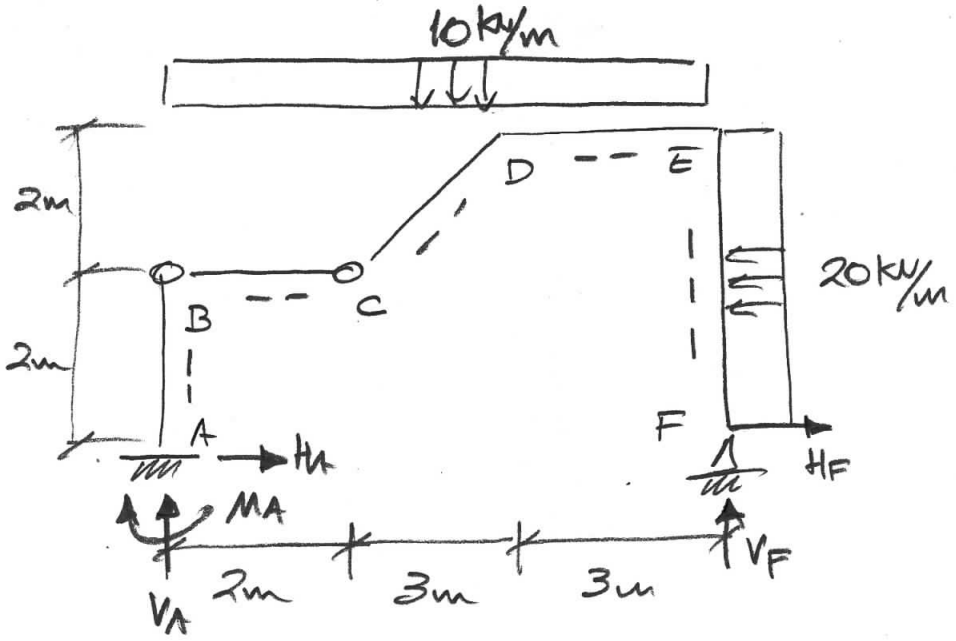
TE1-6.5

(—)



$\Sigma M_C^{\rightarrow F} = 0$ ↶⊕

$+ H_F \times 2m + V_F \times 6m - 10\,kN/m \times (6m)^2/2 = 0$

$2H_F + 6V_F = 180$ (1)

$\Sigma M_B^{\rightarrow F} = 0$ ↶⊕ $H_F \times 2m + V_F \times 8m - 10\,kN/m \times (8m)^2/2 = 0$

$2H_F + 8V_F = 320$ (2)

RESOLVENDO O SISTEMA DE EQUAÇÕES:

$$\begin{cases} 2H_F + 6V_F = 180 & (\times -1) \\ 2H_F + 8V_F = 320 \end{cases}$$

$2V_F = 140$ $\quad V_F = 70\,kN\uparrow$

$H_F = \frac{180 - 6\times 70}{2} = -120\,kN$

$H_F = 120\,kN \leftarrow$

$\Sigma F_H = 0 \overset{\oplus}{\rightarrow}$ $H_A - 120\,kN - 20\,kN/m \times 4m = 0$

$H_A = 120 + 80 = 200\,kN \rightarrow$

$\Sigma F_V = 0 \overset{\oplus}{\uparrow}$ $V_A - 10\,kN/m \times 8m + 70\,kN = 0$

