# PEF 2202 – Prova 1

PROVA A

**Nome:**_____ **Nº USP:**_____

**Turma:**_____ **Professor:**_____

**Questão 1 (3,5):** Dada a viga Gerber abaixo, com apoio duplo em "A", apoios simples em "B" e "C" e articulação (rótula) em "O", pede-se:

$H_A = 50kN$

$V_A = 5kN$

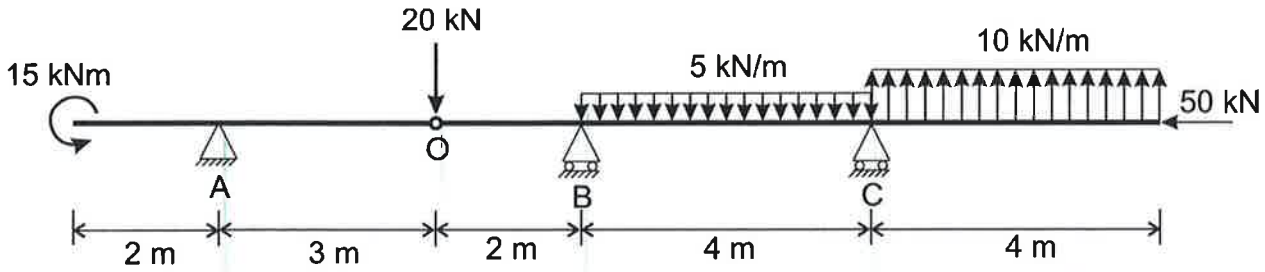
$V_B = 52,5kN$

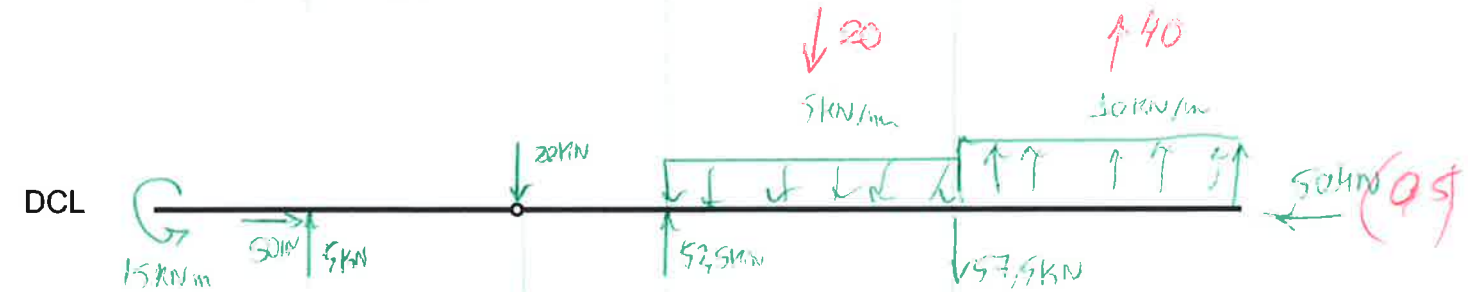
$V_C = -57,5kN$

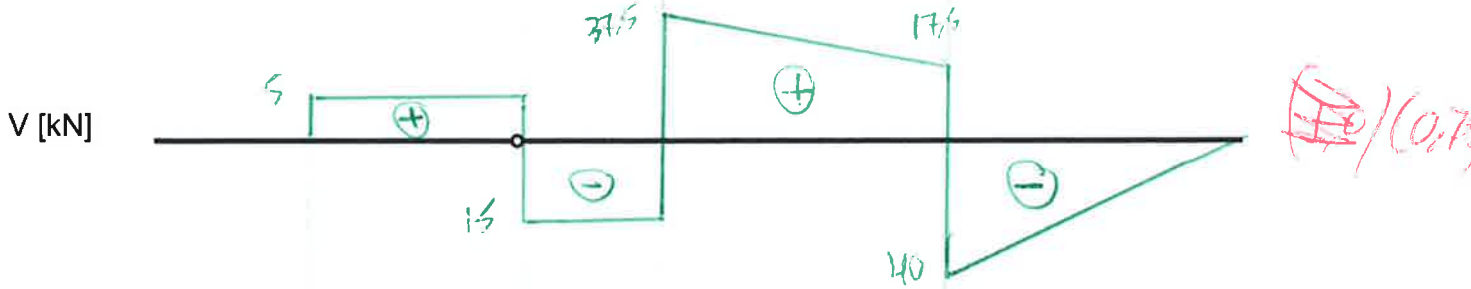
a) Calcular as reações de apoio e fazer o diagrama de corpo livre (DCL) no local indicado. (0,5)

