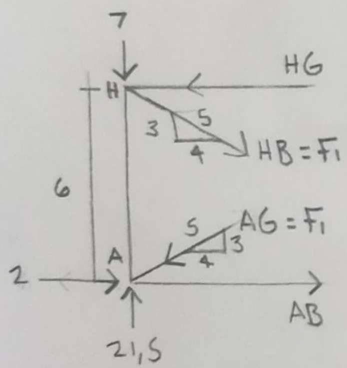
$-14(8) - 14(16) - 7(24) + 2(6) + 24\,D_y = 0$

$\boxed{D_y = 20{,}5\ K \uparrow}$

$\Sigma F_y = 0$

$-7 - 14 - 14 - 7 + 20{,}5 + A_y = 0$

$\boxed{A_y = 21{,}5\ K}$



$\Sigma F_y = 0$

$-7 + 21.5 - 2F_1\left(\frac{3}{5}\right) = 0$

$14{,}5 - 1{,}2F_1 = 0$

$\boxed{F_1 = 12{,}08\ K}$

$\boxed{HB = 12{,}08\ K}$ T

$\boxed{AG = 12.08K}$ C

$\circlearrowleft \Sigma M_A = 0$

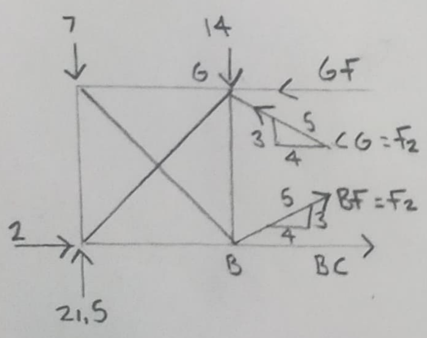
$6HG - 6(12{,}08)\left(\frac{4}{5}\right) = 0$

$\boxed{HG = 9{,}66K}$ C

$\circlearrowleft \Sigma M_H = 0$

$6AB + 6(2) - 6(12{,}08)\left(\frac{4}{5}\right) = 0$

$\boxed{AB = 7{,}66\ K}$ T



$\Sigma F_y = 0$

$-7 - 14 + 21{,}5 + 2F_2\left(\frac{3}{5}\right) = 0$

$0{,}5 + 1{,}2F_2 = 0$

$\boxed{F_2 = -0{,}42\ K}$

$\boxed{CG = 0{,}42\ K}$ T

$\boxed{BF = 0{,}42\ K}$ C

$\circlearrowleft \Sigma M_G = 0$

$8(7) - 8(21{,}5) + 6(2) + 6(-0{,}42)\left(\frac{4}{5}\right)$

$+ 6BC = 0$

$56 - 172 + 12 - 2{,}02 + 6BC = 0$

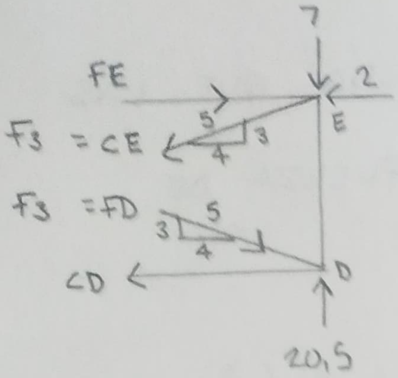
$\boxed{BC = 17{,}67\ K}$ T

$\circlearrowleft \Sigma M_B = 0$

$8(7) - 8(21{,}5) + 6(-0{,}42)\left(\frac{4}{5}\right) + 6GF = 0$

$56 - 172 - 2{,}02 + 6GF = 0$

$\boxed{GF = 19{,}67\ K}$ C



$\Sigma F_y = 0$

$-7 + 20{,}5 - 2F_3\left(\frac{3}{5}\right) = 0$

$13{,}5 - 1{,}2F_3 = 0$

$\boxed{F_3 = 11{,}25\ K}$

$\boxed{CE = 11{,}25\ K}$ T

$\boxed{FD = 11{,}25\ K}$ C

$\circlearrowleft + \Sigma M_E = 0$

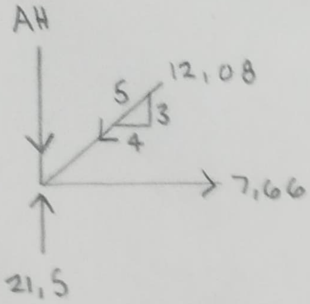
$-6CD + 6(11{,}25)\left(\frac{4}{5}\right) = 0$

