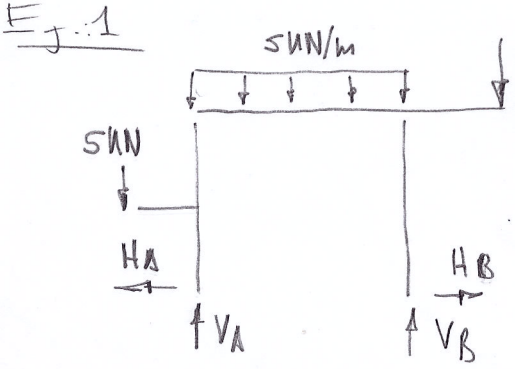
Ej. 1

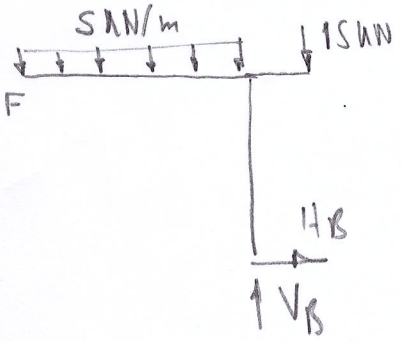
Solución // Ex. R1 19/2/16

a)



$\Sigma M_A = 0 \rightarrow 5x1 - 5x5x2,5 - 15x6 + 5xV_B = 0 \rightarrow \boxed{V_B = 29,5kN}$

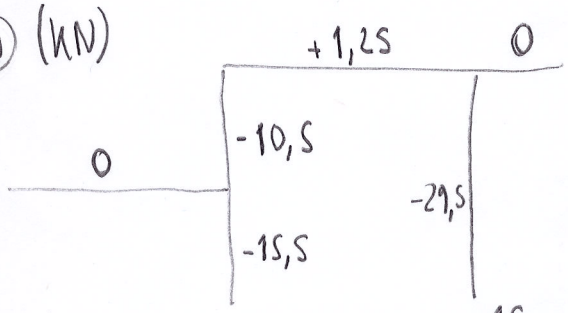
Eq. Vert $\rightarrow 5+25+15-29,5 = V_A \rightarrow \boxed{V_A = 15,5kN}$



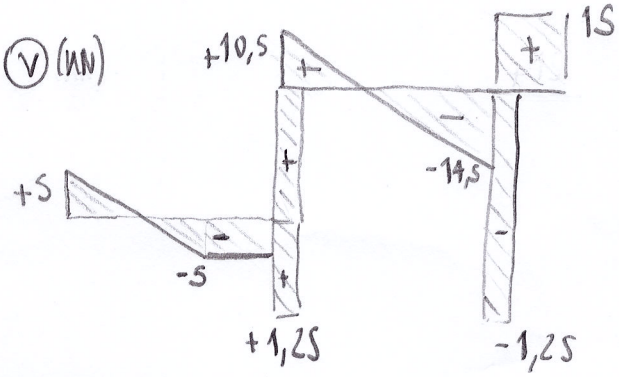
$4xH_B + 29,5x5 - 5x5x2,5 - 15x6 = 0 \rightarrow \boxed{H_B = 1,25kN}$

Eq hor $\rightarrow \boxed{H_A = H_B}$

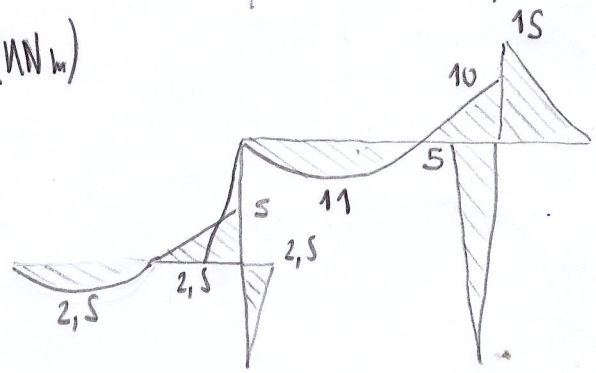
b) (N) (kN)



(V) (kN)



(M) (kNm)



c) PNI aparcados $\rightarrow \sigma_{adm} = 140 MPa \geq M^{máx}/2W_{PNI\,inl.} \rightarrow \boxed{W_{PNI\,inl.} \geq \frac{M_{max}}{2\sigma_{adm}}}$

$M_{Lár} = 15kNm$

$W_{PNI\,inl.} \geq 53 cm^3 \rightarrow \boxed{2PNI\ 12}$

d) $V_{max} = 15kN$ (barra GH)