$V_A = 80 - 70 = 10\,kN\uparrow$

$\Sigma M_B^{\rightarrow A} = 0$ ↷⊕ $M_A - 200\,kN \times 2m = 0$

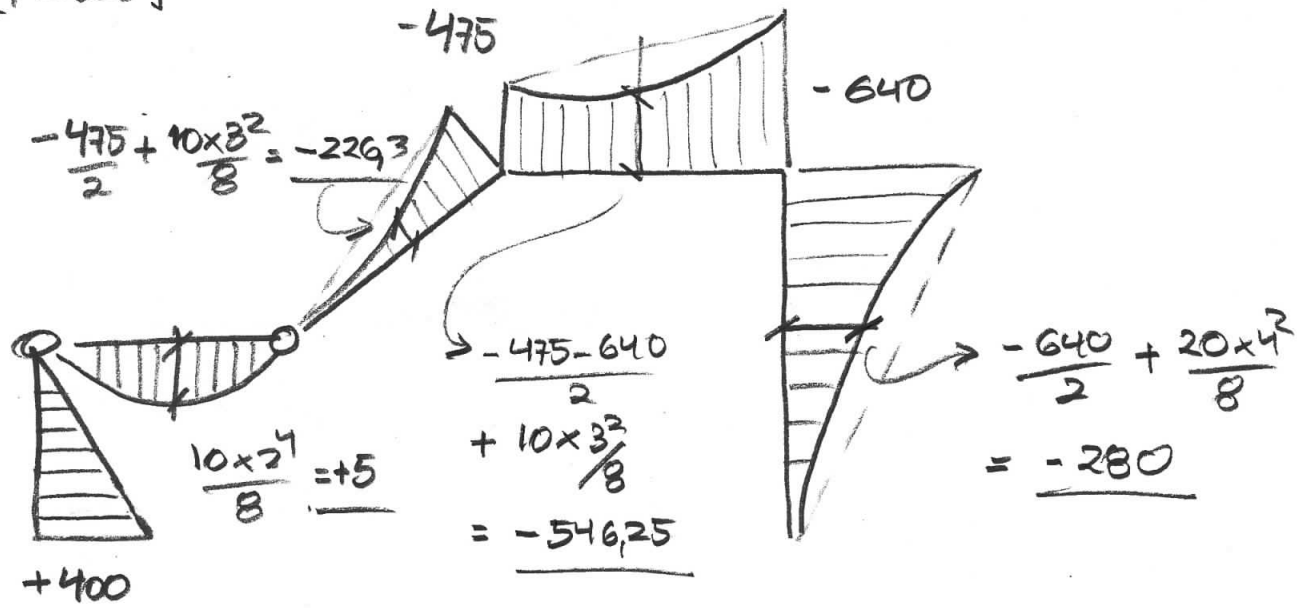
$M_A = 400\,kNm$ ↷

$M_D = 400\,kNm + 10kN \times 5m - 200kN \times 4m - 10\,kN/m \cdot (5m)^2/2$ (=)

$M_D = -475\,kNm$

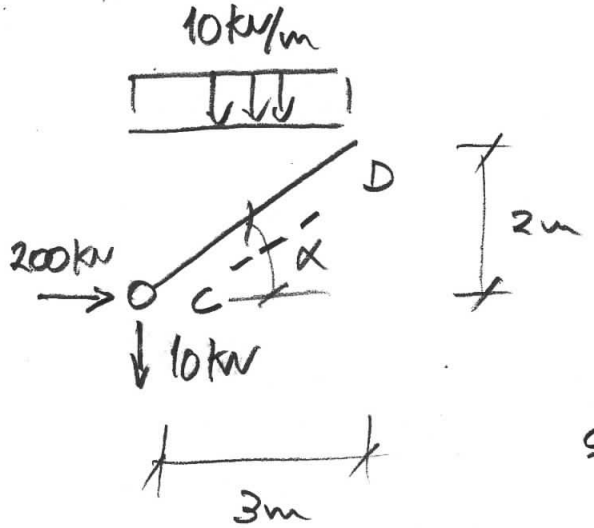
$M_E = -120kN \times 4m - 20\,kN/m \times (4m)^2/2 = -640\,kNm$

(M) [kNm]



$Q_B^{BC} = +10\,kN$, $N_B^{BC} = -200\,kN$

$Q_C^{BC} = 10kN - 10\,kN/m \times 2m = -10\,kN$, $N_C^{BC} = -200\,kN$



$hip = \sqrt{2^2+3^2} = 3{,}6056$

$\cos\alpha = 3/\sqrt{2^2+3^2} = 0{,}83205$

$\text{sen}\,\alpha = 2/\sqrt{2^2+3^2} = 0{,}55470$

$q_{PP} = 10\,kN/m \times \cos^2\alpha = 10 \times 0{,}83205^2$

$q_{PP} = 6{,}9231\,kN/m$

$q_{PL} = 10\,kN/m^2 \times \cos\alpha - \text{sen}\,\alpha = 10 \times 0{,}83205 \times 0{,}55470$