$\boxed{CD = 9K}$ T

$\circlearrowleft + \Sigma M_D = 0$

$-6FE + 6(2) + 6(11{,}25)\left(\frac{4}{5}\right) = 0$

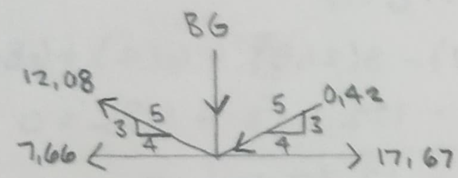
$\boxed{FE = 11\ K}$ C



$\Sigma F_y = 0$

$-AH + 21{,}5 - 12{,}08\left(\frac{3}{5}\right) = 0$

$\boxed{AH = 14{,}25\ K}$ C

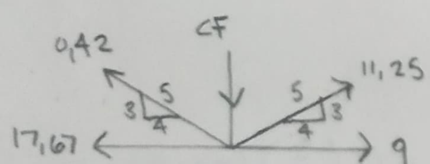


$\Sigma F_y = 0$

$-BG + 12{,}08\left(\frac{3}{5}\right) - 0{,}42\left(\frac{3}{5}\right) = 0$

$-BG + 7{,}25 - 0{,}25 = 0$

$\boxed{BG = 7\ K}$ C

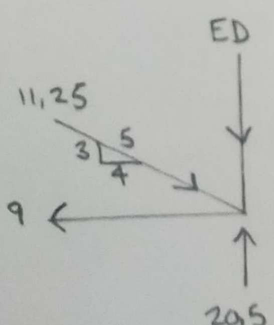


$\Sigma F_y = 0$

$-CF + 0{,}42\left(\frac{3}{5}\right) + 11{,}25\left(\frac{3}{5}\right) = 0$

$-CF + 0{,}25 + 6{,}75 = 0$

$\boxed{CF = 7\ K}$ C

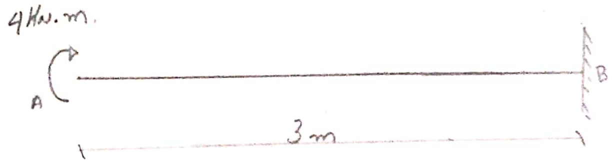


$\Sigma F_y = 0$

$-ED + 20{,}5 - 11{,}25\left(\frac{3}{5}\right) = 0$

$\boxed{ED = 13{,}75\ K}$ C

trabajo Virtual. Determine Δ_A y θ_A



$AB \longrightarrow 0 \leq x \leq 3$

$\Sigma M = 0$

$M - 4\,KN.m = 0$

$M = 4\,KN.m.$

Δ_A Virtual $AB \rightarrow 0 \leq x \leq 3$

$\Sigma M = 0$

$M + 1(x) = 0$

$M = -x$

θ_A Virtual $AB \rightarrow 0 \leq x \leq 3$

$\Sigma M = 0$

$M + 1 = 0$

$M = -1$

$\Delta_A = \int_0^4 4(-x)\,dx$

$\Delta_A = \int_0^3 -4x\,dx$

$\Delta_A = \left. \frac{-4x^2}{2} \right|_0^3$

$\Delta_A = -2x^2 \Big|_0^3$

$\Delta_A = \frac{18}{EI}\,KN.m^3 \uparrow$

$\theta_A = \int_0^3 4(-1)\,dx$

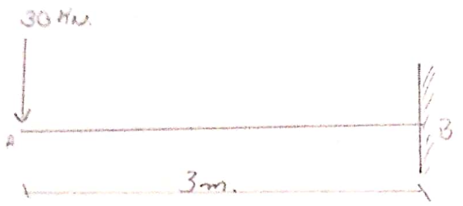
$= \int_0^3 -4$

$= -4 \Big|_0^3$

$\theta_A = \frac{12}{EI}\,KN.m^2$

Trabajo Virtual.

DETERMINAR. Δ_A y θ_A



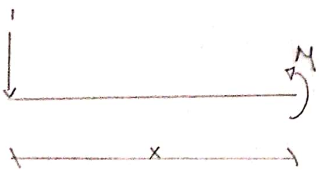
$AB \longrightarrow \quad 0 \leq x \leq 3$

