

#1: [CaseMode := Sensitive, InputMode := Word]

**Longitud de los elementos:**

#2:  $[L1 := 6, L2 := \sqrt{4^2 + 5^2}, L3 := \sqrt{2^2 + 5^2}, L4 := 3, L5 := \sqrt{2^2 + 3^2 + 5^2}, L6 := \sqrt{6^2 + 3^2}]$

#3:  $[L1 := 6, L2 := 6.403124237, L3 := 5.385164807, L4 := 3, L5 := 6.164414002, L6 := 6.708203932]$

#4:  $[L1 := 6, L2 := \sqrt{41}, L3 := \sqrt{29}, L4 := 3, L5 := \sqrt{38}, L6 := 3 \cdot \sqrt{5}]$

**Equilibrio estático con el Diagrama de cuerpo Libre (DCL) de la estructura completa:**

#5:  $[X1 :=, Y1 :=, Z1 :=, Y2 :=, Z2 :=, Z3 :=]$

**$\sum F=0$  y  $\sum M$  respecto al nudo 1=0**

#6: 
$$\begin{bmatrix} X1 + 4 \cdot L5 \cdot \frac{2}{L5} - 5 = 0 \\ Y1 + Y2 + 6 + 4 \cdot L5 \cdot \frac{3}{L5} = 0 \\ Z1 + Z2 + Z3 - 4 \cdot L5 \cdot \frac{5}{L5} = 0 \\ Z3 \cdot 3 - 6 \cdot 5 - 4 \cdot L5 \cdot \frac{3}{L5} \cdot 2.5 - 4 \cdot L5 \cdot \frac{5}{L5} \cdot 1.5 = 0 \\ -Z2 \cdot 6 - Z3 \cdot 6 - 5 \cdot 5 + 4 \cdot L5 \cdot \frac{2}{L5} \cdot 2.5 + 4 \cdot L5 \cdot \frac{5}{L5} \cdot (4 + 1) = 0 \\ Y2 \cdot 6 + 6 \cdot 4 - 4 \cdot L5 \cdot \frac{2}{L5} \cdot 1.5 + 4 \cdot L5 \cdot \frac{3}{L5} \cdot (4 + 1) = 0 \end{bmatrix}$$

#7:  $[X1 := -3 \wedge Y1 := -6 \wedge Y2 := -12 \wedge Z1 := 4.166666666 \wedge Z2 := -14.166666666 \wedge Z3 := 30]$

#8:  $\left[ X1 := -3, Y1 := -6, Y2 := -12, Z1 := \frac{25}{6}, Z2 := -\frac{85}{6}, Z3 := 30 \right]$

**otra forma:  $\sum F=0$  y  $\sum M$  respecto al nudo 4=0**

#9:

$$\begin{bmatrix} X1 + 4 \cdot L5 \cdot \frac{2}{L5} - 5 = 0 \\ Y1 + Y2 + 6 + 4 \cdot L5 \cdot \frac{3}{L5} = 0 \\ Z1 + Z2 + Z3 - 4 \cdot L5 \cdot \frac{5}{L5} = 0 \\ Y1 \cdot 5 + Y2 \cdot 5 + Z3 \cdot 3 = 0 \\ -X1 \cdot 5 + Z1 \cdot 4 - Z2 \cdot 2 - Z3 \cdot 2 = 0 \\ -Y1 \cdot 4 + Y2 \cdot 2 = 0 \end{bmatrix}$$

