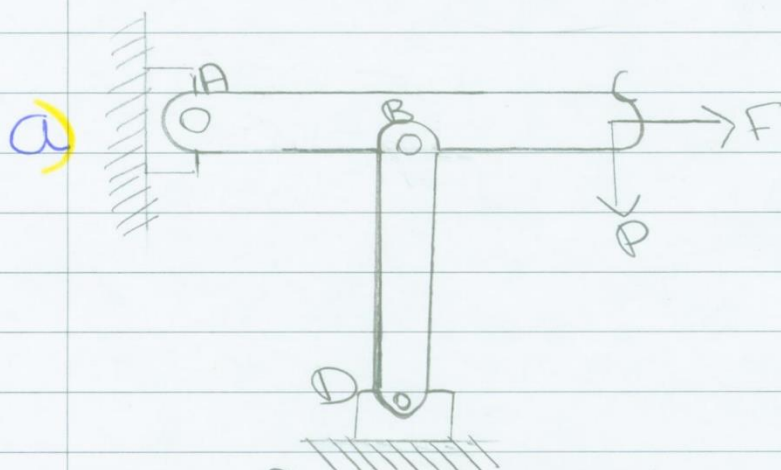


Αντοχή των υλικών

ΕΠΙΘΕΤΟ:.....**ΘΕΟΧΑΡΗ**.....
ΟΝΟΜΑ:**ΚΥΡΙΑΚΗ**.....
ΤΜΗΜΑ:**ΜΗΠΕΡ**.....
Α.Μ.:**2018050043**.....
PROJECT:**1^ο**.....

$E_2 = 5$ $P = 80 \text{ kN}$
 $E_3 = 15$ $AB = 0,2 \text{ m}$
 $F = 60 \text{ kN}$ $BC = 0,18 \text{ m}$
 $A_{\text{rod}} = 8 \times 20 \text{ mm}$

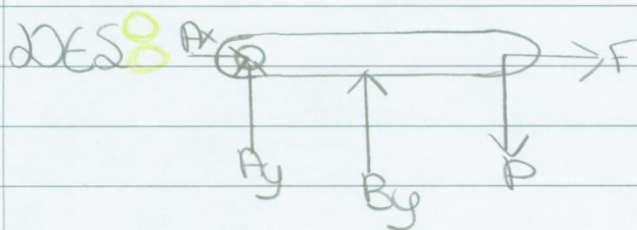


$$\begin{aligned} \Delta m &= 0 \\ B_x \cdot a &= 0 \\ B_x &= 0 \end{aligned}$$

Opřw tu cizozemcům
BD cizce

$$\begin{aligned} S f x &= 0 \\ B x - D x &= 0 \\ 0 &= D x + 0 \\ D x &= 0 \end{aligned}$$

$$B_y - D_y = 0$$

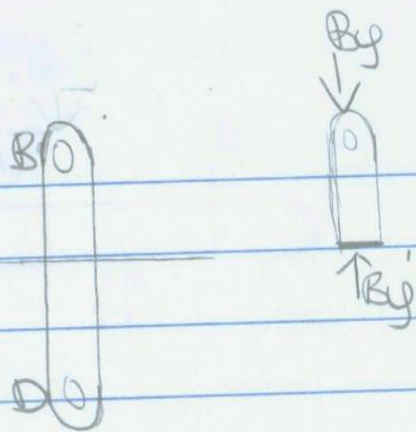


Ορίζω δεύτερη φορά $\rightarrow$ $\uparrow$ και
την αντιστροφή φορά

$$\begin{aligned} \Sigma F_x &= 0 \\ A_x + F &= 0 \\ A_x &= -F \\ A_x &= 60 \text{ kN} \end{aligned}$$

$$\begin{aligned} Sfy &= 0 \\ Ay + By - P &= 0 \\ Ay + 152 - 80 &= 0 \\ Ay + 72 &= 0 \\ Ay &= -72 \text{ kN} \end{aligned}$$

$$\begin{aligned} 2m &= 0 \\ \text{By} \cdot 0,2 - P \cdot 0,38 &= 0 \\ \text{By} \cdot 0,2 &= 80 \cdot 0,38 \\ \text{By} \cdot 0,2 &= 30,4 \\ \text{By} &= 152 \text{ kN} \end{aligned}$$