$\Sigma M = 0$

$M + 30x = 0$

$M = -30x$

Δ_A Virtual $AB \rightarrow 0 \leq x \leq 3$



$\Sigma M = 0$

$M + x = 0$

$M = -x$

θ_A Virtual $AB \Rightarrow 0 \leq x \leq 3$

$\Sigma M = 0$

$M + 1 = 0$

$M = -1$

$$\Delta_A = \int_0^3 -30x(-x)\,dx$$

$$= \int_0^3 30x^2$$

$$= \frac{\overset{10}{\cancel{30}}x^3}{\cancel{3}_1}\Big|_0^3$$

$$= 10x^3\Big|_0^3$$

$$\Delta_A = \frac{270}{EI}\ KN.m^3 \downarrow$$

$$\theta_A = \int_0^3 -30(-1)\,dx$$

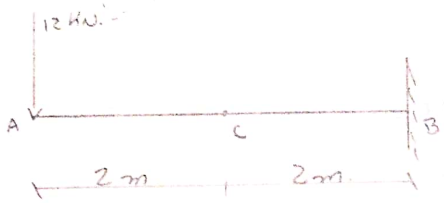
$$= \int_0^3 30x$$

$$= \frac{\overset{15}{\cancel{30}}x^2}{\cancel{2}_1}\Big|_0^3$$

$$= 15x^2\Big|_0^3$$

$$\theta_A = \frac{135}{EI}\ KN.m^2$$

Castisliano Determinar θ_c y Δ_c



$AC \rightarrow 0 \leq x \leq 2$

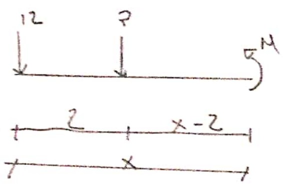
$\Sigma M = 0$

$M + 12(x) = 0$

$M = -12x$

$\frac{\partial M}{\partial P} = 0$

Δ_c AB $0 \leq x \leq 2$



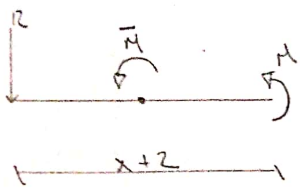
$\Sigma M_v = 0$

$M + P(x-2) + 12(x) = 0$

$M = -12x - Px - 2P$

$\frac{\partial M}{\partial P} = -x - 2.$

$\theta_c \cdot AB \rightarrow 0 \leq x \leq 2$



$\Sigma M = 0$

$M + \bar{M} + 12(x+2) = 0$

$M = -\bar{M} - 12(x-2)$

$\frac{\partial M}{\partial P} = -1$

$$\Delta_c = \int_0^2 (-12x)(-x-2)\,dx$$

$$\Delta_c = \int_0^2 12x^2 + 24x\,dx$$

$$\Delta_c = 4x^3 + 12x^2 \Big|_0^2$$

$$\Delta_c = \frac{80}{EI}\ KN.m^3 \downarrow$$

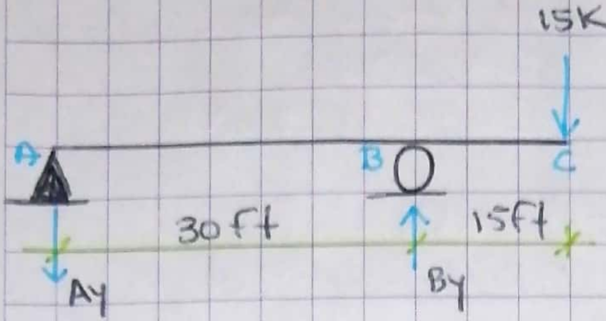
$$\theta_c = \int_0^2 -12(x+2)(-1)\,dx$$

$$\theta_c = \int_0^2 12x + 24\ dx$$

$$\theta_c = 6x^2 + 24x \Big|_0^2$$

$$\theta_c = \frac{72}{EI}\ KN.m^2$$

VIGA CONJUGADA



DETERMINE θ_c y Δ_c

$\sum M_A = 0$

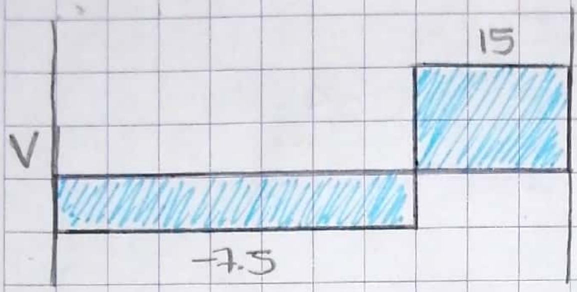
$30B_y - 45(15) = 0$

$\boxed{B_y = 22{,}5\,K\uparrow}$

$\sum F_y = 0$

$-A_y + 22{,}5 - 15 = 0$

$\boxed{A_y = 7{,}5\,K\downarrow}$



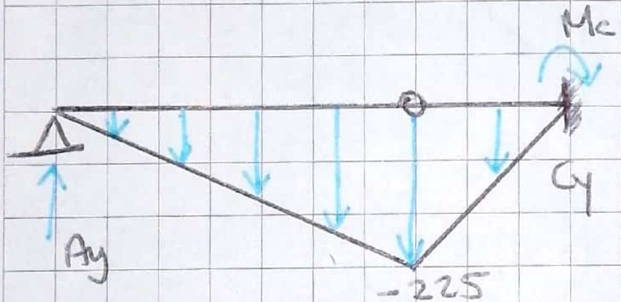
$\Delta_c = M_c$

$\circlearrowleft + \sum M_c = 0$

$-M_c + \frac{1}{2}(225)(15)(10) + \frac{1}{2}(225)(30)(25) - 1125(45) = 0$

$-M_c + 16875 + 84375 - 50625 = 0$

$$\boxed{M_c = \frac{-50625}{EI}\ k\cdot ft^3 \downarrow}$$



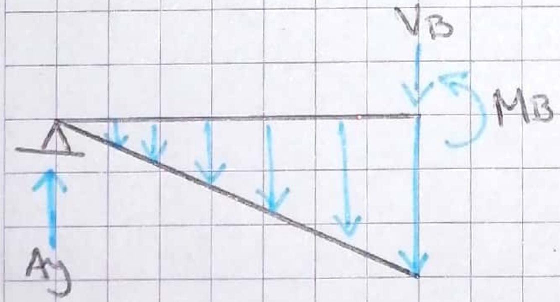
$\theta_c = V_c$

$\sum F_y = 0$

$-V_c - \frac{1}{2}(225)(15) + \frac{1}{2}(225)(30) + 1125 = 0$

$-V_c - 1687{,}5 - 3375 + 1125 = 0$

$$\boxed{V_c = \frac{-3937{,}5}{EI}\ k\cdot ft^2}$$



$\sum M_B = 0$

$\frac{1}{2}(225)(30)(10) - 30A_y = 0$

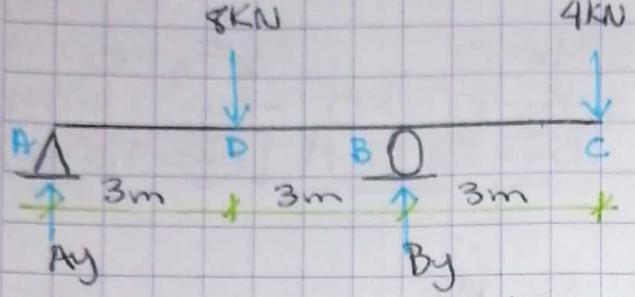
$\boxed{A_y = 1125\uparrow}$

VIGA CONJUGADA

DETERMINE θ_c y Δ_c.

