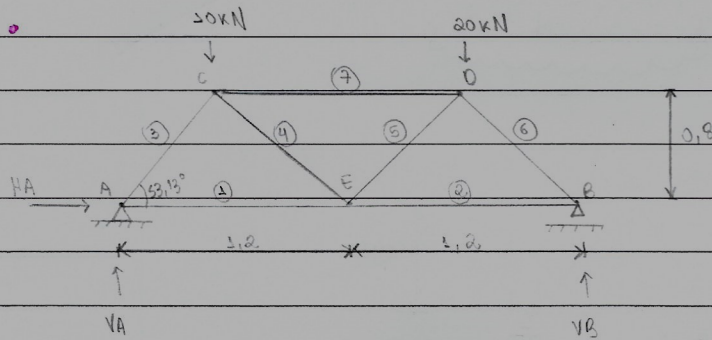


P2 Mecânica Geral

Análise Estrutural de E.V.T. de E.A.N. 2020/2021

EAN

1.



\* CÁLCULO DAS REAÇÕES DE APOIO

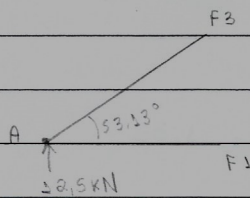
$\Sigma F_x = 0$   
 $HA = 0$

$\Sigma MA = 0 \quad (-1,8 \cdot 20) + (-0,6 \cdot 20) + (VB \cdot 2,4) = 0$   
 $VB = 17,5 \text{ kN}$

$\Sigma F_y = VA + VB - 20 - 20 = 0 \Rightarrow VA = 30 - VB$   
 $VA = 12,5 \text{ kN}$

\* CÁLCULO DAS FORÇAS NORMAIS

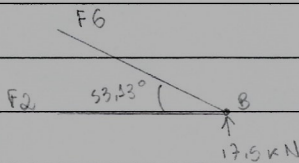
• NÓ "A"



$\Sigma F_x = 0$   
 $F_1 + F_3 \cos 53,13^\circ = 0$   
 $F_1 + 0,6 F_3 = 0$   
 $F_1 = 9,4 \text{ kN (T)}$

$\Sigma F_y = 0$   
 $12,5 + F_3 \sin 53,13^\circ = 0$   
 $F_3 = -19,6 \text{ kN (C)}$

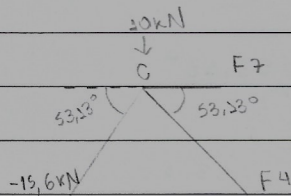
• NÓ "B"



$\Sigma F_x = 0$   
 $-F_2 - F_6 \cos 53,13^\circ = 0$   
 $-F_2 - 0,6 F_6 = 0$   
 $F_2 = 13,2 \text{ kN (T)}$

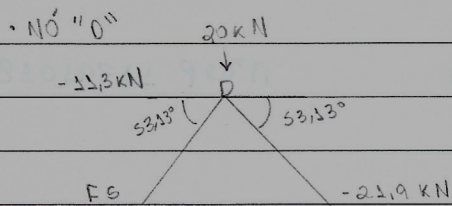
$\Sigma F_y = 0$   
 $17,5 + F_6 \sin 53,13^\circ = 0$   
 $F_6 = -25,9 \text{ kN (C)}$

• NÓ "C"



$\Sigma F_x = 0$   
 $F_7 + F_4 \cos 53,13^\circ - (-19,6 \cos 53,13^\circ) = 0$   
 $F_7 + 0,6 F_4 + 9,4 = 0$   
 $F_7 = -11,3 \text{ kN (C)}$

$\Sigma F_y = 0$   
 $-F_4 \sin 53,13^\circ - (-19,6 \sin 45^\circ) - 20 = 0$   
 $-0,8 F_4 + 12,5 - 20 = 0$   
 $F_4 = 3,2 \text{ kN (T)}$

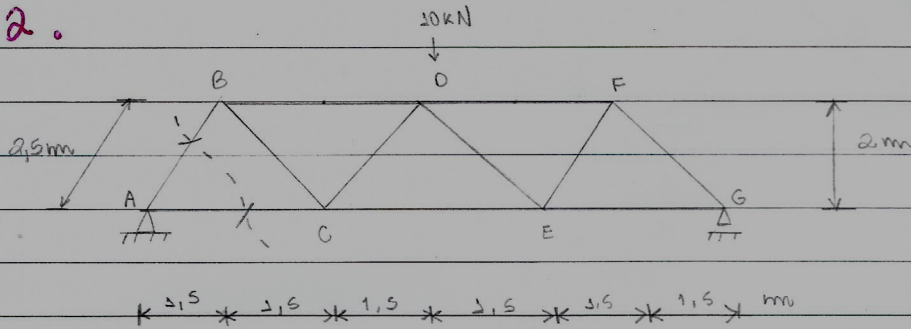


$$\sum F_y = 0$$

$$-20 - (-21.9 \sin 53.13^\circ) + F_s \sin 53.13^\circ = 0$$

$$F_s = -3.2 \text{ kN (C)}$$

2.