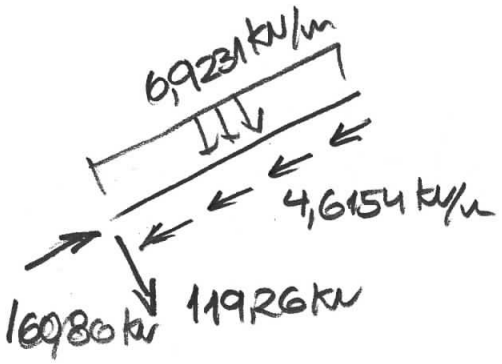
$q_{PL} = 4{,}6154\,kN/m$

$Q_C^{CD} = -10\,kN \cos\alpha - 200\,kN\,\text{sen}\,\alpha$

$= -10 \times 0{,}83205 - 200 \times 0{,}5547 = -119{,}26\,kN$

$N_C^{CD} = +10\,kN\,\text{sen}\,\alpha - 200\,kN\cos\alpha$

$= 10 \times 0{,}5547 - 200 \times 0{,}83205 = -160{,}86\,kN$



$Q_D^{CD} = -119{,}26\,kN - 6{,}9231\,kN/m \times 3{,}6056\,m$

$Q_D^{CD} = -144{,}22\,kN$

$N_D^{CD} = -160{,}86\,kN + 4{,}6154\,kN/m \times 3{,}6056\,m$

$N_D^{CD} = -144{,}22\,kN$

$Q_D^{DE} = 10\,kN - 10\,kN/m \times 5\,m = -40\,kN$

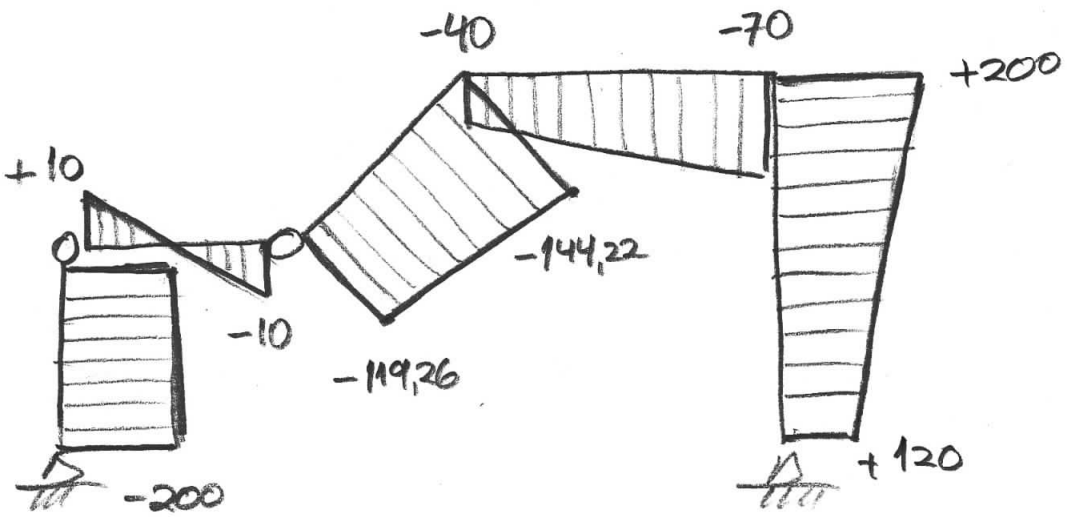
$N_D^{DE} = -200\,kN$

$Q_E^{DE} = 10\,kN - 10\,kN/m \times 8\,m = -70\,kN$

$N_E^{DE} = -200\,kN$

$Q_E^{EF} = +120\,kN + 20\,kN/m \times 4\,m = +200\,kN$

Q [kN]



N [kN]