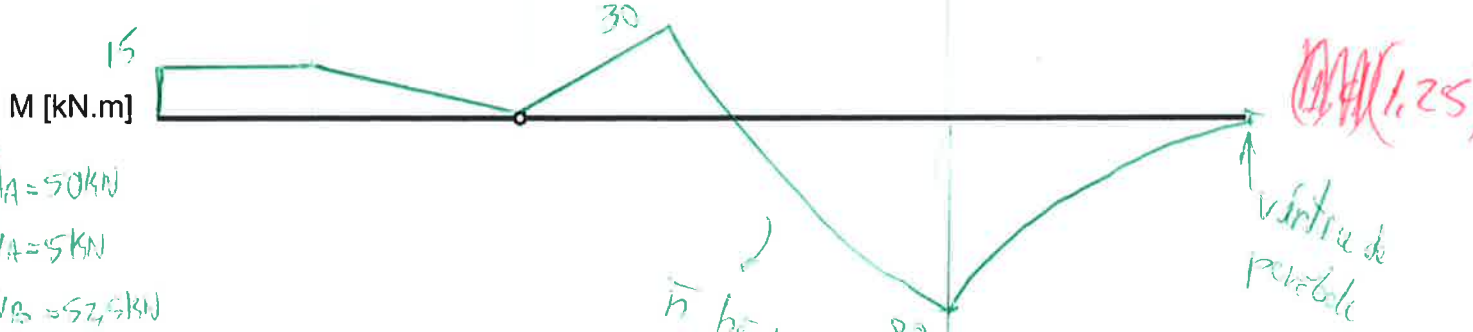
b) Traçar os diagramas de esforço normal (N), esforço cortante (V) e momento fletor (M) nos locais devidos e com as unidades devidamente indicadas. (2,5)

c) Justificar a existência ou não de um ponto de derivada nula no diagrama de momento fletor no trecho entre os apoios dos pontos "B" e "C". (0,5)






$H_A = 50kN$

$V_A = 5kN$

$V_B = 52,5kN$

$V_C = -57,5kN$

# PEF 2202 – Prova 1

PROVA B

**Nome:**_____ **Nº USP:**_____

**Turma:**_____ **Professor:**_____

**Questão 1 (3,5):** Dada a viga Gerber abaixo, com apoio duplo em "A", apoios simples em "B" e "C" e articulação (rótula) em "O", pede-se:

$H_A = 150kN$

$V_A = 15kN$

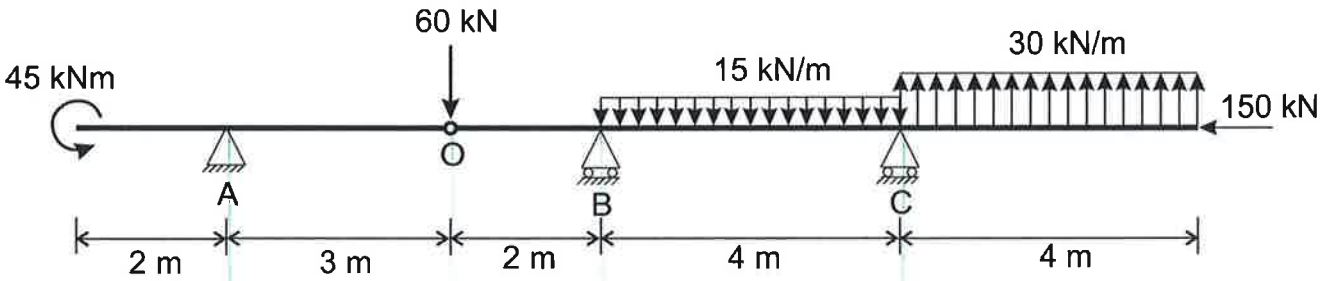
$V_B = 157,5kN$

$V_C = 172,5kN$

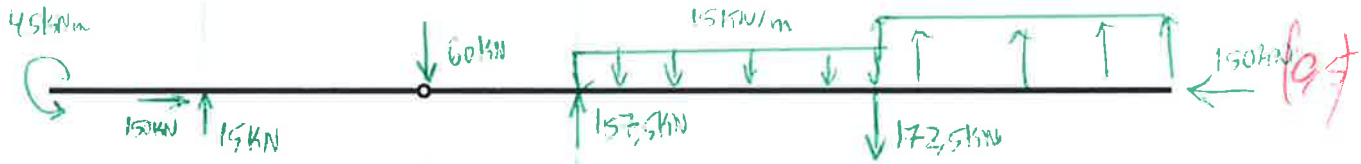
a) Calcular as reações de apoio e fazer o diagrama de corpo livre (DCL) no local indicado. (0,5)

b) Traçar os diagramas de esforço normal (N), esforço cortante (V) e momento fletor (M) nos locais devidos e com as unidades devidamente indicadas. (2,5)

c) Justificar a existência ou não de um ponto de derivada nula no diagrama de momento fletor no trecho entre os apoios dos pontos "B" e "C". (0,5)