1° - CÁLCULO DAS REAÇÕES DE APOIO

$$\sum F_x = 0$$

$$F_{Ax} = 0$$

$$\sum F_y = 0$$

$$F_{Ay} + F_{Gy} - 20 = 0$$

$$F_{Ay} + F_{Gy} = 20 \text{ kN}$$

$$F_{Ay} = 5 \text{ kN}$$

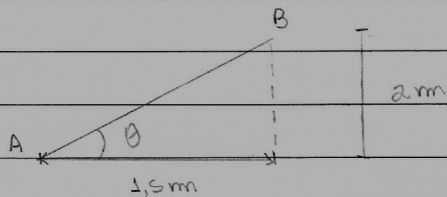
$$\sum M_A = 0$$

$$(-20 \cdot 4.5) + (F_{Gy} \cdot 9) = 0$$

$$-45 + F_{Gy} \cdot 9 = 0$$

$$F_{Gy} = 5 \text{ kN}$$

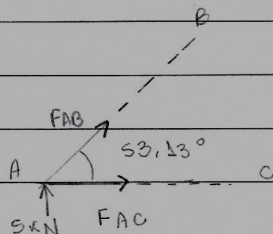
2° - CÁLCULO DO ÂNGULO



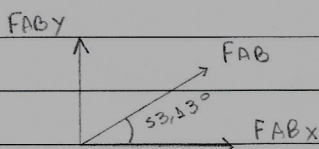
$$\tan \theta = \frac{2}{1.5} = 1.33$$

$$\theta \approx 53.13^\circ$$

3° - CORTE



4° - DECOMPOSIÇÃO DE VETORES



$$F_{ABx} = F_{AB} \cos 53.13^\circ$$

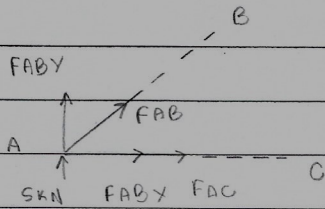
$$F_{ABx} = 0.6 F_{AB}$$

$$F_{ABY} = F_{AB} \sin 53.13^\circ$$

$$F_{ABY} = 0.8 F_{AB}$$



5° - soma rória das forças



$$\sum F_x = 0$$

$$F_{AC} + 0,6 F_{AB} = 0$$

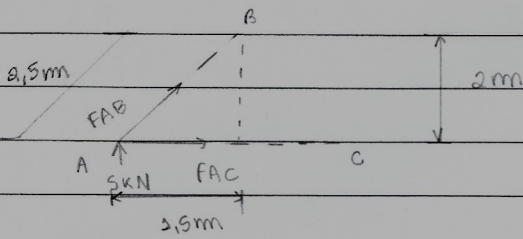
$$F_{AC} = 3,75 \text{ kN (T)}$$

$$\sum F_y = 0$$

$$5 + 0,8 F_{AB} = 0$$

$$F_{AB} = -6,25 \text{ kN (C)}$$

6° - momento



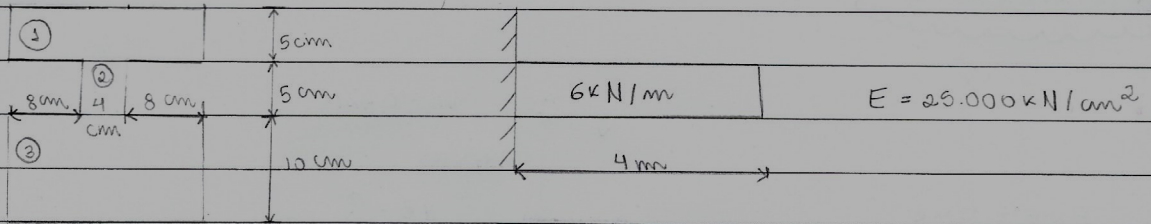
$$\sum M_B = 0$$

$$(-5 \cdot 3,5) + (F_{AC} \cdot 2) = 0$$

$$-7,5 + 7,5 = 0$$

$$0 = 0$$

3.



Fuga.	x	y	A	x A	y A	$\bar{x} = \sum x A = 3000 = 10 \text{ cm}$
1	10	17,5	100	1000	1750	$\sum A = 320$
2	10	12,5	20	200	250	$\bar{y} = \sum y A = 3000 = 9,375 \text{ cm}$
3	10	5	200	2000	1000	$\sum A = 320$
			$\sum$	3000	3000	

$$I_x = \frac{b \cdot h^3}{12} + A (\gamma - \bar{y})^2$$

$$I_x = I_{x1} + I_{x2} + I_{x3} = \left[ \frac{20 \cdot 5^3}{12} + 100 (17,5 - 9,375)^2 \right] + \left[ \frac{4 \cdot 10^3}{12} + 20 (12,5 - 9,375)^2 \right] + \left[ \frac{20 \cdot 10^3}{12} + 200 (5 - 9,375)^2 \right] = 12.541,6 \text{ cm}^4$$

$$F = \frac{P \cdot L^4}{8 \cdot E \cdot I}$$

$$F = \frac{0,06 \cdot 400^4}{8 \cdot 25.000 \cdot 12.541,6} = 0,61 \text{ cm}$$

$$F = 0,61 \text{ cm}$$

4. a) Forças alternativas, apenas.

5.  $m = 8 \text{ kg}$        $v_i = 0 \text{ m/s}$

$$\zeta = 300 \text{ J}$$

$$v_f = ?$$

$$\zeta = \Delta E_c$$

$$\zeta = m \frac{v_f^2}{2} - m \frac{v_i^2}{2}$$

$$300 = 8 \frac{v_f^2}{2}$$

$$v_f = \sqrt{75}$$

$$v_f = 8,66 \text{ m/s}$$

6.  $m$

$$h = 40,8 \text{ m}$$

$$E_{MA} = E_{MB}$$

$$E_{cA} + E_{pA} = E_{cB} + E_{pB}$$

$$0 + mgh_A = m \frac{v_B^2}{2} + 0$$

$$m \cdot 10 \cdot 40,8 = m \frac{v_B^2}{2}$$

$$408 \text{ m} = \frac{m v_B^2}{2}$$

$$v_B = \sqrt{816}$$

$$v_B = 28,57 \text{ m/s}$$