$$\sigma_{BD} = \frac{\frac{By}{2}}{A_{BD}} \quad 7,5 \text{ MPa}$$

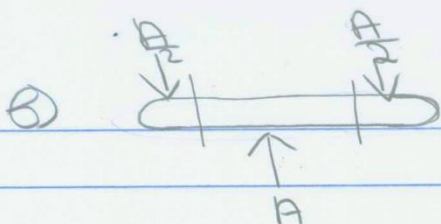
$$\frac{\frac{By}{2}}{A_{BD}} = \sigma_{BD}$$

$$\frac{152 \cdot 10^3}{2} = 105 \cdot 10^6$$

$$\frac{76 \cdot 10^3}{A_{BD}} = 105 \cdot 10^6$$

$$\frac{76 \cdot 10^3}{105 \cdot 10^6} = \frac{105 \cdot 10^6}{105 \cdot 10^6} A_{BD}$$

$$A_{BD} = 0,72 \cdot 10^{-3} \text{ m}^2$$



$$\frac{A}{2}$$

$$A = \sqrt{A_x^2 + A_y^2}$$

$$= \sqrt{60^2 + 67,3^2}$$

$$= 12\sqrt{61} \text{ kN}$$

$$\sigma = 3\sigma + \epsilon_3$$

$$= 3\sigma + 15$$

$$= 50 \text{ MPa}$$

$$\sigma_A = \frac{A}{\frac{\pi d^2}{4}}$$

$$\frac{A}{\frac{\pi d^2}{4}} = \sigma$$

$$\frac{12\sqrt{61} \cdot 10^3}{\frac{\pi d^2}{4}} = 50 \cdot 10^6$$

$$\frac{6\sqrt{61} \cdot 10^3}{\frac{\pi d^2}{4}} = 50 \cdot 10^6$$

$$\frac{24\sqrt{61} \cdot 10^3}{\pi d^2} = 50 \cdot 10^6$$

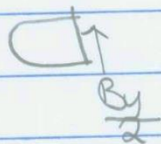
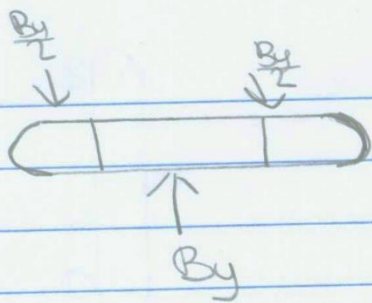
$$24\sqrt{61} \cdot 10^3 = 50 \cdot 10^6 \pi d^2$$

$$d^2 = \frac{24\sqrt{61} \cdot 10^3}{50 \cdot 10^6 \pi}$$

$$d^2 = 1,19 \cdot 10^{-3}$$

$$d = \sqrt{1,19 \cdot 10^{-3}}$$

$$= 0,04 \text{ m}$$



$$\tau_s = \frac{B_y}{2} \cdot \frac{\pi \delta^2}{4} \cdot \tau_s$$

$$\frac{B_y}{2} = \tau_s$$

$$\frac{152 \cdot 10^3}{2} = 50 \cdot 10^6$$

$$\frac{76 \cdot 10^3}{\pi \delta^2} = 50 \cdot 10^6$$

$$\frac{304 \cdot 10^3}{\pi \delta^2} = 50 \cdot 10^6$$

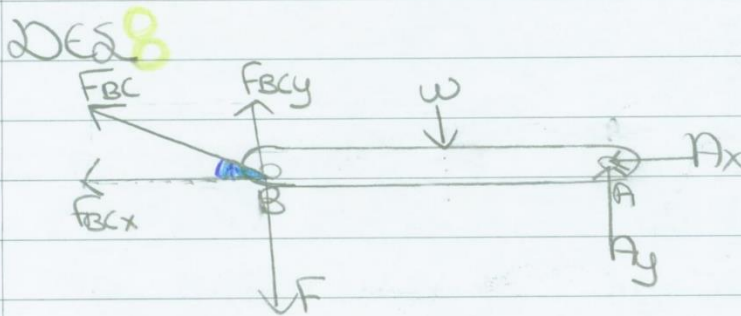
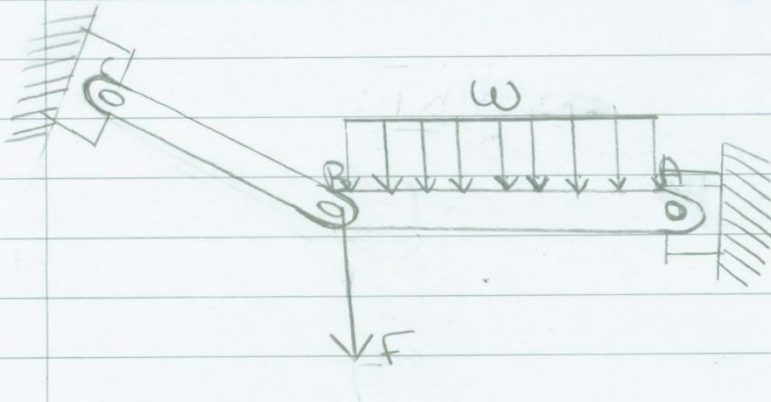
$$10^6 \cdot 50 \pi \delta^2 = 304 \cdot 10^3$$