$E = 200\,GPa$

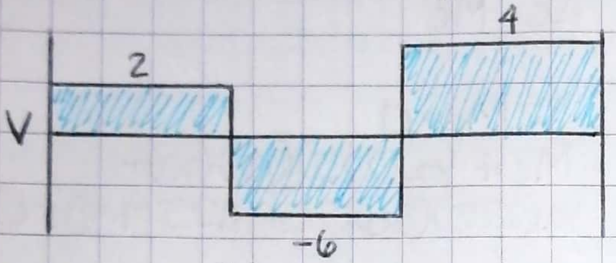
$I = 70 \times 10^6\,mm^4$



$\Sigma M_A = 0$

$-8(3) + 6B_y - 9(4) = 0$

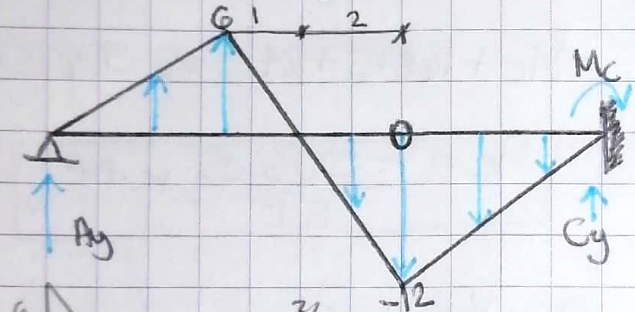
$\boxed{B_y = 10\,KN \uparrow}$

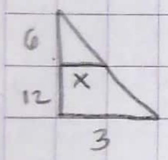


$\Sigma F_y = 0$

$A_y - 8 + 10 - 4 = 0$

$\boxed{A_y = 2\,KN \uparrow}$





$X/6 = 3/18$

$\boxed{X = 1}$

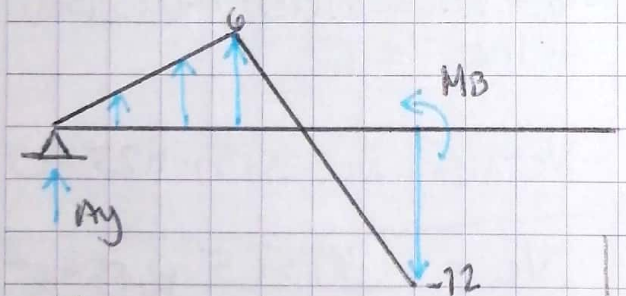
$\Delta_c = M_c$

$\Sigma M_c = 0$

$-M_c + \frac{1}{2}(12)(3)(2) + \frac{1}{2}(12)(2)(3{,}6667)$
$-\frac{1}{2}(6)(1)(5{,}6667) - \frac{1}{2}(6)(3)(7)$
$-9(-6) = 0$

$-M_c - 36 + 44 - 17 - 63 + 54 = 0$

$\boxed{M_c = \frac{54}{EI}\,KN \cdot m^3 \Rightarrow 3{,}86\,mm \downarrow}$



$\Sigma M_B = 0$

$\frac{1}{2}(12)(2)(0{,}6667) - \frac{1}{2}(6)(1)(2{,}6667)$
$-\frac{1}{2}(6)(3)(4) - 6A_y = 0$

$\cancel{8} - \cancel{8} - 36 - 6A_y = 0$

$\boxed{A_y = -6 \downarrow}$

$\theta_c = V_c$

$\Sigma F_y = 0$

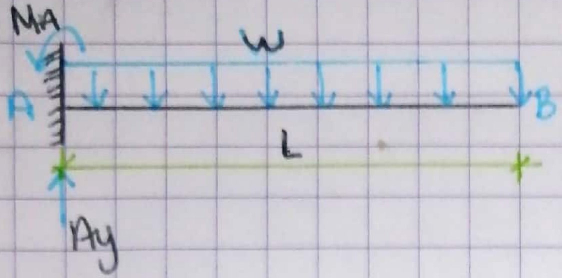
$-6 + \frac{1}{2}(6)(3) + \frac{1}{2}(6)(1) - \frac{1}{2}(12)(2)$
$-\frac{1}{2}(12)(3) - V_c = 0$

$-6 + 9 + 3 - 12 - 18 - V_c = 0$

$\boxed{V_c = \frac{-24}{EI}\,KN \cdot m^2 \Rightarrow 0{,}001714\,RAD}$

DOBLE INTEGRACIÓN

DETERMINE LA ECUACIÓN DE LA CURVA ELÁSTICA



$\Sigma M_A = 0$

$M_A - WL(L/2) = 0$

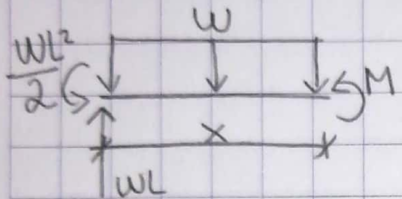
$\boxed{M_A = \frac{WL^2}{2}}$

$\Sigma F_y = 0$

$A_y - WL$

$\boxed{A_y = WL}$

TRAMO I $0 \leq x \leq L$



$\Sigma M = 0$

$\frac{WL^2}{2} - WL(x) + W(x)(x/2) + M = 0$

$M = -\frac{WL^2}{2} - \frac{Wx^2}{2} + WLx$

$EI\,\theta = \int -\frac{WL^2}{2} - \frac{Wx^2}{2} + WLx = -\frac{WL^2x}{2} - \frac{Wx^3}{6} + \frac{WLx^2}{2} + C_1$

$EI\,\Delta = \int -\frac{WL^2x}{2} - \frac{Wx^3}{6} + \frac{WLx^2}{2} + C_1 = -\frac{WL^2x^2}{4} - \frac{Wx^4}{24} + \frac{WLx^3}{6} + C_1x + C_2$

$x = 0 \quad \Delta = 0$

$EI\,\Delta = -\frac{WL^2x^2}{4} - \frac{Wx^4}{24} - \frac{WLx^3}{6} + C_1x + C_2 \Rightarrow \boxed{C_2 = 0}$

