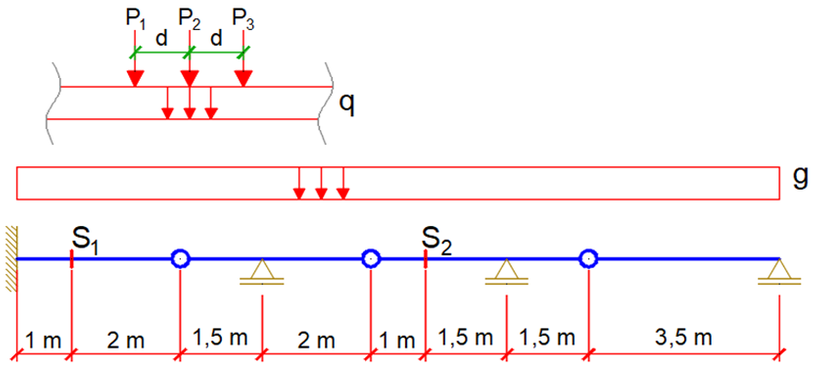
B1T4NA0820A

Trace as linhas de influência de momento fletor e esforço cortante para as seções S1 e S2 e responda os questionamentos:

Q01) Mínimo momento fletor na seção S1 [em kNm];

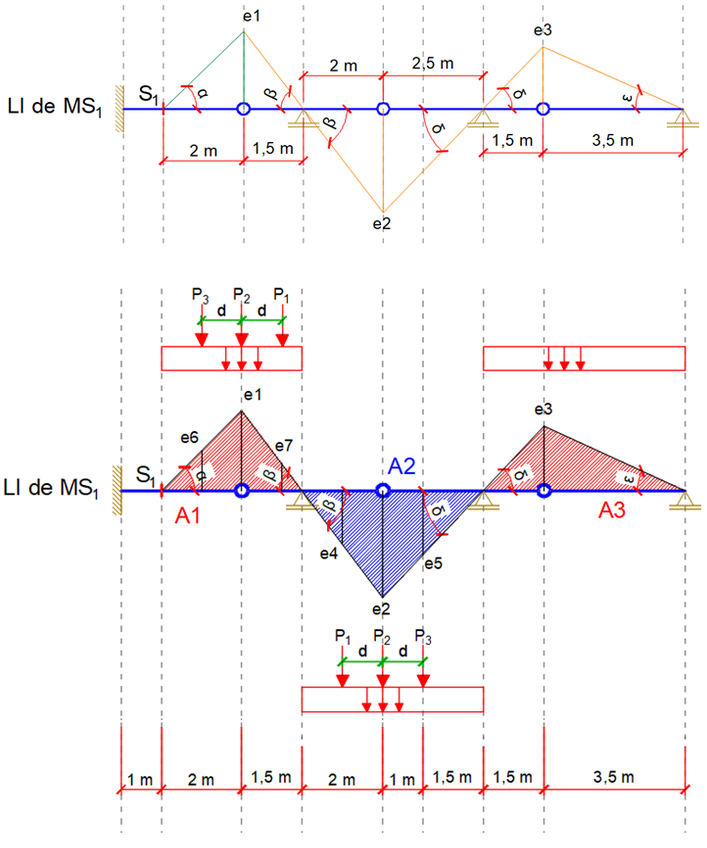
Q02) Máximo esforço cortante na seção S2 [em kN]

Q03) Mínimo esforço cortante na seção S2 [em kN];



$P1 := 40,0\ \text{kN}$ $P2 := 100,0\ \text{kN}$ $P3 := 70,0\ \text{kN}$ $d := 1,0\ \text{m}$ $q := 15\ \frac{\text{kN}}{\text{m}}$ $g := 20\ \frac{\text{kN}}{\text{m}}$

LI de Ms1:



$tg\alpha := 1$

$e1 := -2\ \text{m}$

$tg\beta := \frac{|e1|}{1,5\ \text{m}} = 1,3333$

$e2 := tg\beta \cdot 2\ \text{m} = 2,6667\ \text{m}$

$tg\delta := \frac{|e2|}{2,5\ \text{m}} = 1,0667$

$e3 := tg\delta \cdot (-1,5)\ \text{m} = -1,6\ \text{m}$

$tg\varepsilon := \frac{|e3|}{3,5\ \text{m}} = 0,45714$

$A1 := (2\ \text{m} + 1,5\ \text{m}) \cdot \frac{e1}{2} = -3,5\ \text{m}^2$

$A2 := (2 + 1 + 1,5)\ \text{m} \cdot \frac{e2}{2} = 6\ \text{m}^2$

$A3 := (1,5 + 3,5)\ \text{m} \cdot \frac{e3}{2} = -4\ \text{m}^2$

$e4 := tg\beta \cdot (2\ \text{m} - d) = 1,3333\ \text{m}$

$e5 := tg\delta \cdot ((1 + 1,5)\ \text{m} - d) = 1,6\ \text{m}$

$e6 := (-tg\alpha) \cdot (2\ \text{m} - d) = -1\ \text{m}$

$e7 := (-tg\beta) \cdot (1,5\ \text{m} - d) = -0,66667\ \text{m}$

Ms1 máximo: $Ms1_max_rodas := P1 \cdot e4 + P2 \cdot e2 + P3 \cdot e5 = 432\ \text{kN m}$