$$\delta^2 = 1,94 \cdot 10^{-3}$$

$$\delta = 0,04m$$

Problem 2

$$\begin{array}{l|l} \text{Determine } & E = 50 \text{ kN} \\ \delta = 0.012 \text{ m} & E_s = S \\ \phi = 30^\circ & \tau_s = 25 \text{ MPa} \\ & AB = 5 \text{ m} \end{array}$$



$$\begin{array}{ll} \sum F_x = 0 & \sum F_y = 0 \\ -F_{BCx} - A_x = 0 & F_{BCy} + A_y - F - w \cdot 5 = 0 \\ -F_{BCx} = A_x & F_{BCy} + A_y - 50 - 5w = 0 \\ \boxed{F_{BCx} = -A_x} & 50 + 2.5w + A_y - 50 - 5w = 0 \\ & A_y - 2.5w = 0 \\ & \boxed{A_y = 2.5w} \end{array}$$

$$\begin{array}{l} \sum M = 0 \\ -F_{BCy} \cdot 5 + F \cdot 2.5 + w \cdot 5 \cdot 2.5 = 0 \\ -5F_{BCy} + 50 \cdot 5 + 12.5w = 0 \\ -5F_{BCy} = -250 - 12.5w \\ \boxed{F_{BCy} = 50 + 2.5w} \end{array}$$

$$F_{BCy} = 50 + 2,5w$$

$$F_{BC} = \frac{F_{BCy}}{\sin 30}$$

$$-A_x = F_{BCx}$$

$$A_x = -(100 + 5w) \sin 30$$

$$A_x = -50\beta - \frac{5w\beta}{2}$$

$$F_{BC} = \frac{50 + 2,5w}{\frac{1}{2}}$$

$$F_{BC} = 100 + 5w$$

$$A = \sqrt{A_x^2 + A_y^2}$$

$$= \sqrt{\left(-50\beta - \frac{5w\beta}{2}\right)^2 + (2,5w)^2}$$

$$\frac{F_{BC}}{\frac{2}{\pi \cdot 10^2}} = T_B$$

$$= \sqrt{\left(-50\beta - \frac{5w\beta}{2}\right)^2 + 6,25w^2}$$

$$= \sqrt{7500 - 750w + \frac{7}{4}w^2 + 6,25w^2}$$

$$T_B = \frac{100 + 5w}{2} \cdot 10^3$$

$$\frac{\pi \cdot 10^2}{4}$$

$$= \sqrt{25w^2 - 750w + 7500}$$

$$25 \cdot 10^6 = \frac{(50 + 2,5w)10^3}{36\pi \cdot 36 \times 10^{-5}\pi}$$

$$= \sqrt{w^2 - 30w + 300}$$

$$25 \cdot 10^6 = \frac{(50 + 2,5w) \cdot 10^8}{3,6\pi}$$

$$D = b^2 - 4ac$$

$$= (-30)^2 - 4(1)(300)$$

$$= 900 - 1200$$

$$= -300 \text{ caprice wopofice-}$$

Tun, 10on

$$25 = \frac{(50 + 2,5w)10^2}{3,6\pi}$$

$$25 \cdot 3,6\pi = (50 + 2,5w) \cdot 10^2$$

$$90\pi = 50 \cdot 10^2 + 2,5w \cdot 10^2$$

$$-50 \cdot 10^2 + 90\pi = 2,5w \cdot 10^2$$

$$-4717,26 = 2,5w \cdot 10^2$$

$$w = -18,87 \text{ N}$$

$$w = 9,019 \text{ kN}$$