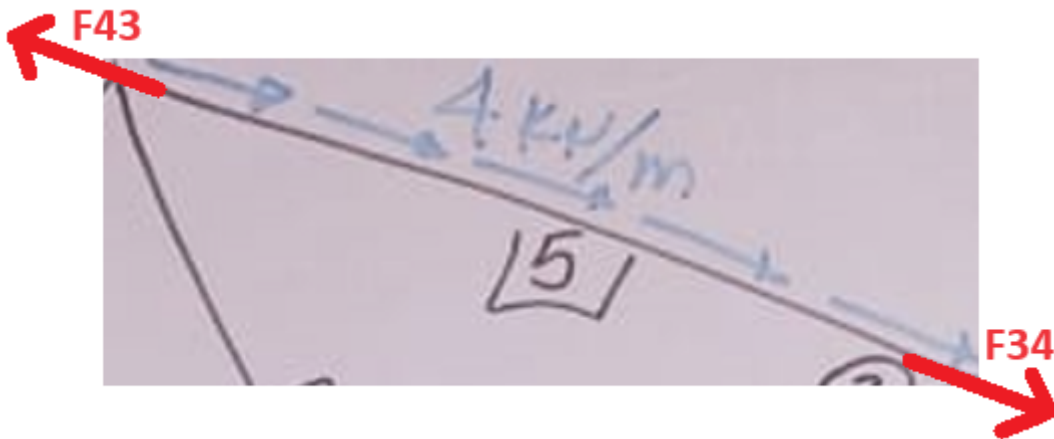
#10:

$$\left[ X1 = -3 \wedge Y1 = -6 \wedge Y2 = -12 \wedge Z1 = \frac{25}{6} \wedge Z2 = -\frac{85}{6} \wedge Z3 = 30 \right]$$

#11:  $[X1 = -3 \wedge Y1 = -6 \wedge Y2 = -12 \wedge Z1 = 4.166666666 \wedge Z2 = -14.166666666 \wedge Z3 = 30]$

**DCL de los elementos:**

**DCL del elemento 5:**



#12:  $-F43 + 4 \cdot L5 + F34 = 0$

#13:  $F43 := + 4 \cdot L5 + F34$

**DCL de los demás elementos:**

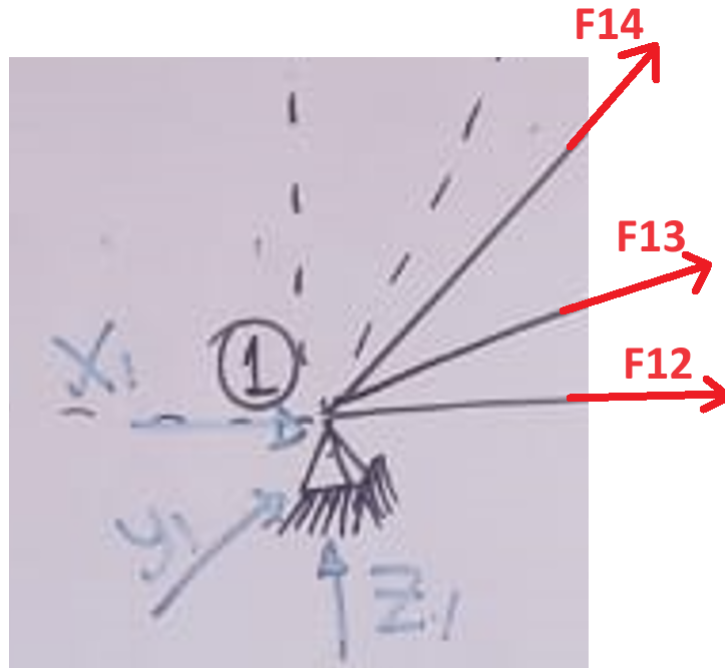
#14:  $[F12 :=, F13 :=, F14 :=, F23 :=, F24 :=, F34 :=]$



