B2T4N0512B

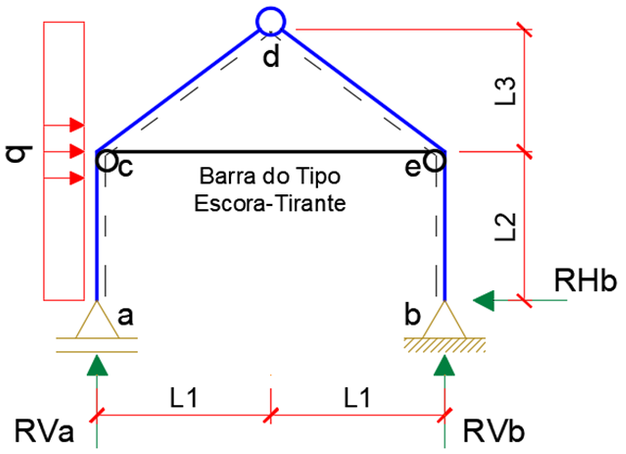
Considerando o modelo estrutural esboçado, responda os questionamentos.

$L1 := 4\ m$

$L2 := 3\ m$

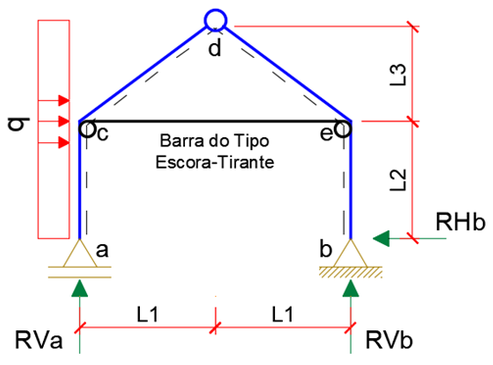
$L3 := 3\ m$

$q := 30\ \frac{kN}{m}$



OBS: Todas as respostas devem ser dadas com sinal respeitando a convenção de diagramas
Q01) Qual o valor do esforço cortante no meio da barra "cd"? [em kN]
Q02) Qual o valor do esforço axial no meio da barra "cd"? [em kN]
Q03) Qual o valor do esforço cortante no meio da barra "de"? [em kN]
Q04) Qual o valor do esforço axial no meio da barra "de"? [em kN]
Q05) Qual o valor do esforço axial na barra "ce"? [em kN]

Reações de Apoio:



ΣFh = 0 (+) para direita

$q \cdot (L2 + L3) - RHb = 0$

$RHb := q \cdot (L2 + L3) = 180\ kN$

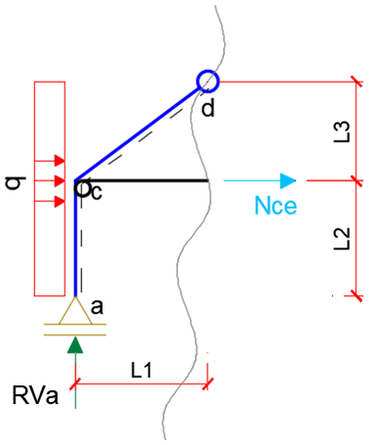
ΣMb = 0 (+) giro horário

$RVa \cdot 2 \cdot L1 + q \cdot (L2 + L3) \cdot \frac{(L2 + L3)}{2} = 0$

$RVa := \frac{1}{2 \cdot L1} \cdot \left(- q \cdot (L2 + L3) \cdot \frac{(L2 + L3)}{2} \right) = -67,5\ kN$

ΣFv = 0 (+) para cima

$RVb + RVa = 0 \qquad RVb := -RVa = 67,5\ kN$



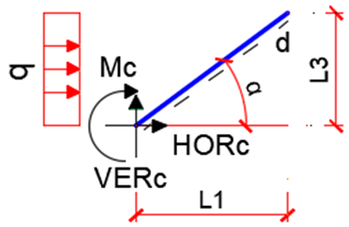
ΣMd = 0 "olhando para "ac" (+) giro antihorário

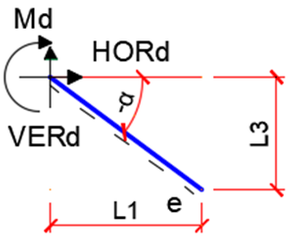
$Nce \cdot L3 + q \cdot (L2 + L3) \cdot \frac{(L2 + L3)}{2} - RVa \cdot L1 = 0$