$x = 0 \quad \theta = 0$

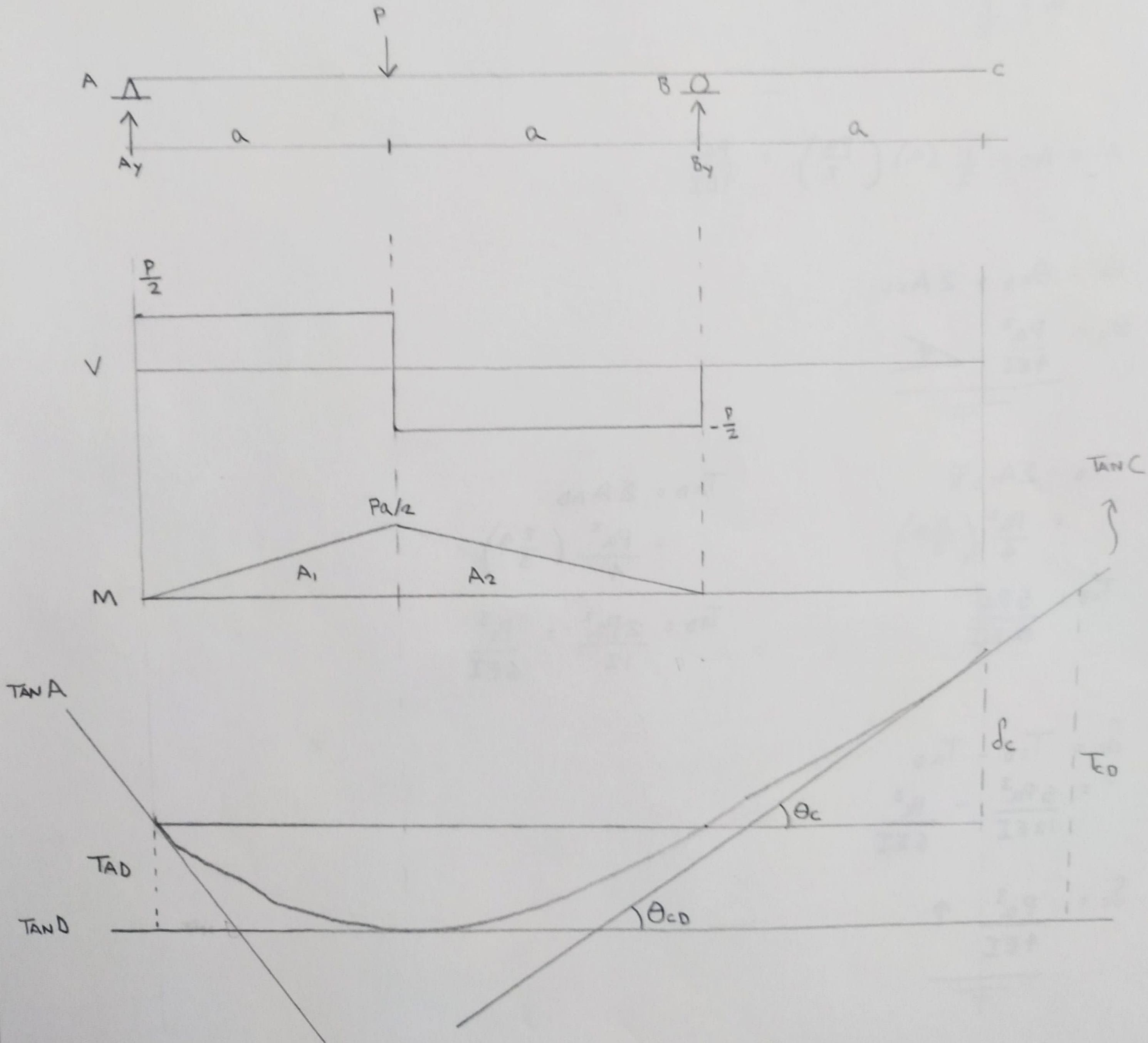
$EI\,\theta = -\frac{WL^2x}{2} - \frac{Wx^3}{6} + \frac{WLx^2}{2} + C_1 \Rightarrow \boxed{C_1 = 0}$

$\theta = \left(-\frac{WL^2x}{2} - \frac{Wx^3}{6} + \frac{WLx^2}{2}\right)\left(\frac{1}{EI}\right)$

$\Delta = \left(-\frac{WL^2x^2}{4} - \frac{Wx^4}{24} + \frac{WLx^3}{6}\right)\left(\frac{1}{EI}\right)$

AREA MOMENTO

DETERMINE LA PENDIENTE Y EL DESPLAZAMIENTO EN C.
EI = CONSTANTE.



