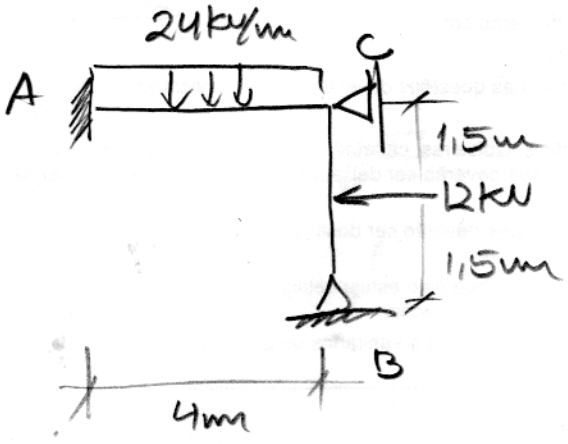
TE2-6.1

$E = 20000\ MPa$

$b \times h = 5 \times 40\ cm^2$



$\frac{qL^2}{12} = \frac{24 \times 4^2}{12} = 32$

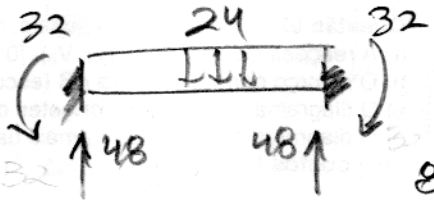
$\frac{qL}{2} = \frac{24 \times 4}{2} = 48$

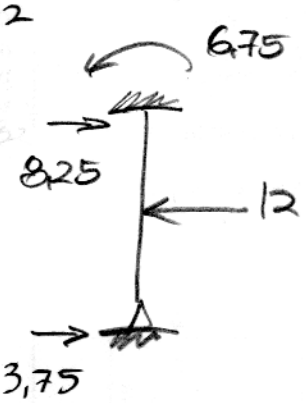
$\frac{3PL}{16} = \frac{3}{16} \times 12 \times 3 = 6,75$

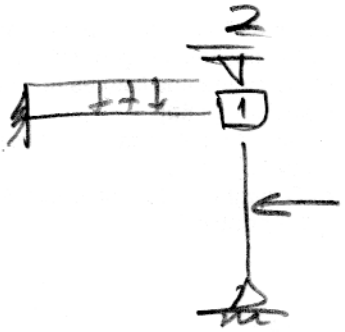
$\frac{5}{16} P = \frac{5}{16} \times 12 = 3,75$

$\frac{11}{16} P = \frac{11}{16} \times 12 = 8,25$

Caso 0:



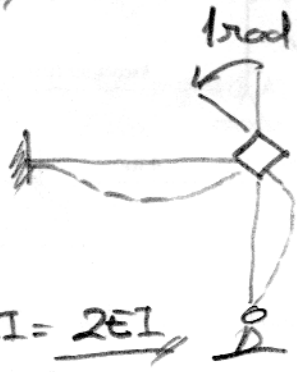


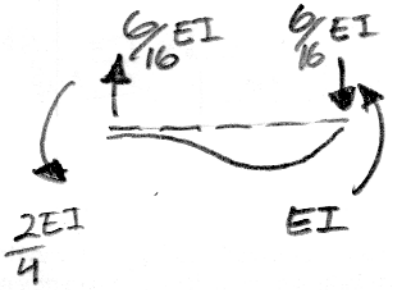


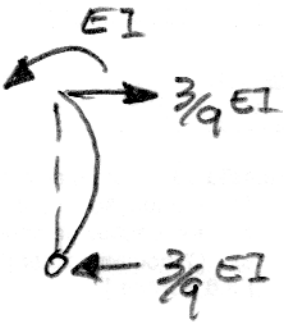
$F_1 = -32 + 6,75 = -25,25$

$F_2 = +48$

Caso 1:



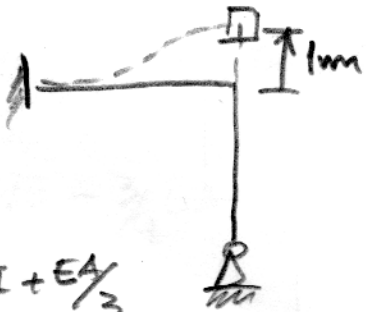


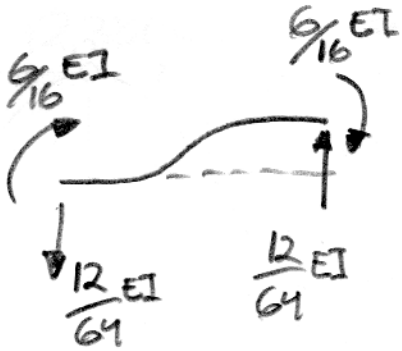


$K_{11} = EI + EI = 2EI$

$K_{21} = -\frac{6}{16} EI$

Caso 2:







$K_{22} = \frac{12}{64} EI + EA/3$

$K_{12} = -\frac{6}{16} EI$

$EI = 20\times10^6 \times 0{,}15 \times 0{,}4^3/12 = 16.000\ kNm^2$

$EA = 20\times10^6 \times 0{,}15 \times 0{,}4 = 1200.000\ kN$

$$\begin{bmatrix} 2EI & -9/16\,EI \\ -9/16\,EI & 12/64\,EI + EA/3 \end{bmatrix} \begin{Bmatrix} D_1 \\ D_2 \end{Bmatrix} = \begin{Bmatrix} +25{,}25 \\ -48 \end{Bmatrix}$$

$$\begin{bmatrix} 32000 & -6000 \\ -6000 & 403000 \end{bmatrix} \begin{Bmatrix} D_1 \\ D_2 \end{Bmatrix} = \begin{Bmatrix} +2525 \\ -48 \end{Bmatrix}$$

$D_1 = +7{,}68876\times10^{-4}$ rad

$D_2 = -1{,}07659\times10^{-4}$ m

$M_A = 32 + 3/4\,EI\times D_1 - 9/16\,EI\times D_2 = 38{,}7969\ kNm$ ↶

$V_A = 48 + 9/16\,EI\times D_1 - 12/64\,EI\times D_2 = 53{,}9362\ kN$ ↑

$M_C^{(1)} = -32 + EI_x D_1 - 9/16\,EI\times D_2 = -19{,}052\ kNm$ ↷

$M_C^{(2)} = 6{,}75 + EI\times D_1 = 19{,}052\ kNm$ ↶

$H_C = 8{,}25 + 3/9\,EI\times D_1 = 12{,}3506\ kN$ →

$V_B = 48 - 9/16\,EI\times D_1 + 12/64\,EI\times D_2 = 43{,}0637\ kN$ ↑

$H_B = 3{,}75 - 3/9\,EI\times D_1 = -0{,}35067\ kN$ ←