En el baricentro de la sección

$\tau_{max} = \frac{V_{max} \cdot \mu}{b \cdot I}$ $\quad \mu = 2.S_x = 2.31,8\,cm^3 = 63,6\,cm^3$

$b = 2.0,51\,cm = 1,02\,cm$

$I = 2.328\,cm^4 = 656\,cm^4$

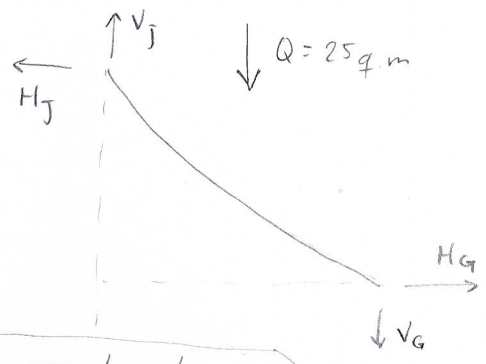
$\tau_{max} = \frac{15kN \cdot 63,6cm^3}{1,02cm \cdot 656cm^4}$

$\boxed{\tau_{max} = 1,43\,kN/cm^2}$

$\boxed{\tau_{max} = 14,3\,MPa}$

Ej.: 2

cable JG



Tramo GK sin carga $\Rightarrow \frac{H_G}{10m} = \frac{V_G}{4m} \Rightarrow V_G = 2/5\ H$

$\sum H = 0 \Rightarrow H_J = H_G = H$

$\sum M_J = 0 \Rightarrow \frac{(25m)^2}{2} q + 2/5\ H \cdot 25m - 21m\ H = 0$

$\Rightarrow 312{,}5\ qm = 11\ H \Rightarrow \boxed{H = 28{,}4\ qm} = H_K$

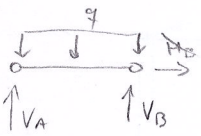
$\boxed{V_G = 11{,}4\ qm} = V_K$

$\sum V\uparrow = 0 \Rightarrow V_J - 25\ qm - 11{,}4\ qm = 0 \Rightarrow \boxed{V_J = 36{,}4\ qm}$

Fuerza máx. en J: $F_J = \sqrt{36{,}4^2 + 28{,}4}\ qm \Rightarrow \boxed{F_J = 46{,}17\ qm}$

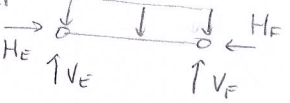
Estructura

AB



$V_A = V_B = \frac{6\ qm}{2}$

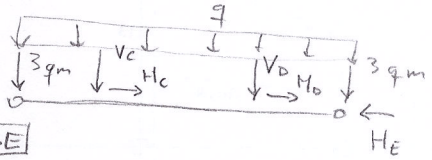
EF



$V_E = V_F = 3\ qm$

$H_E = H_F$

BE



$\sum M_C = 0 \Rightarrow -3\ qm \cdot 3 + 14\ qm\ 4 - 8 V_D + 3\ qm \cdot 11 = 0$

$\Rightarrow 80\ qm = 8 V_D \Rightarrow \underline{V_D = 10\ qm}$

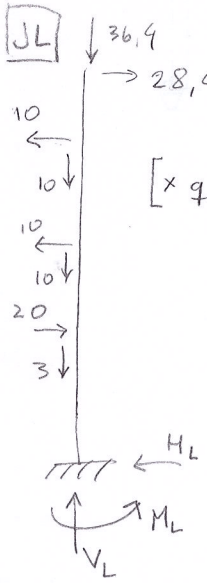
$\sum V = 0 \Rightarrow 14\ qm + 3\ qm + 3\ qm - 10\ qm - V_C = 0$

$\Rightarrow \underline{V_C = 10\ qm}$

(CI y DH bielas a 45° $\Rightarrow V_D = H_D$ y $V_C = H_C$)

$\sum H = 0 \Rightarrow 10\ qm + 10\ qm - H_E = 0 \Rightarrow \underline{H_E = 20\ qm}$

JL

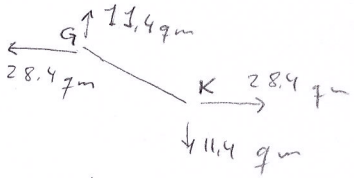


$\sum \vec{H} = 0 \Rightarrow 28{,}4 - 10 - 10 + 20 - H_L = 0 \Rightarrow \underline{H_L = 28{,}4\ qm}$