REACCIONES

$\circlearrowleft \Sigma M_A = 0$

$$-aP + 2a\,B_y = 0$$

$$B_y = \frac{aP}{2a}$$

$$B_y = \frac{P}{2}$$

$\Sigma F_y = 0$

$$A_y - P + \frac{P}{2}$$

$$A_y = \frac{P}{2}$$

$$A_1 = A_2 = \frac{1}{2}(a)\left(\frac{Pa}{2}\right) = \frac{Pa^2}{4EI}$$

$$\theta_c = \theta_{CD} = \Sigma A_{CD}$$

$$\underline{\underline{\theta_c = \frac{Pa^2}{4EI}}}$$

$$T_{CD} = \Sigma A_{CD}\,\overline{X}$$

$$= \frac{Pa^2}{4}\left(\frac{5}{3}a\right)$$

$$T_{CD} = \frac{5Pa^3}{12EI}$$

$$T_{AD} = \Sigma A_{AD}$$

$$= \frac{Pa^2}{4}\left(\frac{2}{3}a\right)$$

$$T_{AD} = \frac{2Pa^2}{12} = \frac{Pa^3}{6EI}$$

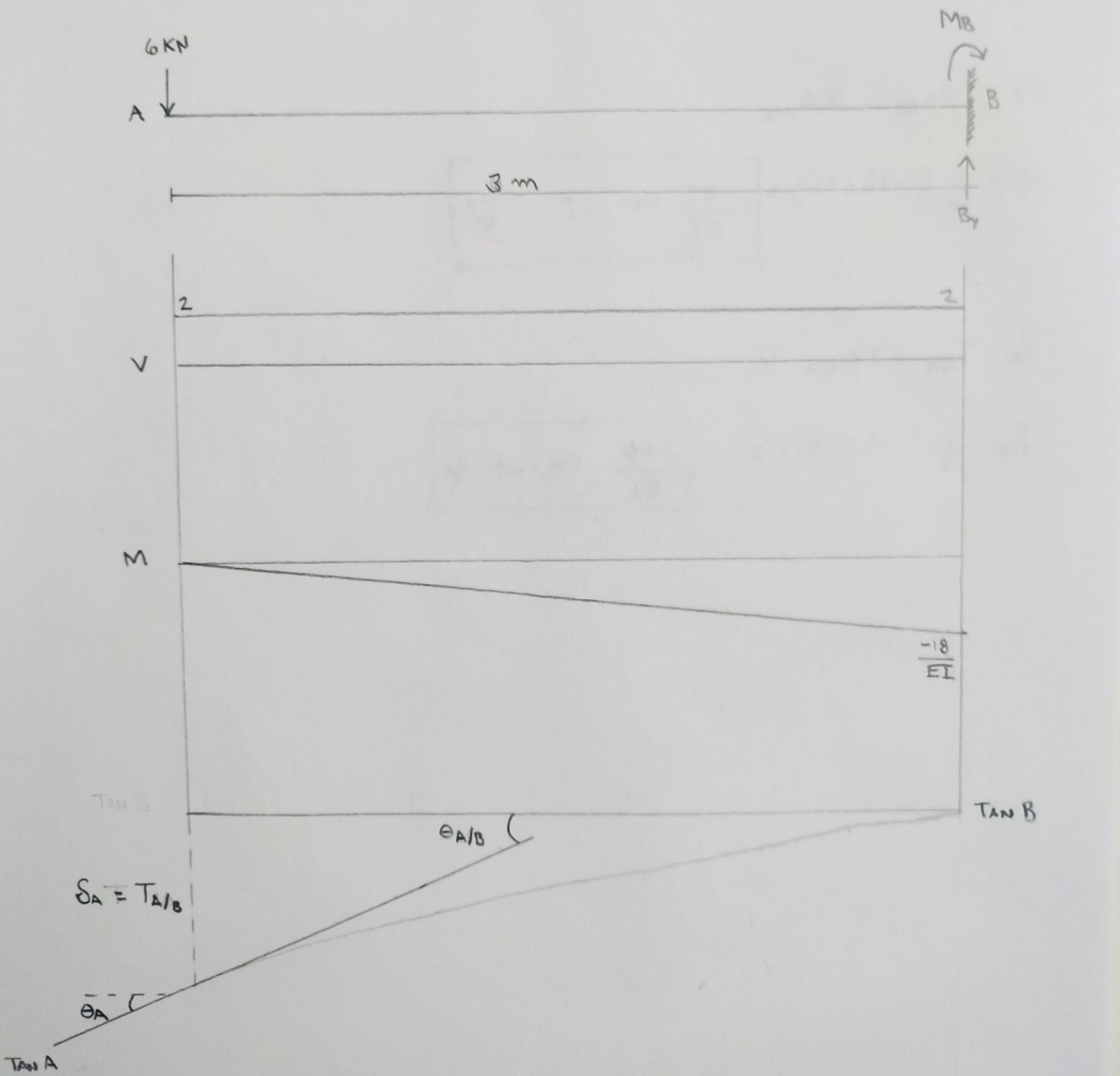
$$\delta_c = T_{CD} - T_{AD}$$

$$= \frac{5Pa^3}{12EI} - \frac{Pa^3}{6EI}$$

$$\underline{\underline{\delta_c = \frac{Pa^3}{4EI} \uparrow}}$$

AREA MOMENTO

DETERMINE LA PENDIENTE Y LA DEFLEXION EN A . EI = CONSTANTE



REACIONES

$\Sigma F_y = 0$

$-6 + B_y = 0$

$B_y = 6\ KN \uparrow$

$\Sigma M_B = 0$

$-M_B + 6(3) = 0$

$M_B = 18\ KN$

$\theta_B = \theta_{A/B} = \Sigma A_{B/A}$

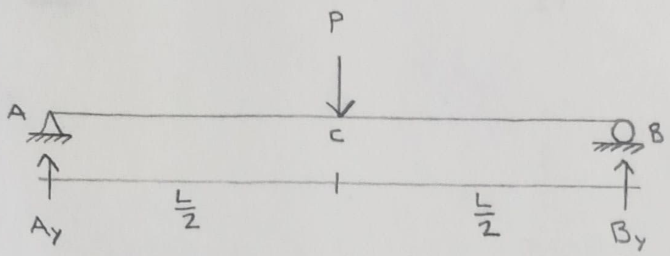
$\theta_B = \frac{1}{2}(-18(3)) = \boxed{\frac{-27}{EI}\ KN \cdot m^2}$

$\delta_A = T_{A/B} = \Sigma A_{B/A} \cdot \bar{X}$

$\delta_A = \frac{1}{2}(-18(3))(2) = \boxed{\frac{-54}{EI}\ KN \cdot m^3 \downarrow}$