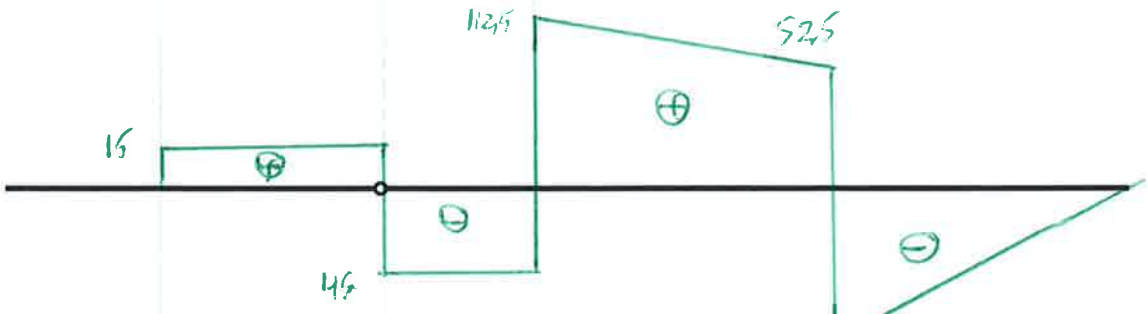



DCL

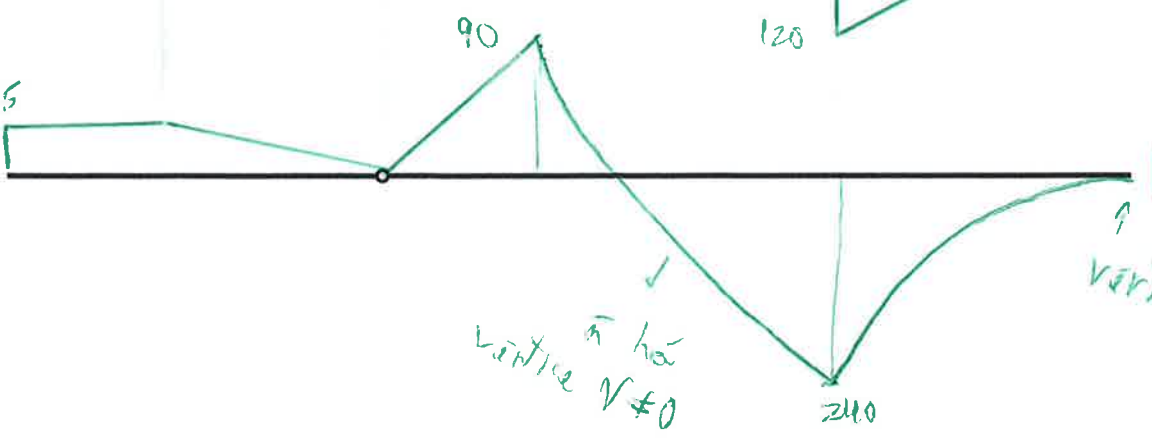



N [kN]

V [kN]




M [kN.m]



