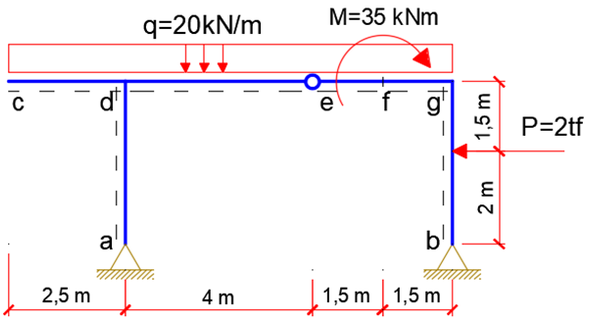
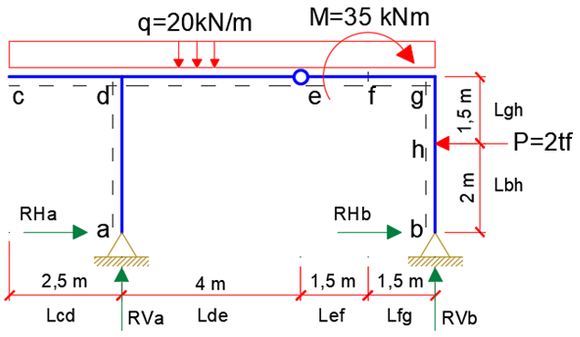
TE1_E05-04

Para o modelo estrutural ao lado determine:
Q01) As reações de apoio;
Q02) A equação de momentos fletores para o trecho "de" ;
Q03) A equação de esforços cortantes para os trechos "ef" e "fg'
Q04) O traçado do diagrama de esforços cortantes para todo o modelo estrutural;
Q05) O traçado do diagrama de esforços normais (axiais) para todo o modelo estrutural.





$q := 20$ kN/m

$M := 35$ kNm

$P := 2$ tf $\qquad P := 20$ kN

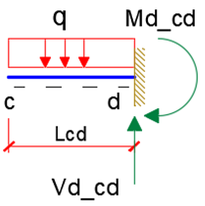
$Lcd := 2,5$ m $\qquad Lgh := 1,5$ m

$Lde := 4,0$ m $\qquad Lbh := 2,0$ m

$Lef := 1,5$ m

$Lfg := 1,5$ m

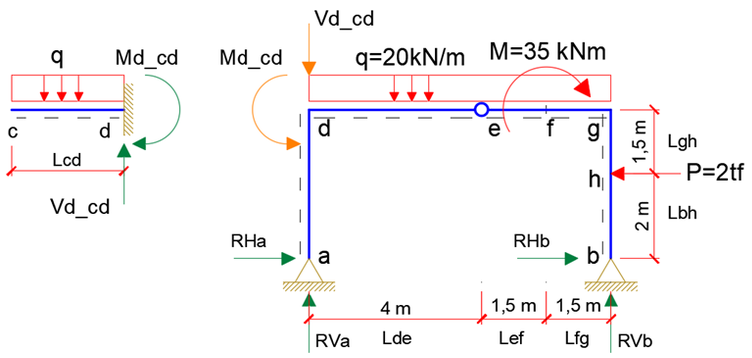
Separação do Balanço:



$Vd_cd := q \cdot Lcd = 50$ kN

$Md_cd := q \cdot Lcd \cdot \frac{Lcd}{2} = 62,5$ kNm

Cálculo das Reações de Apoio:



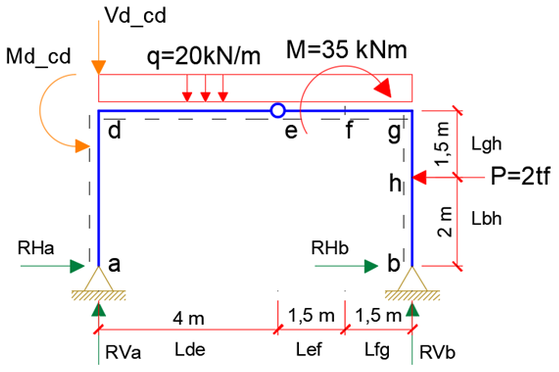
$Ldg := Lde + Lef + Lfg = 7$

$\Sigma Ma := 0$ giro antihorário (+) $\qquad RVb \cdot Ldg + P \cdot Lbh - M - q \cdot Ldg \cdot \frac{Ldg}{2} + Md_cd = 0$

$RVb := \frac{1}{Ldg} \cdot \left(- P \cdot Lbh + M + q \cdot \frac{Ldg^{2}}{2} - Md_cd \right) = 60,36$ kN (para cima)

$\Sigma Fv := 0$ para cima (+) $\qquad RVa + RVb - Vd_cd - q \cdot Ldg = 0$

$RVa := - RVb + Vd_cd + q \cdot Ldg = 129,64$ kN (para cima)



$Lbg := Lgh + Lbh$

$\Sigma Me := 0$ olhando para "ad" - giro horário (+)

$RVa \cdot Lde - RHa \cdot Lbg - Md_cd - Vd_cd \cdot Lde - q \cdot Lde \cdot \frac{Lde}{2} = 0$