DOBLE INTEGRACIÓN

DETERMINE LA ECUACIÓN DE LA CURVA ELASTICA



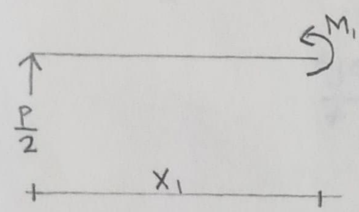
$\Sigma M_A = 0$

$-P\left(\frac{L}{2}\right) + B_y L = 0$

$B_y = \frac{PL}{2}\left(\frac{1}{L}\right)$

$B_y = \frac{P}{2} \uparrow \qquad A_y = \frac{P}{2} \uparrow$

TRAMO I $\rightarrow$ $0 \leq x_1 \leq \frac{L}{2}$

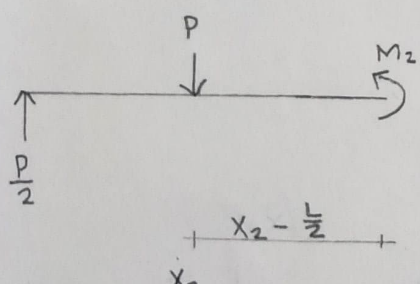


$\Sigma M = 0$

$M_1 - \frac{P}{2}(X_1) = 0$

$M_1 = \frac{P}{2}(X_1)$

TRAMO II $\rightarrow$ $\frac{L}{2} \leq x_2 \leq L$



$\Sigma M = 0$

$M_2 + P\left(X_2 - \frac{L}{2}\right) - \frac{P}{2} X_2 = 0$

$M_2 = \frac{P}{2} X_2 - PX_2 + \frac{PL}{2}$

$M_2 = \frac{-PX_2}{2} + \frac{PL}{2}$

$EI\,\theta^{I} = \int \frac{P}{2}(X_1)\,dx \Rightarrow EI\,\theta^{I} = \frac{PX_1^2}{4} + C_1 \quad (1)$

$EI\,\Delta^{I}_{AC} = \int \frac{PX_1^2}{4} + C_1\,dx \Rightarrow EI\,\Delta^{I}_{AC} = \frac{PX_1^3}{12} + C_1 X + C_2 \quad (2)$

$EI\,\theta^{II}_{CB} = \int \frac{-PX_2}{2} + \frac{PL}{2}\,dx \Rightarrow EI\,\theta^{II}_{CB} = \frac{-PX_2^2}{4} + \frac{PLX_2}{2} + C_3 \quad (3)$

$EI\,\Delta^{II}_{CB} = \int \frac{-PX_2^2}{4} + \frac{PLX_2}{2} + C_3 \Rightarrow EI\,\Delta^{II}_{CB} = \frac{-PX_2^3}{12} + \frac{PLX_2^2}{4} + C_3 X_2 + C_4 \quad (4)$

$X = 0 \qquad \Delta^{I} = 0$

$$EI\,\Delta^{I} = \frac{PX_1^3}{12} + C_1 X + C_2 \Rightarrow EI\,(0) = \frac{P(0)^3}{12} + C_1(0) + C_2 \Rightarrow \underline{\underline{C_2 = 0}}$$

PRINCIPIO DE CONTINUIDAD TRAMO I y II

$$\theta^{I}_{x=\frac{L}{2}} = \theta^{II}_{x=\frac{L}{2}}$$

$$\frac{PX^2}{4} + C_1 = \frac{-PX^2}{4} + \frac{PLX}{2} + C_3 \Rightarrow \frac{P\left(\frac{L}{2}\right)^2}{4} + C_1 = \frac{-P\left(\frac{L}{2}\right)^2}{4} + \frac{PL\left(\frac{L}{2}\right)}{2} + C_3$$

$$\frac{PL^2}{16} + C_1 = \frac{-PL^2}{16} + \frac{PL^2}{4} + C_3 \Rightarrow C_1 - C_3 = \frac{-PL^2}{16} - \frac{PL^2}{16} + \frac{PL^2}{4}$$

$$C_1 - C_3 = \frac{PL^2}{8} \qquad (5)$$

$$\Delta^{I}_{x=6} = \Delta^{II}_{x=6}$$

$$\frac{PX^3}{12} + C_1 X = \frac{-PX^3}{12} + \frac{PLX^2}{4} + C_3 X + C_4$$

$$\frac{P\left(\frac{L}{2}\right)^3}{12} + C_1\left(\frac{L}{2}\right) = -\frac{P\left(\frac{L}{2}\right)^3}{12} + \frac{PL\left(\frac{L}{2}\right)^2}{4} + C_3\left(\frac{L}{2}\right) + C_4$$

$$\frac{PL^3}{96} + C_1\left(\frac{L}{2}\right) = \frac{-PL^3}{96} + \frac{PL^3}{16} + C_3\left(\frac{L}{2}\right) + C_4$$

$$\frac{PL^3}{96} + C_1\left(\frac{L}{2}\right) - C_3\left(\frac{L}{2}\right) + \frac{PL^3}{96} - \frac{PL^3}{16} = C_4 \Rightarrow C_4 = \frac{-PL^3}{24} + \frac{L}{2}(C_1 - C_3)$$

$$C_4 = \frac{-PL^3}{24} + \frac{L}{2}\left(\frac{PL^2}{8}\right)$$

$$\underline{\underline{C_4 = \frac{PL^3}{48}}}$$

$X = L \qquad \Delta^{II} = 0$

$$EI\,\Delta^{II} = \frac{-PX^3}{12} + \frac{PLX^2}{4} + C_3X + C_4$$

$$0 = \frac{-PL^3}{12} + \frac{PL(L)^2}{4} + C_3(L) + \left(\frac{PL^3}{48}\right)$$

$$0 = \frac{-PL^3}{12} + \frac{PL^3}{4} + C_3(L) + \frac{PL^3}{48}$$

$$\underline{\underline{C_3 = \frac{-3PL^2}{16}}}$$

$$C_1 - C_3 = \frac{PL^2}{8}$$

$$C_1 = \frac{PL^2}{8} - \frac{3PL^2}{16}$$

$$C_1 = \frac{-PL^2}{16}$$

$$EI\,\Delta^{I} = \frac{PX^3}{12} + C_1X + C_2 \Rightarrow \Delta^{I} = \left(\frac{PX^3}{12} + \left(\frac{-PL^2}{16}\right)X\right)\frac{1}{EI} \qquad (2)$$