Prova A

- $V_A + V_B + V_C - 20 - 20 + 40 = 0$

$V_A + V_B + V_C = 0 \Rightarrow V_B + V_C = -5$

- $15 = 3V_A$ $\quad \boxed{V_A = 5\,kN}$

$2V_B + 6V_C - 20 \cdot 4 + 40 \cdot 8 = 0$

$2V_B + 6V_C = -240$

$2 \cdot (-V_C - 5) + 6V_C = -240$

$4V_C = -240 + 10 = -230$

$\boxed{V_C = -57{,}5}$

$\boxed{V_B = 52{,}5}$

Reações

$H_A = 50\,kN$

$V_A = 5\,kN$

$V_B = 52{,}5\,kN$

$V_C = -57{,}5\,kN$

---

Prova B $\quad V_A + V_B + V_C - 60 - 60 + 120 = 0$

$3V_A = 45 \quad V_A = 15$

$V_B = -15 - V_C$

$2V_B + 6V_C - 60 \cdot 4 + 120 \cdot 8 = 0$

$-30 + 4V_C - 240 + 960 = 0$

$V_C = -172{,}5$

$V_B = 157{,}5$

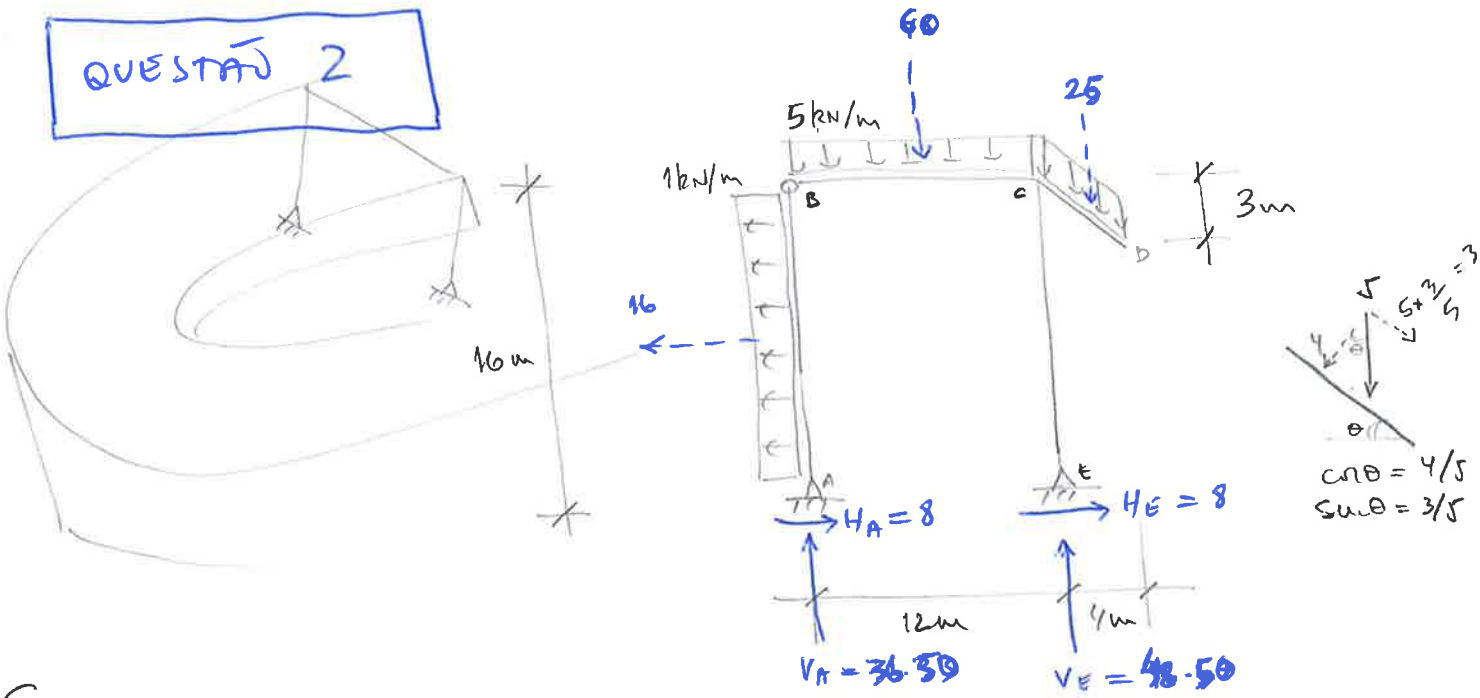
$H_A = +150\,kN$

$V_A = 15\,kN$

$V_B = 157{,}5\,kN$

$V_C = -172{,}5\,kN$

# QUESTÃO 2

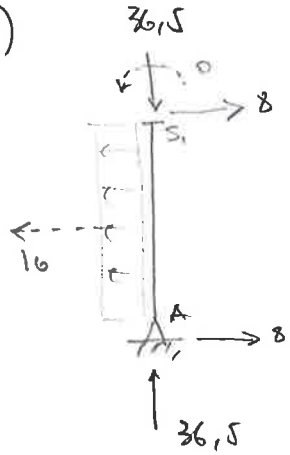


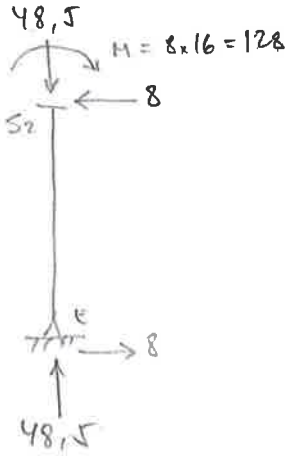

(a)