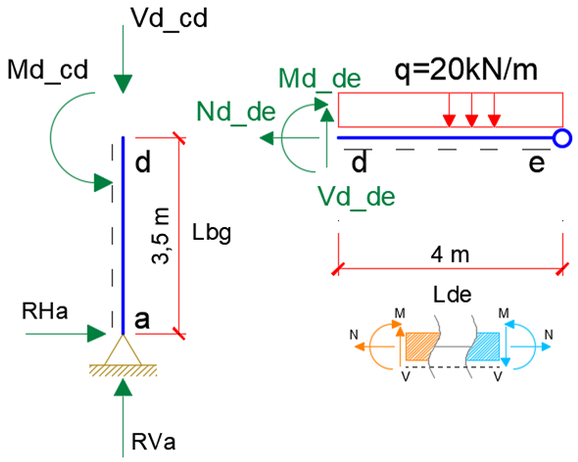
$RHa := \frac{1}{Lbg} \cdot \left(RVa \cdot Lde - Md_cd - Vd_cd \cdot Lde - \frac{q \cdot Lde^{2}}{2} \right)$

$RHa = 27,449$ kN

$\Sigma Fh := 0$ para direita (+) $RHa + RHb - P = 0$

$RHb := -RHa + P = -7,449$ kN

Equação de Momentos para o trecho "de":



$Vd_de := RVa - Vd_cd = 79,64$ kN

$Md_de := -Md_cd - RHa \cdot Lbg = -158,6$ kNm

$Nd_de := -RHa = -27,449$ kN

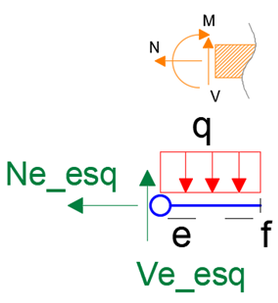
$Mde(x) := Md_de + Vd_de \cdot x - q \cdot \frac{x^{2}}{2}$

$Mde(x) = -\frac{1110}{7} + \frac{1115}{14} \cdot x - 20 \cdot \frac{x^{2}}{2}$

$Vde(x) := Vd_de - q \cdot x$

$Vde(x) = \frac{1115}{14} - 20 \cdot x$

Análise do Trecho "ef":



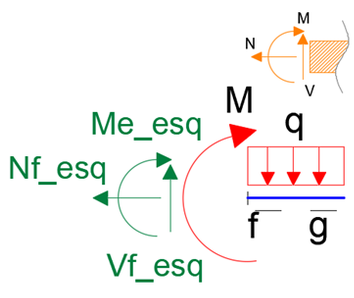
$Ve_esq := Vde(Lde) = -0,3571$ kN

$Vef(x) := Ve_esq - q \cdot x$

$Vef(x) = -\frac{5}{14} - 20 \cdot x$

$Ne_esq := Nd_de = -27,449$

Análise do Trecho "fg":



$Vf_esq := Vef(Lef) = -30,36$ kN

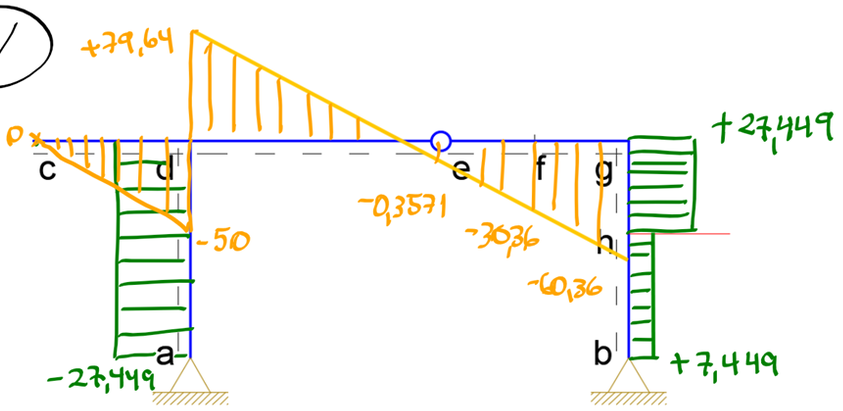
$Vfg(x) := Vf_esq - q \cdot x$

$Vfg(x) = -\frac{425}{14} - 20 \cdot x$

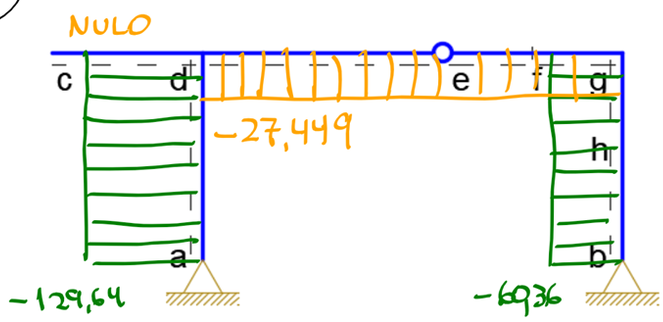
$Nf_esq := Nd_de = -27,449$

$Vg := Vfg(Lfg) = -60,36$

V


+79,64
0
c
d
e
f
g
+27,449
-0,3571
-50
-30,36
h
-60,36
a
b
-27,449
+7,449

N


NULO
c
d
e
f
g
-27,449
h
a
b
-129,64
-60,36