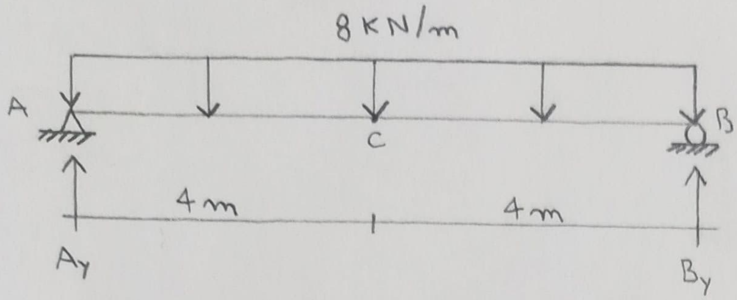
$$EI\,\theta^{I} = \frac{PX^2}{4} + C_1 \Rightarrow \theta^{I} = \left(\frac{PX^2}{4} + \left(\frac{-PL^2}{16}\right)\right)\frac{1}{EI} \qquad (1)$$

$$EI\,\Delta^{II} = \frac{-PX^3}{12} + \frac{PLX^2}{4} + C_3X + C_4 \Rightarrow \Delta^{II} = \frac{\frac{-PX^3}{12} + \frac{PLX^2}{4} - \left(\frac{3PL^2}{16}\right) + \left(\frac{PL^3}{48}\right)}{EI}$$

$$EI\,\theta^{II} = \frac{-PX^2}{4} + \frac{PLX}{2} + C_3 \Rightarrow \theta^{II} = \frac{\frac{-PX^2}{4} + \frac{PLX}{2} - \frac{3PL^2}{16}}{EI}$$

CASTIGLIANO

DETERMINE θ_A y Δ_C



Δ_C

$\Sigma M_A = 0$

$-8(8)(4) + 8B_y - 4P = 0$

$B_y = 32 + 0{,}5P$

$A_y = 32 + 0{,}5P$

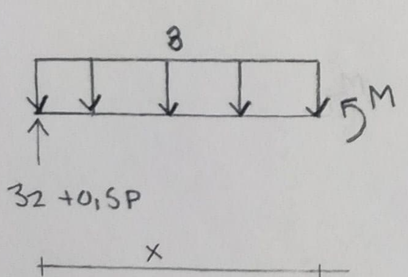
θ_A

$-8(8)(4) + 8B_y + \overline{M} = 0$

$B_y = 32 + \frac{\overline{M}}{8}$

$A_y = 32 + \frac{\overline{M}}{8}$

Δ_C AB $\rightarrow 0 \le x \le 8$



$\Sigma M_v = 0$

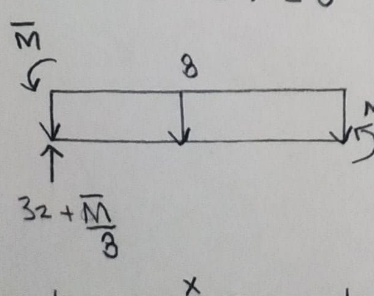
$M + 8x\left(\frac{x}{2}\right) - x(32 + 0{,}5P) = 0$

$\frac{\partial M}{\partial P} = 0{,}5x$

$M = x(32 + 0{,}5P) - 4x^2$

$M = 32x + 0{,}5Px - 4x^2$

θ_A AB $\rightarrow 0 \le x \le 8$



$\Sigma M_v = 0$

$M + 8(x)\left(\frac{x}{2}\right) - x\left(32 + \frac{\overline{M}}{8}\right) + \overline{M} = 0$

$\frac{\partial M}{\partial P} = \frac{x}{8} - 1$

$M = x\left(32 + \frac{\overline{M}}{8}\right) - 4x^2 - \overline{M}$

$M = 32x + \frac{\overline{M}x}{8} - 4x^2 - \overline{M}$

$$\Delta_c = \int_0^4 2\,(0{,}5x)(32x - 4x^2)\,dx$$

$$= \int_0^4 32x^2 - 4x^3$$

$$= \frac{32x^3}{3} - \frac{4x^4}{4} \Big|_0^4$$

$$\boxed{\Delta_c = \frac{426{,}67}{EI}\ \text{KN}\cdot\text{m}^3 \downarrow}$$

$$\theta_A = \int_0^8 \left(\frac{x}{8} - 1\right)(32x - 4x^2)\,dx$$

$$= \int_0^8 \frac{x}{8}(32x) + \frac{x}{8}(-4x^2) - 1(32x) - 1(-4x^2)\,dx$$

$$= \int_0^8 4x^2 - \frac{x^3}{2} - 32x + 4x^2\,dx$$

$$= \int_0^8 -\frac{x^3}{2} + 8x^2 - 32x$$

$$= \frac{-x^4}{8} + \frac{8x^3}{3} - 16x^2 \Big|_0^8$$

$$\boxed{\theta_A = \frac{170{,}6}{EI}\ \text{KN}\cdot\text{m}^2}$$