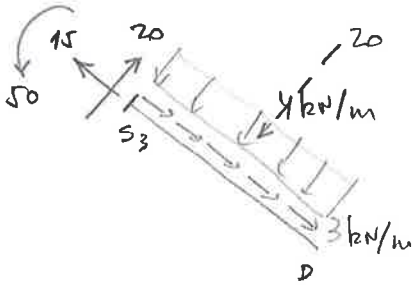
$$+\circlearrowleft \sum M_A = 0 \Rightarrow 12V_E + 8\times16 - 60\times6 - 25\times14 = 0 \Rightarrow V_E = 48,5 \text{ kN}$$

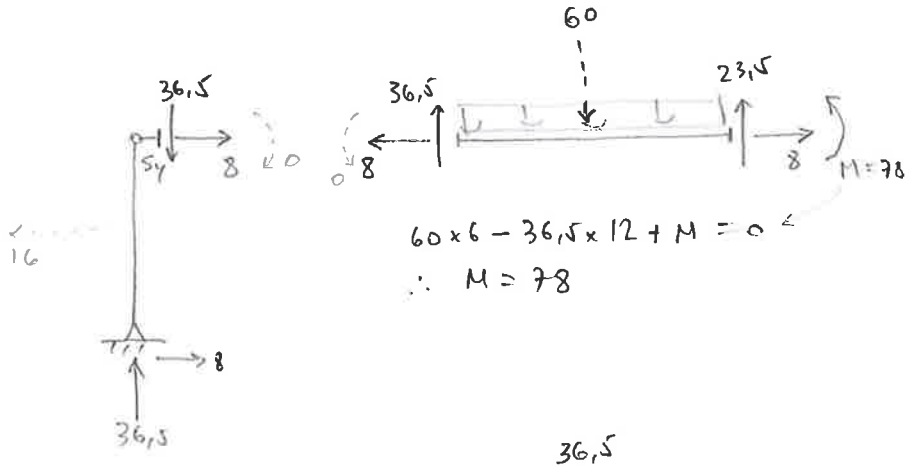
$$\therefore V_A = 36,5 \text{ kN}$$

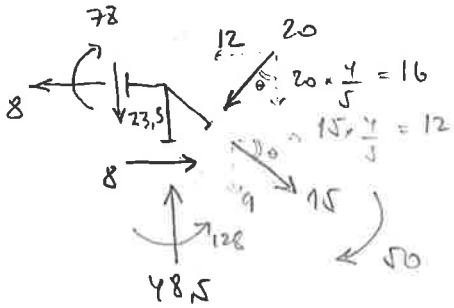
(b)

