

المادة: ميكانيكا المواد (1) - ص 40

$$\tau_a = \frac{16 M t_a}{\pi d^3} = \frac{89126}{d^3} \quad (2)$$

$$\tau_{eq} = \tau_m + \frac{\tau_a z_g}{A \sigma_c} = \frac{145148}{d^3} \quad (3)$$

$$\sigma_b = \frac{32 M b}{\pi d^3} = \frac{2023718.5}{d^3} \quad (2)$$

$$\tau_{max} = \sqrt{\left(\frac{\sigma_b}{2}\right)^2 + \tau_{eq}^2} \leq \tau_{all} \quad (2)$$

$$\Rightarrow d = 30.9 \text{ mm} \quad (2)$$

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$$k_2 = \frac{G d}{8 n c s} = 1 \frac{dN}{\text{mm}} \quad (3)$$

$$L_{s2} = N_f \cdot d = 80 \text{ mm} \quad (2)$$

$$F = k_1 x_1 + k_2 x_2 = 2 \times 70 + 1 \times 40 = 180 \text{ dN} \quad (4)$$

$$\tau_c = k_c \frac{8 F D}{\pi d^3} = 41,36 \frac{dN}{\text{mm}^2} \quad (2)$$

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$$t_g = \frac{P}{\cos \beta/2} \Rightarrow P = 7.97 \text{ (2)}$$

$$d_m = d_o - P = 21 \text{ mm} \quad (2)$$

$$M_t = W_{max} \frac{d_m (2 t_g (\alpha + \beta))}{2} = 2.455 W_{max}$$

$$t_g \alpha = \frac{n P}{\pi d_m} \Rightarrow \alpha = 5.19 \quad (2)$$

$$\sigma = \frac{4 W_{max}}{\pi d^2} ; \sigma = \frac{W_{max}}{25446} \quad (3)$$

$$d_i = d_o - P = 18 \text{ mm} \quad (2)$$

$$\tau = \frac{16 M_t}{\pi d^3} = \frac{W_{max}}{466.44} \quad (3)$$

$$\tau_{max} \sqrt{\left(\frac{\sigma}{2}\right)^2 + \tau^2} \leq \tau_{all} \quad (3)$$

$$W_{max} = 6877 \text{ dN} \quad (2)$$

$$x_c = \frac{\sum x_i L_i}{\sum L_i} = 58.66 \text{ mm} \quad (3)$$

$$M_b = 70 \times W = 481390$$

$$I = 2 \left[\frac{0.7 \times 8 \times 80^3}{12} + 80 \times 0.7 \times 8 (x_c - 40)^2 \right] + \frac{140 (0.7 \times 8)^3}{12} + 140 \times 0.7 \times 8 (80 - x_c)^2$$

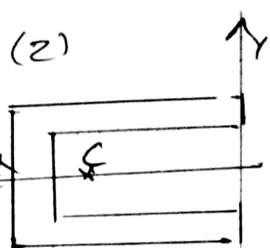
$$= 114928 \text{ mm}^4$$

$$\tau_1 = \frac{F}{A} = 4.1 \frac{\text{kg}}{\text{mm}^2} \quad (2)$$

$$\tau_2 = \frac{M_b \cdot y}{I} = 24 \frac{\text{dN}}{\text{mm}^2} \quad (3)$$

$$\tau_{eq} = \sqrt{\tau_1^2 + \tau_2^2} = 24.33 \frac{\text{dN}}{\text{mm}^2} \quad (2)$$

النتيجة تتجاوز القيمة المسموح بها (المادة) (2)



المادة: ميكانيكا المواد (1) - ص 17

$$M_{tmax} = 21000 \quad M_{tmin} = -14000$$

$$M_{tm} = \frac{M_{tmax} + M_{tmin}}{2} = 3500 \text{ dNm} \quad (2)$$

$$M_{ta} = \frac{M_{tmax} - M_{tmin}}{2} = 17500 \text{ dNm} \quad (2)$$

$$\tau_m = \frac{16 M_{tm}}{\pi d^3} = \frac{17825}{d^3} \quad (2)$$