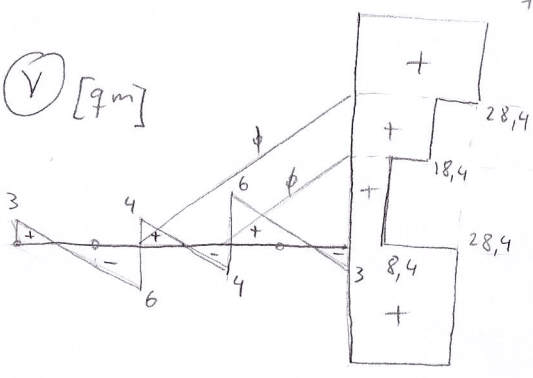
$\sum V\downarrow = 0 \Rightarrow 36{,}4 + 10 + 10 + 3 - V_L = 0 \Rightarrow \underline{V_L = 59{,}4\ qm}$

$\sum M_L = 0 \Rightarrow 28{,}4 \cdot 33 - 10 \cdot 29 - 10 \cdot 21 + 20 \cdot 12 - M_L = 0 \Rightarrow \underline{M_L = 677\ qm^2}$

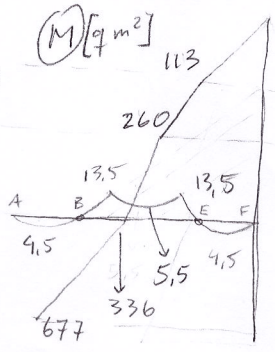
Reacciones en K iguales a G: $\underline{V_K = 11{,}4\ qm}$ $\underline{H_K = 28{,}4\ qm}$



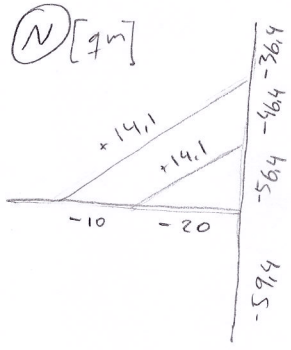
V [qm]



M [qm²]



N [qm]



$3{,}3/2 = 4{,}5$

$4{,}5 - 6 \cdot 6/2 = -13{,}5$

$-13{,}5 + 4 \cdot 4/2 = 5{,}5$

$28.4 = 113$

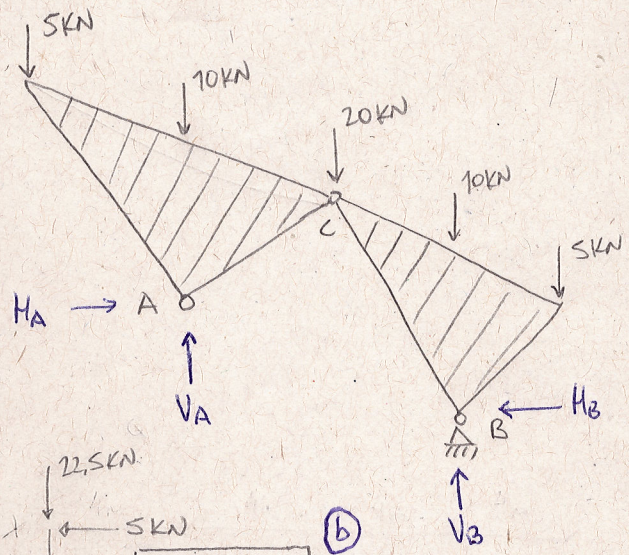
$112 + 18 \cdot 8 = 260$

$256 + 8 \cdot 9 = 336$

$328 + 28 \cdot 12 = 677$

Examen Resistencia de Materiales 1 - Febrero 2016 - Ejercicio 3 - Mc.

a)



$\curvearrowright \Sigma M_A = 0 \Rightarrow (20\times 4 + 10\times 8 + 5\times 12 - 5,4)\,KNm + H_B\cdot 4m - V_B\cdot 8m = 0$

$$\boxed{50\,KN + H_B = 2V_B} \quad (1)$$

$\curvearrowright \Sigma M_C^{der} = 0 \Rightarrow (10\times 4 + 5\times 8)\,KNm + H_B\cdot 6m - V_B\cdot 4m = 0$

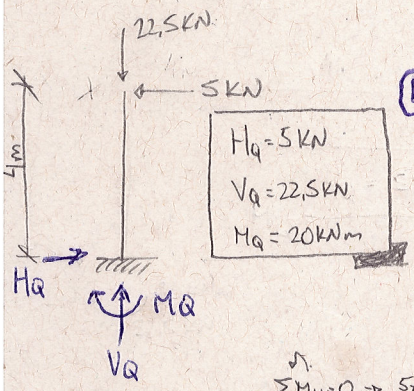
$$\boxed{40\,KN + 3H_B = 2V_B} \quad (2)$$