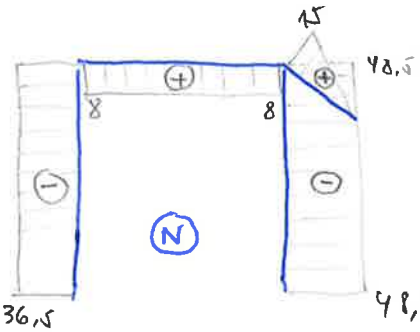


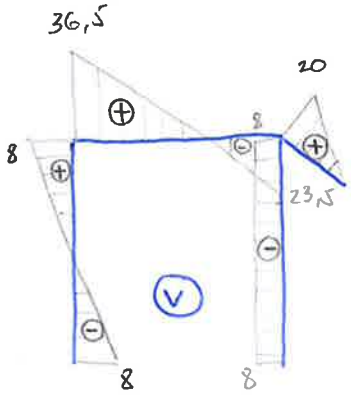



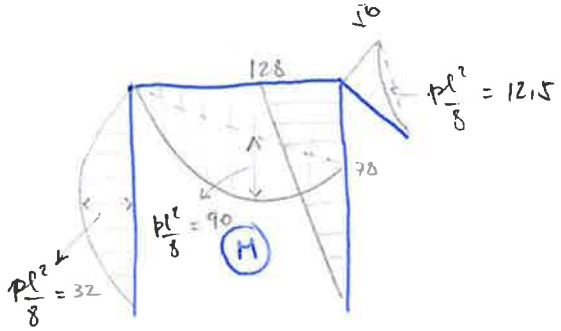



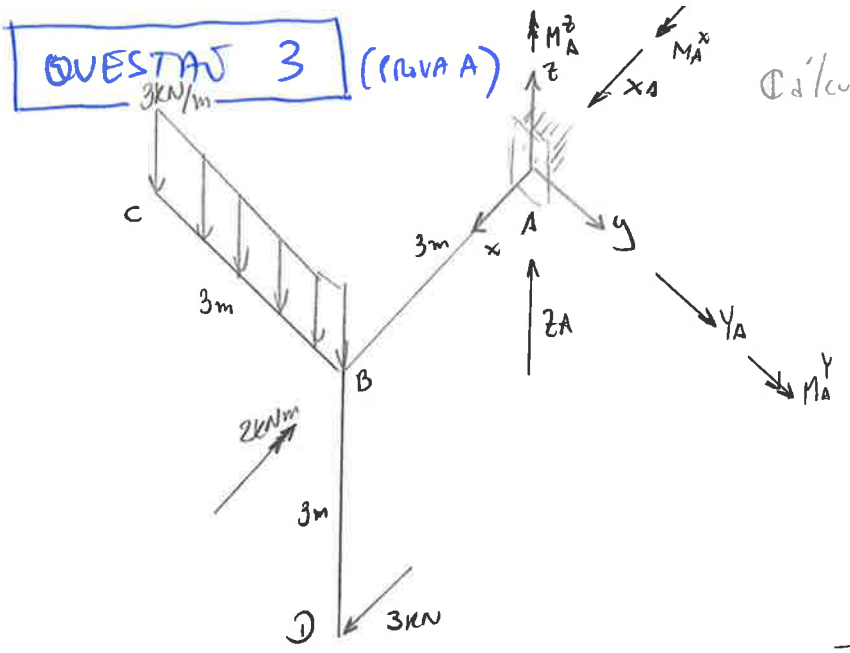



# QUESTÃO 3 (PROVA A)




Cálculo reações apoio

$\sum F_x = 0 \Rightarrow X_A = -3kN$

$\sum F_y = 0 \Rightarrow Y_A = 0\,kN$

$\sum F_z = 0 \Rightarrow Z_A = 9kN$

$\sum M_x = 0 \Rightarrow M_A^x - 2 + 3.3 \cdot \frac{3}{2} = 0$

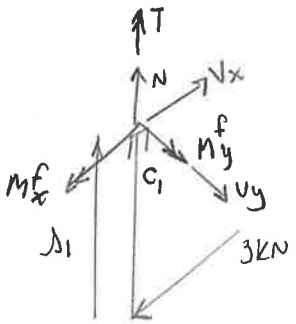
$M_A^x = -11,5\,kNm$

$\sum M_y = 0 \Rightarrow M_A^y - 3.3 + 3.3.3 = 0 \Rightarrow M_A^y = -18kNm$

$\sum M_z = 0 \Rightarrow M_A^z = 0\,kN$

PROVA A

BD




$\sum F_x = 0 \Rightarrow Vx = 3$

$\sum F_y = 0 \Rightarrow Vy = 0$

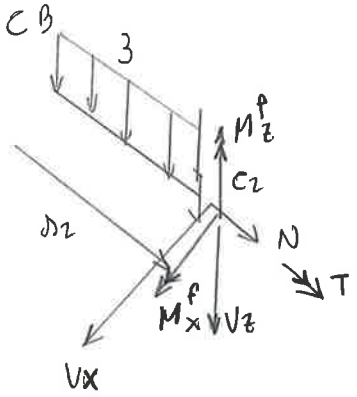
$\sum F_z = 0 \Rightarrow N = 0$

$\sum M_x^{C_1} = 0 \Rightarrow M_x^f = 0$

$\sum M_y^{C_1} = 0 \Rightarrow M_y^f = 3s_1$

