

ΣΤΟΙΧΕΙΑ ΜΗΧΑΝΩΝ

1

14/6/2019

ΠΡΟΤΕΙΝΟΜΕΝΕΣ ΑΠΑΝΤΗΣΕΙΣ

ΘΕΜΑ Α

A1. 1. στ, 2. γ, 3. α, 4. β, 5. δ

A2. α. Σ, β. Λ, γ. Λ, δ. Σ, ε. Σ

ΘΕΜΑ Β

B1. α. υδάτων
β. δύναμη
γ. ωροτροπή
δ. βήμα
ε. ~~επιρροή~~ επιρροή (επιρροή)
στ. σχαρότα

B2. Σελ. 239-240 Η Πίστα... στα δόντια



ΘΕΜΑ Γ

2

Γ1

$$k=1$$

$$Q=3140 \text{ daN}$$

$$z=4$$

$$\eta=1$$

$$d=10 \text{ mm} = 1 \text{ cm}$$

$$\tau_{\text{ελ}} = 900 \text{ daN/cm}^2$$

$$a) A = \frac{\pi d^2}{4} = \frac{3,14 \cdot 1^2}{4} = 0,785 \text{ cm}^2$$

$$\tau = \frac{Q}{\eta A k z} = \frac{3140}{1 \cdot 0,785 \cdot 1 \cdot 4} = \frac{3140}{3,14} = 1000 \text{ daN/cm}^2$$

$\tau > \tau_{\text{ελ}}$ άρα η κατασκευή δεν αντέχει οπότε προσθέτουμε έναν ήλιο δηλαδή $z=5$

$$b) d_1 = d + 1 \text{ mm} = 10 + 1 = 11 \text{ mm} = 1,1 \text{ cm}$$

Γ2

3

$$\text{a) } A = \frac{\pi d_1^2}{4} = \frac{3,14 \cdot 1^2}{4} = 0,785 \text{ cm}^2$$

$$F = A \sigma_{\text{en}} = 0,785 \cdot 1000 = 785 \text{ daN}$$

β

~~$F = 0,6 d_1^2 \sigma_{\text{en}} = 0,6 \cdot 1^2 \cdot 1000$~~

$$\Rightarrow F = 600 \text{ daN}$$

$$\rho = \frac{F}{\frac{\pi}{4} (d^2 - d_1^2)} = \frac{600}{\frac{3,14}{4} \cdot (2^2 - 1^2) \cdot 10} = \frac{600}{0,785 \cdot 3 \cdot 10}$$
$$= \frac{600}{23,55} = \frac{20}{0,785} \approx 25,5 \text{ daN/cm}^2$$

ΘΕΜΑ Δ

4

Δ1

$$d_1 = 300 \text{ mm}$$

$$n_2 = 250 \text{ rpm}$$

$$i = \frac{1}{4}$$

$$P = i$$

$$b = 100 \text{ mm} = 10 \text{ cm}$$

$$s = 5 \text{ mm} = 0,5 \text{ cm}$$

$$\sigma_{\text{EN}} = 30 \frac{\text{daN}}{\text{cm}^2}$$

$$A = b \cdot s = 10 \cdot 0,5 = 5 \text{ cm}^2$$

$$F = A \sigma_{\text{EN}} = 5 \cdot 30 = 150 \text{ daN}$$

$$i = \frac{n_2}{n_1} \Rightarrow \frac{1}{4} = \frac{250}{n_1} \Rightarrow n_1 = 250 \cdot 4 = 1000 \text{ rpm}$$

$$V = \pi d_1 n_1 = 3,14 \cdot \frac{300}{1000} \cdot \frac{1000}{60} = 3,14 \cdot 5 = 15,7 \frac{\text{m}}{\text{s}}$$

$$F_v = 75P \Rightarrow 150 \cdot 15,7 = 75P \Rightarrow P = \frac{150 \cdot 15,7}{75}$$

$$\rightarrow P = 2 \cdot 15,7 = 31,4 \text{ HP}$$

Δ2

5

$$\left. \begin{aligned} a &= \frac{d_{01} + d_{02}}{2} \\ d_{01} &= \omega z_1 \\ d_{02} &= \omega z_2 \end{aligned} \right\} \Rightarrow a = \frac{\omega z_1 + \omega z_2}{2} \Rightarrow a = \frac{\omega(z_1 + z_2)}{2}$$

$$\Rightarrow 90 = \frac{\omega(20 + 40)}{2} \Rightarrow 90 = \frac{\omega \cdot 60}{2} \Rightarrow 90 = \omega \cdot 30$$

$$\Rightarrow \omega = \frac{90}{30} \Rightarrow \omega = 3 \text{ rad/s}$$

$$\omega = \frac{t}{r} \Rightarrow 3 = \frac{t}{3,14} \Rightarrow t = 3 \cdot 3,14 \Rightarrow t = 9,42 \text{ ms}$$

$$s = 0,5 t = 0,5 \cdot 9,42 = 4,71 \text{ mm}$$