$Ms1_max_mult := q \cdot A2 = 90\ \text{kN m}$

$Ms1_max_perm := g \cdot (A1 + A2 + A3) = -30\ \text{kN m}$

$Ms1_max := Ms1_max_rodas + Ms1_max_mult + Ms1_max_perm = 492\ \text{kN m}$

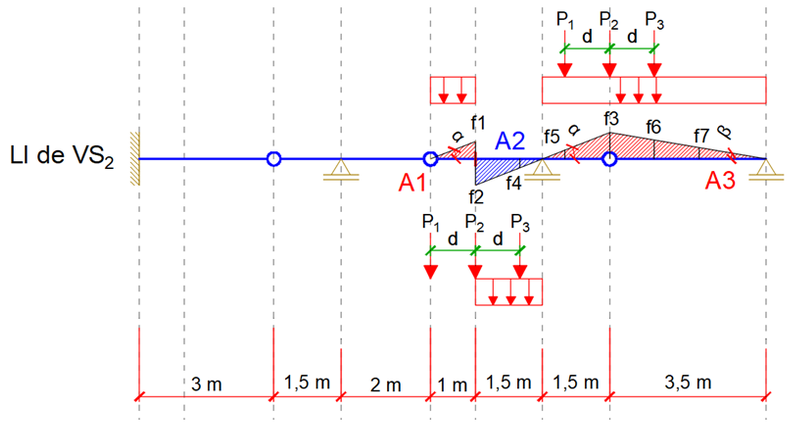
Ms1 mínimo: $Ms1_min_rodas := P1 \cdot e7 + P2 \cdot e1 + P3 \cdot e6 = -296,67\ kN\ m$

$Ms1_min_mult := q \cdot (A1 + A3) = -112,5\ kN\ m$

$Ms1_min_perm := g \cdot (A1 + A2 + A3) = -30\ kN\ m$

$Ms1_min := Ms1_min_rodas + Ms1_min_mult + Ms1_min_perm = -439,17\ kN\ m$

LI de Vs2:



$tg\alpha := \frac{1}{1\ m + 1,5\ m} = 0,4 \cdot \frac{1}{m}$

$f1 := (-tg\alpha) \cdot 1\ m = -0,4$

$f2 := tg\alpha \cdot 1,5\ m = 0,6$

$f4 := tg\alpha \cdot (1,5\ m - d) = 0,2$

$f5 := (-tg\alpha) \cdot (1,5\ m - d) = -0,2$

$f3 := (-tg\alpha) \cdot 1,5\ m = -0,6$

$tg\beta := \frac{|f3|}{3,5\ m} = 0,17143 \cdot \frac{1}{m}$

$f6 := (-tg\beta) \cdot (3,5\ m - d) = -0,42857$

$f7 := (-tg\beta) \cdot (3,5\ m - 2 \cdot d) = -0,2571$

$A1 := 1\ m \cdot \frac{f1}{2} = -0,2\ m$

$A2 := 1,5\ m \cdot \frac{f2}{2} = 0,45\ m$

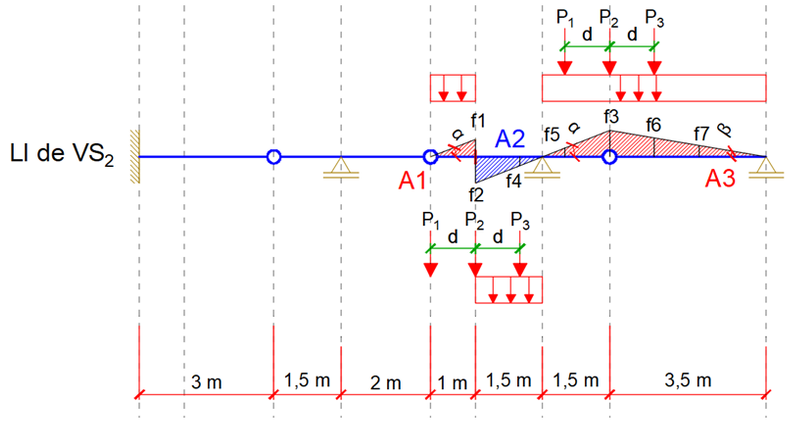
$A3 := (1,5 + 3,5)\ m \cdot \frac{f3}{2} = -1,5\ m$

Vs2 máximo: $Vs2_max_rodas := P1 \cdot 0 + P2 \cdot f2 + P3 \cdot f4 = 74\ kN$

$Vs2_max_mult := q \cdot A2 = 6,75\ kN$

$Vs2_max_perm := g \cdot (A1 + A2 + A3) = -25\ kN$

$Vs2_max := Vs2_max_rodas + Vs2_max_mult + Vs2_max_perm = 55,75\ kN$



Vs2 mínimo: $Vs2_min_rodas := P1 \cdot f5 + P2 \cdot f3 + P3 \cdot f6 = -98\ kN$

$Vs2_min_mult := q \cdot (A1 + A3) = -25,5\ kN$

$Vs2_min_perm := g \cdot (A1 + A2 + A3) = -25\ kN$

$Vs2_min := Vs2_min_rodas + Vs2_min_mult + Vs2_min_perm = -148,5\ kN$

$Q01 := Ms1_min = -439,17\ kN\ m$

$Q02 := Vs2_max = 55,75\ kN$

$Q03 := Vs2_min = -148,5\ kN$