$Nce := \frac{1}{L3} \cdot \left(- q \cdot (L2 + L3) \cdot \frac{(L2 + L3)}{2} + RVa \cdot L1 \right) = -270\ kN$

$Q05 := Nce$

Equilíbrio Forças no Sistema HOR / VER nos pontos "c" e "d" e projeção no sistema PAR (N) / PER (V):



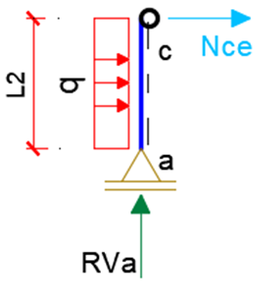


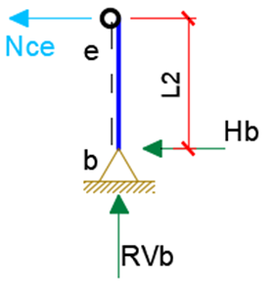
$HORc := q \cdot L2 + Nce = -180\ kN$

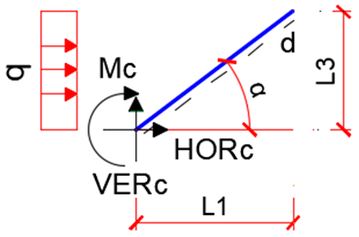
$VERc := RVa = -67,5\ kN$

$HORd := q \cdot (L2 + L3) + Nce = -90\ kN$

$VERd := RVa = -67,5\ kN$







$Lcd := \sqrt{L1^{2} + L3^{2}} = 5\ m$

$cos\alpha := \frac{L1}{Lcd} = 0,8$ $\qquad$ $sen\alpha := \frac{L3}{Lcd} = 0,6$

$qcd_per := q \cdot (sen\alpha)^{2} = 10,8\ \frac{kN}{m}$

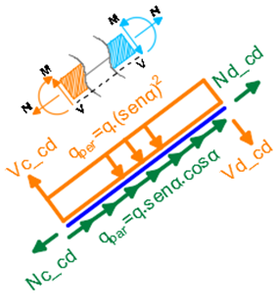
$qcd_par := q \cdot cos\alpha \cdot sen\alpha = 14,4\ \frac{kN}{m}$

$Nc_cd := -HORc \cdot cos\alpha - VERc \cdot sen\alpha = 184,5\ kN$

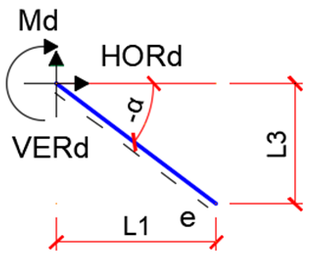
$Vc_cd := -HORc \cdot sen\alpha + VERc \cdot cos\alpha = 54\ kN$

$Vcd(x) := Vc_cd - qcd_per \cdot x$

$Ncd(x) := Nc_cd - qcd_par \cdot x$



$Q01 := Vcd\left(\frac{Lcd}{2}\right) = 27\ kN$ $\qquad$ $Q02 := Ncd\left(\frac{Lcd}{2}\right) = 148,5\ kN$

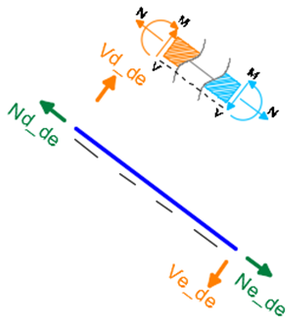


$Lde := Lcd = 5\ m$

$Nd_de := -HORd \cdot cos\alpha - VERd \cdot (-sen\alpha) = 31,5\ kN$

$Vd_de := -HORd \cdot (-sen\alpha) + VERd \cdot cos\alpha = -108\ kN$

Como não há carga distribuída na barra "de" os esforços internos que ocorrem no ponto "d" se propagam ao longo de toda barra



$Q03 := Vd_de = -108\ kN$

$Q04 := Nd_de = 31,5\ kN$

$Q01 = 27$ kN

$Q02 = 148,5$ kN

$Q03 = -108$ kN

$Q04 = 31,5$ kN

$Q05 = -270$ kN