(2) - (1): $-10\,KN + 2H_B = 0 \Rightarrow \boxed{H_B = 5\,KN} \Rightarrow \boxed{V_B = 27,5\,KN}$

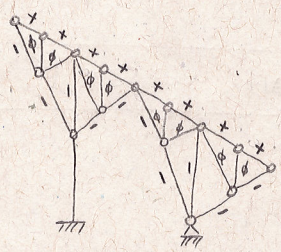
$\boxed{H_A = H_B = 5\,KN}$; $\Sigma F_h = 0 \Rightarrow (5\times 2 + 10\times 2 + 20 - 27,5)\,KN - V_A = 0$

$\Rightarrow \boxed{V_A = 22,5\,KN}$

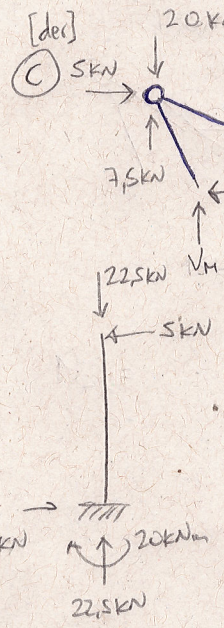
b)



$H_Q = 5\,KN$
$V_Q = 22,5\,KN$
$M_Q = 20\,KNm$



c)



$\uparrow V_C = 20\,KN + 10\,KN + 5\,KN - 27,5\,KN = 7,5\,KN$

$\rightarrow H_C = H_B = 5\,KN$

$\curvearrowright \Sigma M_M = 0 \Rightarrow 12,5\times 2\,KNm - 5\times 3\,KNm - H_L\times 2m = 0$

$\Rightarrow \boxed{H_L = 5\,KN}$

$\curvearrowright \Sigma M_C = 0 \Rightarrow 5\times 1\,KNm - V_L\times 2m = 0 \Rightarrow \boxed{V_L = 2,5\,KN}$

$\Rightarrow \boxed{V_M = 15\,KN,\ H_M = 10\,KN}$

$N_{CM} = -\sqrt{10^2 + 15^2}\,KN \Rightarrow \boxed{N_{CM} = -18,03\,KN}$

d)

$\delta_A = \dfrac{V_A\cdot L_{AB}}{EA} = \dfrac{22,5\times 4\times 100}{21000\times 50}\,cm = 0,0086\,cm$ → Lo despreciable.

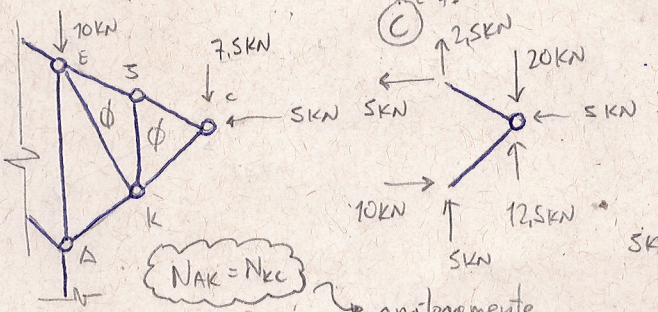
$\delta_A = \dfrac{H_A\times L_{AB}^3}{3EI} = \dfrac{5,0\times(4\times 100)^3}{3\times 21000\times 1500}\,cm = 3,386\,cm$

$\Delta_{AK} = \Delta_{KC} = \dfrac{N\cdot L}{EA} = \dfrac{11,18\times 2,236\times 100}{21000\times 50}\,cm = 0,00238\,cm$

$\Delta_{CM} = \Delta_{MB} = \dfrac{NL}{EA} = \dfrac{18,03\times 3,606\times 100}{21000\times 50}\,cm = 0,00619\,cm$

$\Rightarrow$ despreciable.

e)



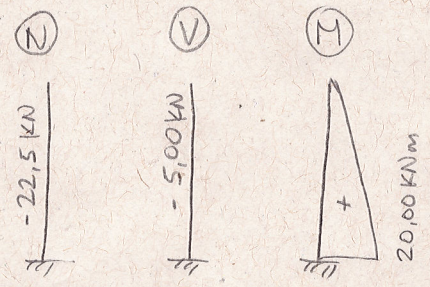
$N_{AK} = N_{KC}$ → analogamente $N_{CM} = N_{MB}$

$N_{AK} = \sqrt{10^2 + 5^2}\,KN$

$\boxed{N_{AK} = 11,18\,KN}$

f)

g)



h)

Aplico método de Williot para hallar C'. Esc: 1cm ≙ 3cm