#15:  $[F21 := F12, F31 := F13, F32 := F23, F41 := F14, F42 := F24]$

**DCL de los nudos:**

**Equilibrio del DCL del nudo 1:**



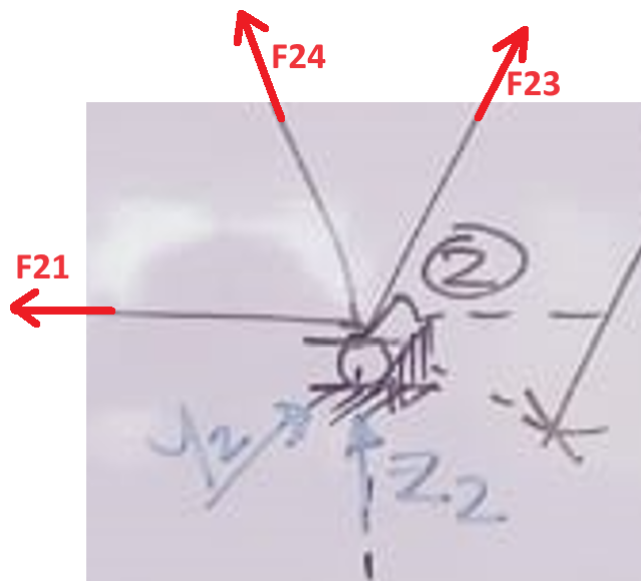
#16:

$$\begin{cases} X1 + F12 + F13 \cdot \frac{6}{L6} + F14 \cdot \frac{4}{L2} = 0 \\ Y1 + F13 \cdot \frac{3}{L6} = 0 \\ Z1 + F14 \cdot \frac{5}{L2} = 0 \end{cases}$$

#17:  $[F12 = -5.666666666 \wedge F13 = 13.41640786 \wedge F14 = -5.335936864]$

#18:  $\left[ F12 := -\frac{17}{3}, F13 := 6 \cdot \sqrt{5}, F14 := -\frac{5 \cdot \sqrt{41}}{6} \right]$

**Equilibrio en el DCL del nudo 2:**

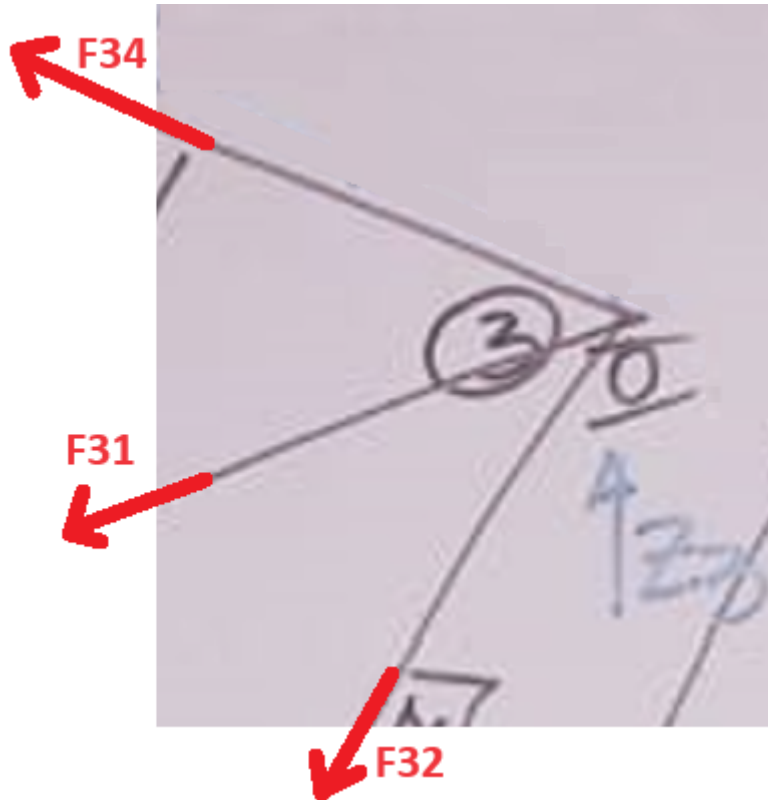


$$\#19: \begin{bmatrix} -F21 - F24 \cdot \frac{2}{L3} = 0 \\ Y2 + F23 = 0 \\ Z2 + F24 \cdot \frac{5}{L3} = 0 \end{bmatrix}$$

