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Prova 2 de Mecânica dos Sólidos 3

①

$v_A = ?$

$\theta_D = ?$

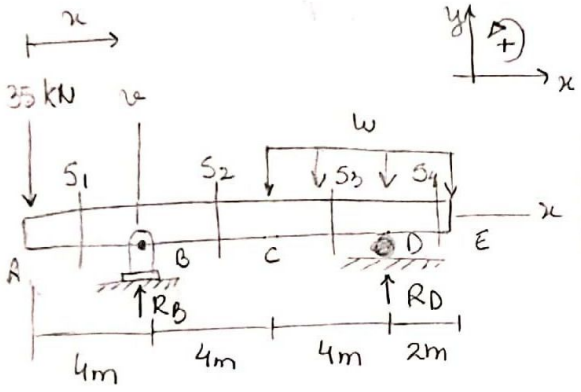
$w = 80\,kN/m$

$I_z = 351 \times 10^6\ mm^4$

$I_z = 3,51 \times 10^{-4}\ m^4$

$E = 200\ GPa = 2 \times 10^{11}\ Pa = 2 \times 10^8\ kN/m^2$

$EI = 7,02 \times 10^4\ kN.m^2$



- Reações de apoio

$\Sigma F_y = 0$

$R_B + R_D - 35 - 80.6 = 0$

$R_B + R_D - 515 = 0$

$R_B + R_D = 515$

$\boxed{R_B = 112,5\ kN}$

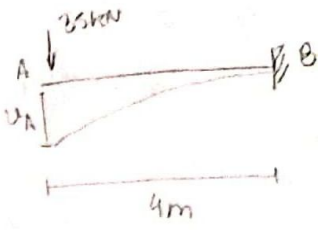
$\Sigma M_B = 0$

$35.4 - (80.6).7 + 8R_D = 0$

$R_D = \frac{-140 + 3360}{8}$

$\boxed{R_D = 402,5\ kN}$

- Utilizando o método da superposição, temos que:



$v_A = \frac{-PL^3}{3EI}$

$v_A = \frac{-35.4^3}{3(7,02 \times 10^4)}$

$v_A = -0,01063\ m$

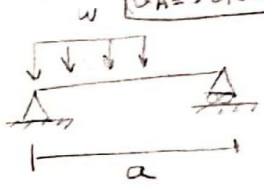
$\boxed{v_A = -1,063 \times 10^{-3}\ m}$

$\theta_B = \frac{ML}{2EI} = \frac{(140).(8)}{3(7,02 \times 10^4)} = 0,00531\ rad$

$v_A = -4(\theta_B)$

$\boxed{v_A = -0,02127\ m}$

$\theta_B = \frac{wa^2}{24LEI}(2L^2 - a^2)$



$= \frac{80.(4)^2}{24.8.(7,02 \times 10^4)}(2(8)^2 - (4)^2$

$\theta_B = 0,01603\ rad$

$v_A = 4.0,01603 = \boxed{0,0425\ m}$

$\theta_B = \frac{ML}{6EI} = \frac{160.8}{6(7,02 \times 10^4)}$

$\theta_B = 0,00303\ rad$

$v_A = -4.0,00303$

$\boxed{v_A = -0,0121\ m}$

Logo, todo o deslocamento em A será a soma dos parciais

$v_A = -0,01063 - 0,0121 + 0,0425 - 0,0217$

$v_A = -0,0015195\ m$

$\boxed{v_A = 1,520\ mm}$

- Rotação em D:

Em DE

$$\theta_D = \frac{qL^3}{6EI} = \frac{80 \cdot 2 \cdot 2^3}{6 (7{,}02 \times 10^4)}$$

$$\theta_D = 3{,}04 \times 10^{6}$$

Em CD

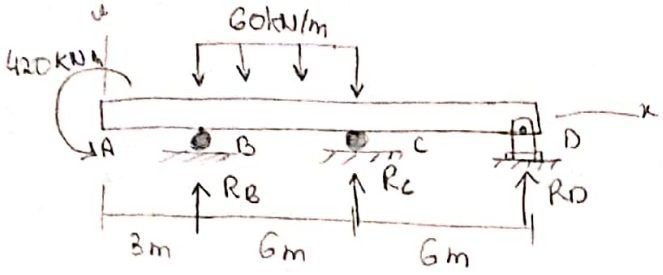
$$\theta_D = \frac{3qL^3}{128EI} = \frac{38 \cdot 4 \cdot 4^3}{128\,EI}$$

$$\theta_D = 6{,}84 \times 10^{-6}$$

$$\theta_D = 3{,}04 \times 10^{6} - 6{,}84 \times 10^{-6}$$

$$\theta_D = -3{,}8 \times 10^{-6}$$

(2)



3 incog
- 2 eq
(gc = 1)

Reações de apoio

$\Sigma F_y = 0$

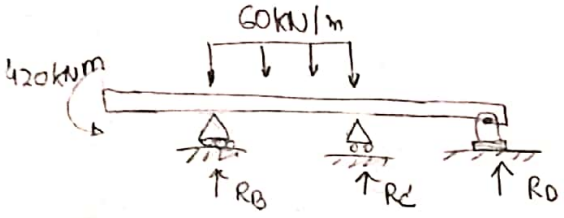
$R_B + R_D + R_C - 60.6 = 0$

$R_B + R_C + R_D = 360$

$\Sigma M_B = 0$

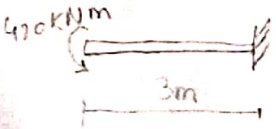
$420 - (60.6).3 + R_C 6 + R_D 12 = 0$

$6R_C + 12R_D = 660$



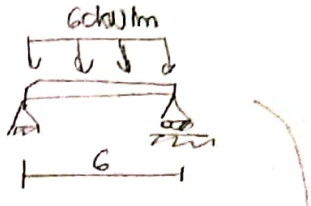
Condições de contorno:

$\delta_B = 0 \quad \delta_C = 0 \quad \delta_D = 0$



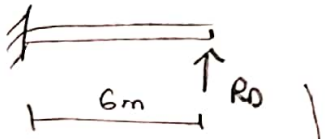
$\delta_{AB} = \frac{-420.3^2}{2EI}$

$\delta = + \frac{M_0 L^2}{2EI}$



$\delta = \frac{5qL^4}{384EI}$

$\delta = \frac{5(60)(6)^4}{384\ 2EI}$



$\delta = \frac{PL^3}{3EI}$

$\delta_D = + \frac{R_D (6)^3}{3EI}$

$\frac{-420.3^2}{2EI} + \frac{5(60)(6^4)}{384\ 2EI} + \frac{R_D (6)^3}{3EI} = 0$

$\frac{-1890}{EI} + \frac{506,25}{EI} + \frac{R_D 72}{EI} = 0$

$R_D = \frac{1383,75}{72}$

$\boxed{R_D = 19,22\ kN}$