$\sum M_z^{C_1} = 0 \Rightarrow T = 0$

CB




$\sum F_y = 0 \Rightarrow N = 0$

$\sum F_x = 0 \Rightarrow Vx = 0$

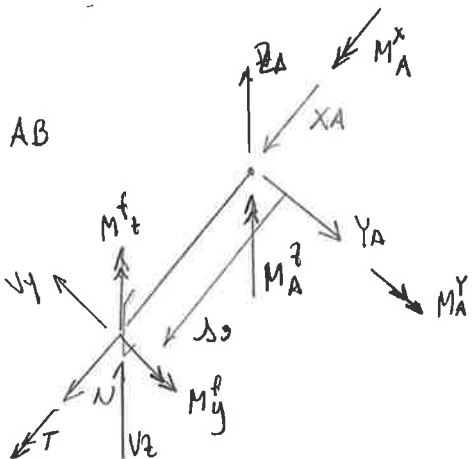
$\sum F_z = 0 \Rightarrow Vz = -3s_2$

$\sum M_x^{C_2} = 0 \Rightarrow M_x^f = \frac{-3}{2} s_2^2$

$\sum M_y^{C_2} = 0 \Rightarrow T = 0$

$\sum M_z^{C_2} = 0 \Rightarrow M_t^f = 0$

AB




$\sum F_x = 0 \Rightarrow N = 3$

$\sum F_y = 0 \Rightarrow Vy = 0$

$\sum F_z = 0 \Rightarrow Vz = -9$

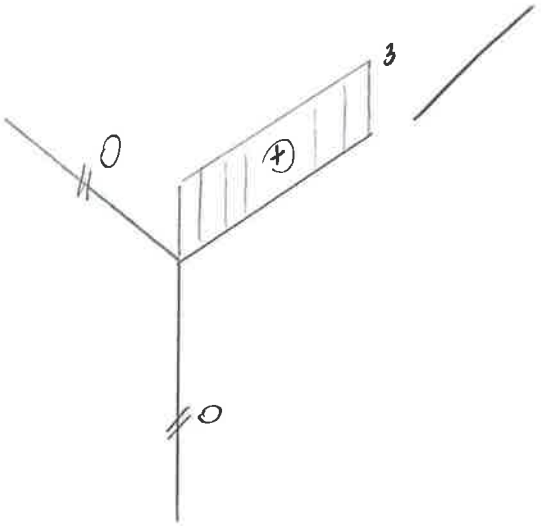
$\sum M_x = 0 \Rightarrow T = +11,5$

$\sum M_y = 0 \Rightarrow M_y^f + Z_A s_3 + M_A^y = 0$

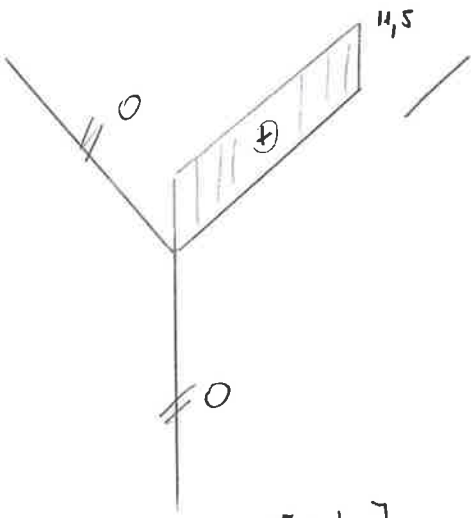
$M_y^f = -9s_3 + 18$

$\sum M_z = 0 \Rightarrow M_t^f - Y_A s_3 + M_A^z = 0$

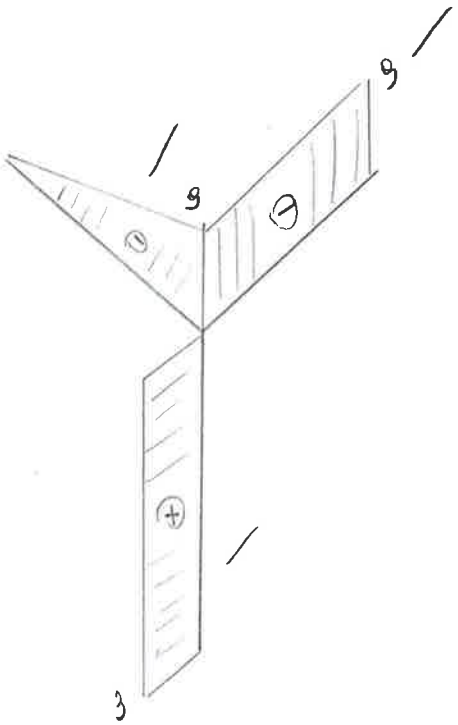
$M_t^f = 0$



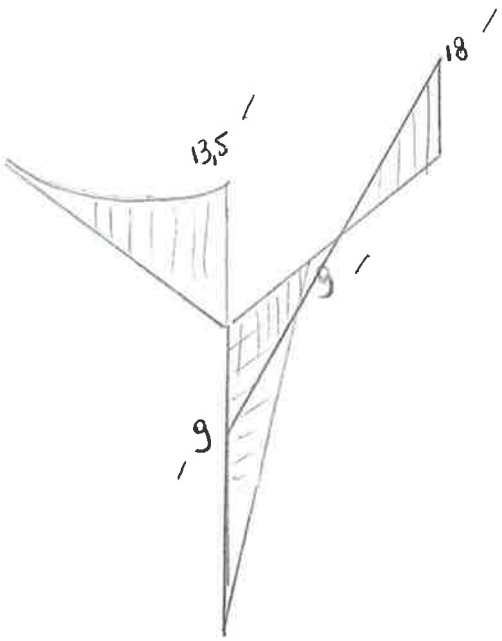

N [KN]




T [KNm]




V [KN]




q [KN/m]