#20:  $[F23 = 12 \wedge F24 = 15.25796695]$

#21:  $\left[ F23 := 12, F24 := \frac{17 \cdot \sqrt{29}}{6} \right]$

**Equilibrio en el DCL del nudo 3:**



$$\#22: \begin{bmatrix} -F31 \cdot \frac{6}{L6} - F34 \cdot \frac{2}{L5} = 0 \\ -F31 \cdot \frac{3}{L6} - F32 - F34 \cdot \frac{3}{L5} = 0 \\ Z3 + F34 \cdot \frac{5}{L5} = 0 \end{bmatrix}$$

#23:  $[F34 = -36.98648401]$

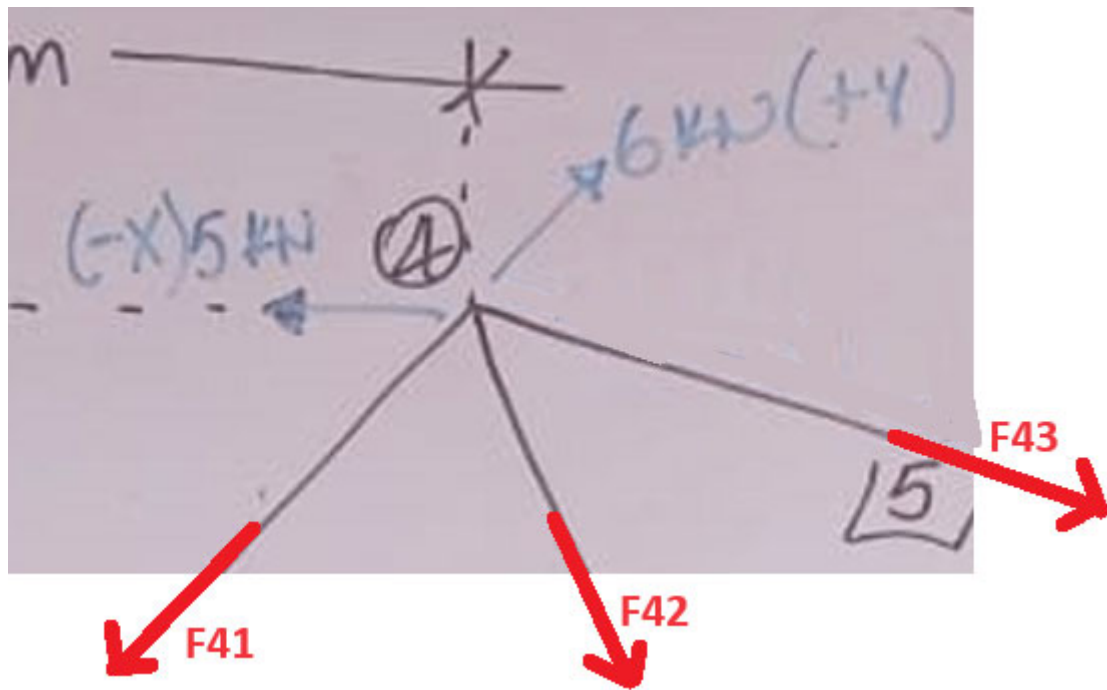
#24:  $[F34 := -6 \cdot \sqrt{38}]$

**Del elemento 5:**

#25:  $F43 := -2 \cdot \sqrt{38}$

#26:  $F43 := -12.328828$

**Equilibrio del nudo 4 para chequeo:**



#27:

$$\begin{bmatrix} -F41 \cdot \frac{4}{L2} + F42 \cdot \frac{2}{L3} + F43 \cdot \frac{2}{L5} - 5 = 0 \\ F43 \cdot \frac{3}{L5} + 6 = 0 \\ -F41 \cdot \frac{5}{L2} - F42 \cdot \frac{5}{L3} - F43 \cdot \frac{5}{L5} = 0 \end{bmatrix}$$

#28:

$$\begin{bmatrix} \text{true} \\ \text{true} \\ \text{true} \end{bmatrix}$$