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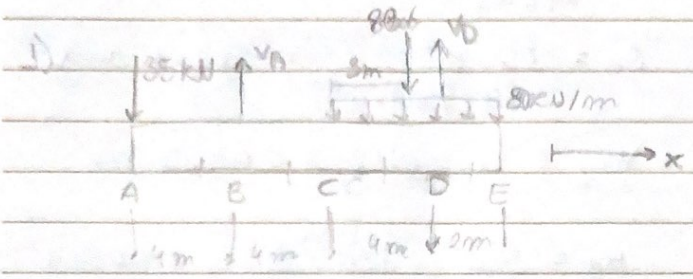
AGI - P2 Mecânica dos sólidos 3.



Calculando as reações de apoio:

$\Sigma F_y = 0 \Rightarrow V_B + V_D - 35 - 80 \times 6 = 0 \Rightarrow V_D = 515 - V_B$

$\Sigma M_D = 0 \Rightarrow 35.12 - V_B.8 + (80 \times 6).3 = 0 \Rightarrow V_B = 112,5\ kN \Rightarrow V_D = 402,5\ kN$

calculando o momento fletor:

Trecho AB: $\circlearrowright$ $0 < x < 4$

$M_{AB} + 35x = 0 \Rightarrow M_{AB} = -35x$

Trecho BC: $\circlearrowright$ $4 < x < 8$

$M_{BC} + 35x - V_B(x-4) = 0 \Rightarrow M_{BC} = -35x + 112,5x - 450 \Rightarrow M_{BC} = 77,5x - 450$

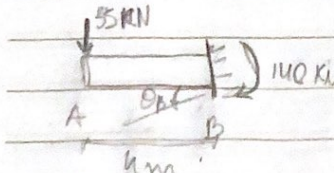
Trecho CD: $\circlearrowright$ $8 < x < 12$

$M_{CD} + 35x - V_B(x-4) + 80.\frac{(x-8)^2}{2} = 0 \Rightarrow M_{CD} = 77,5x - 450 - 40(x-8)^2$

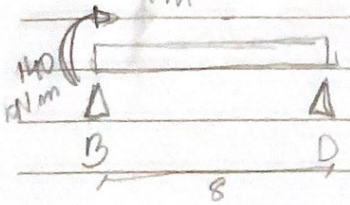
Trecho DE: $\circlearrowleft$ $12 < x < 14$

$M_{DE} + 80.\frac{(x-12)^2}{2} = 0 \Rightarrow M_{DE} = -40(x-12)^2$

Aplicando o método da superposição:



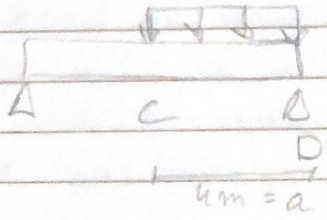
$\delta_{B_1} = \frac{-PL^3}{3EI} = \frac{-35.4^3}{3.7,02.10^4} = -0,0106\ m \quad Va_1$



$\theta_B = \frac{ML}{3EI} = \frac{140.8}{3.7,02.10^4} = 0,005318\ rad$

$Va_2 = -4.0,005318 = -0,02127\ m$

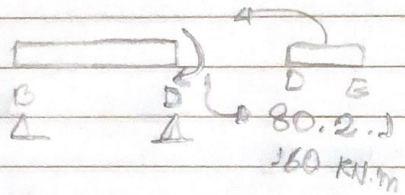
8m = L



$$\theta_B = \frac{W a^2}{24 L E I}(2L^2 - a^2)$$

$$\theta_B = \frac{80 \cdot 4^2}{24 \cdot 8 \cdot 7{,}02 \cdot 10^4} = 0{,}0106 \text{ rad}$$

$$V_{a_3} = 4 \cdot 0{,}0106 = 0{,}0425 \text{ m}$$



$$\theta_B = \frac{M L}{6 E I} = \frac{160 \cdot 8}{6 \cdot 7{,}02 \cdot 10^4} = 0{,}00304$$

$$V_{a_4} = -4 \cdot 0{,}00304 = -0{,}01215 \text{ m}$$

$$\therefore \delta_A = V_{a_1} + V_{a_2} + V_{a_3} + V_{a_4} = \boxed{-0{,}00152 \text{ m}}$$

2) equação de equilíbrio:

$\Sigma F_y = 0 \Rightarrow V_B + V_C + V_D - 60.6 = 0 \Rightarrow V_B + V_C + V_D = 360$

$V_B = 360 - V_C - V_D$

$\Sigma M_D = 0 \Rightarrow 420 + V_B.3 + V_C.9 + V_D.15 - 60.6.6 = 0$

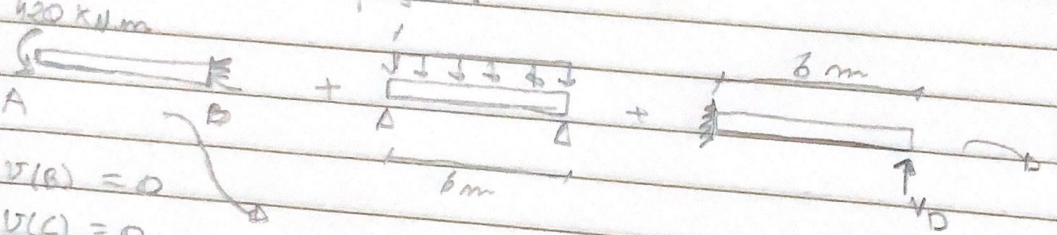
$\Rightarrow 3V_B + 9V_C + 15V_D = 2160 - 420$

$V_B = 580 - 3V_C - 5V_D$

$\therefore 360 - V_C - V_D = 580 - 3V_C - 5V_D$

$2V_C = 220 - 4V_D \Rightarrow V_C = 110 - 2V_D$

Pelo método dos forças:



$v(A) = 0$

$v(C) = 0$

$v(D) = 0$

$v_B = \frac{-V_D \cdot 6^3}{3.EI}$

$v_B = 0$

$\frac{-V_D.6^3}{3EI} = 0$