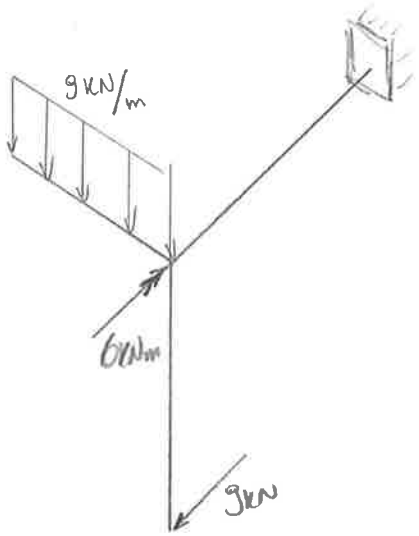
~~barra certa~~ → 0,15 barra errada −0,15

propagou erro ou erro deslocado → 0,1

sinal no diagrama

erro reação → −0,15 cada

Prova B (Q3)




Reações vinculares

$X_A = -9KN$

$Y_A = 0KN$

$Z_A = 27\ KN$

$M_A^x = -34,5\ KN$

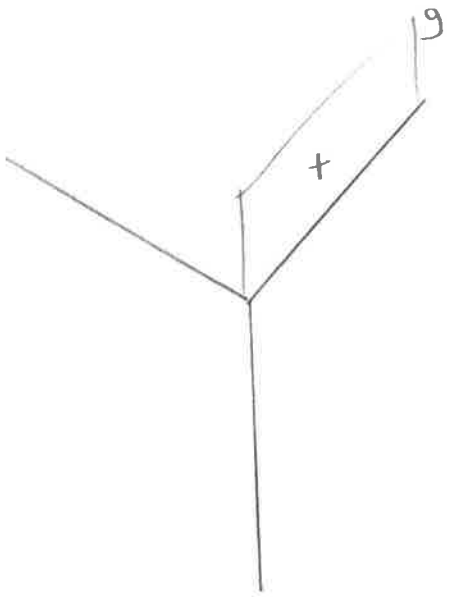
$M_A^y = -54\ KN$

$M_A^z = 0$

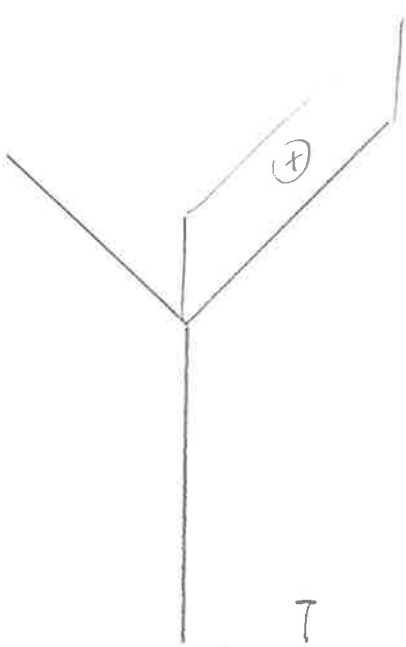
bano errado -0,15

propagou erro, erro similar ou erro desenho -0,1

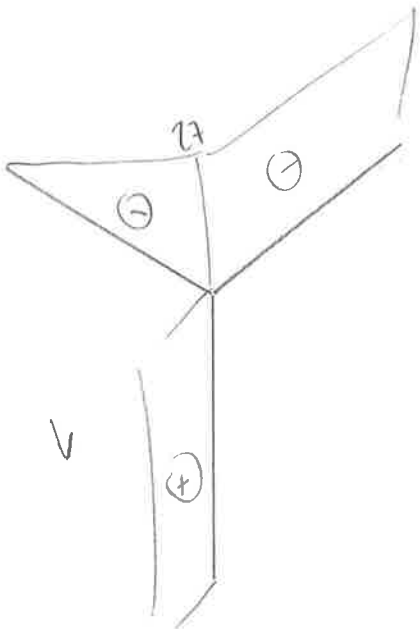
erro reação -0,15 cada



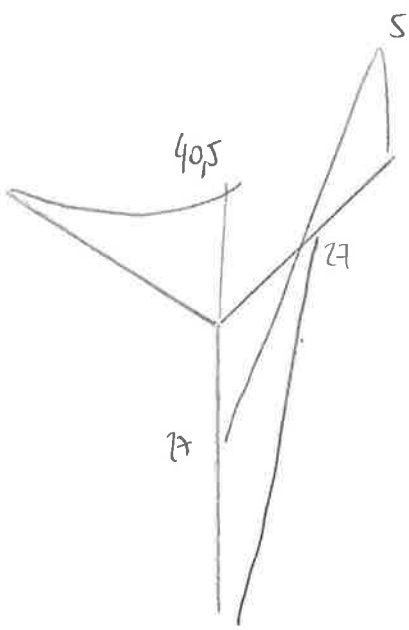

N




T




V




M

g