ΑΠΑΝΤΗΣΕΙΣ ΣΤΟ ΜΑΘΗΜΑ ΦΥΣΙΚΗ ΘΕΤΙΚΗΣ & ΤΕΧΝΟΛΟΓΙΚΗΣ ΚΑΤΕΥΘΥΝΣΗΣ

ΘΕΜΑ Α

Α1. γ

Α2. γ

Α3. δ

Α4. γ

Α5. **α.** Σ, **β.** Λ, **γ.** Σ, **δ.** Λ, **ε.** Σ.

ΘΕΜΑ Β

Β1. α. Σωστή απάντηση : ii

β. Αιτιολόγηση:

$$Q = C \cdot V = 2 \cdot 10^{-5} \cdot 20 = 4 \cdot 10^{-4} C$$

$$\left.\begin{array}{l} E_{αρχ} = \frac{1}{2} \cdot \frac{Q^2}{C} = \frac{16 \cdot 10^{-8}}{4 \cdot 10^{-5}} = 4 \cdot 10^{-3} J \\ E_{τελ} = \frac{1}{2} \cdot L \cdot I^2 = \frac{1}{2} \cdot \frac{1}{9} \cdot 10^{-3} \cdot 36 = 2 \cdot 10^{-3} J \end{array}\right\} \Rightarrow ΔE = 2 \cdot 10^{-3} J$$

Β2. α. Σωστή απάντηση : iii

β. Αιτιολόγηση:

$$\left.\begin{array}{l} u = λ_1 \cdot f_1 \\ u = λ_2 \cdot f_2 \end{array}\right\} \Rightarrow 1 = \frac{λ_1}{3λ_2} \Leftrightarrow λ_2 = \frac{λ_1}{3}$$

$$\left.\begin{array}{l} r_1' - r_2' = (2N' + 1) \cdot \frac{λ_1}{6} \\ r_1' + r_2' = 2λ_1 \end{array}\right\} \overset{(+)}{\Rightarrow} 2r_1' = (2N' + 1) \cdot \frac{λ_1}{6} + 2λ_1$$

$$r'_1 = (2N' + 1) \cdot \frac{λ_1}{12} + λ_1$$

$$0 < r'_1 < 2λ_1 \Leftrightarrow 0 < (2N' + 1) \cdot \frac{λ_1}{12} + λ_1 < 2λ_1 \Leftrightarrow$$

$$-\cancel{λ_1} < (2N' + 1) \cdot \frac{\cancel{λ_1}}{12} < \cancel{λ_1} \Leftrightarrow -12 < 2N' + 1 < 12 \Leftrightarrow$$

$$-13 < 2N' < 11 \Leftrightarrow -6{,}5 < 2N' < 5{,}5$$

$N' = -6 , -5 , -4 , -3 , -2 , -1 , 0 , 1 , 2 , 3 , 4 , 5$

Β3. α. Σωστή απάντηση : ii

β. Από α.δ.στρ. $L_{αρχ} = L_{τελ}$

$$I_1 \cdot ω_1 = \left(I_1 + \frac{I_1}{4}\right) \cdot ω' \Leftrightarrow \cancel{I_1} \cdot ω_1 = \frac{5\cancel{I_1}}{4} \cdot ω' \Leftrightarrow ω' = \frac{4}{5} ω_1$$

$$ΔL = L_{τελ} - L_{αρχ} = I_1 \cdot \frac{4}{5} ω_1 - I_1 \cdot ω_1 = -\frac{1}{5} I_1 \cdot ω_1 = -\frac{1}{5} L_1 \Rightarrow |ΔL| = \frac{1}{5} L_1$$

ΘΕΜΑ Γ

Γ1. Από τους τύπους της ελαστικής κρούσης

$$u_1' = \frac{(m_1 - m_2)\cdot u_1}{m_1 + m_2} \Rightarrow u_1 = 3\sqrt{10} \text{ m/s}$$

Από Θ.Μ.Κ.Ε

$$K_{τελ} - K_{αρχ} = ΣW \Leftrightarrow \frac{1}{2}m_1u_1^2 - \frac{1}{2}m_1u_0^2 = -μm_1gd \Leftrightarrow u_0 = 10 \text{ m/s}$$

Γ2. $$\frac{K_2'}{K_1} = \frac{\frac{1}{2}m_2u_2'^2}{\frac{1}{2}m_1u_1^2}\cdot 100\% \xRightarrow{u_2' = \frac{2m_1u_1}{m_1+m_2} = 2\sqrt{10} \text{ m/s}} \frac{K_2'}{K_1} = \frac{800}{9}\%$$

Γ3. $ΣF = mα \Rightarrow T = mα \Rightarrow -μmg = mα \Rightarrow α = 5 \text{ m/s}^2$

$$u = u_0 - αt \Rightarrow 3\sqrt{10} = 10 - 5t \Rightarrow t = 0{,}08 \text{ sec}$$

$$u = u_1' - αt \Rightarrow 0 = u_1' - αt \Rightarrow u_1' = αt \Rightarrow t = 0{,}64 \text{ sec}$$

$$t_{ολ} = 0{,}72 \text{ sec}$$

Γ4. Από το Θ.Μ.Κ.Ε

$$K_{τελ} - K_{αρχ} = ΣW \Rightarrow 0 - \frac{1}{2}m_2u_2'^2 = -μm_2gx_{max} - \frac{1}{2}kx_{max}^2 \Rightarrow$$

$$10{,}5\cdot x_{max}^2 + x_{max} - 4 = 0 \rightarrow Δ = 169$$

$x_{max} = \frac{12}{21} \text{ m} = \frac{4}{7} \text{ m}$ ή $x_{max} = -\frac{14}{21}$ m απορρίπτεται

ΘΕΜΑ Δ

Δ1.

$$\left.\begin{array}{l} \sum τ = I\cdot α_{γων} \\ I = \frac{1}{2}MR^2 \end{array}\right\} \Rightarrow T\cdot \cancel{R} = \frac{1}{2}M R^{\cancel{2}}\cdot\frac{α_{cm}}{\cancel{R}} \Leftrightarrow T = \frac{M\cdot α}{2}$$

$$\sum F = M\cdot α \Rightarrow w_x - T = M\cdot α \Rightarrow \cancel{M}\cdot g\cdot ημφ = \cancel{M}\cdot α + \frac{\cancel{M}\cdot α}{2}$$

$$\Rightarrow \frac{3}{2}α = gημφ \Rightarrow \boldsymbol{α = \frac{2}{3}g\cdot ημφ}$$

Δ2. $I = \frac{1}{2}MR^2$

Αν ρ η πυκνότητα είναι :

$$\left.\begin{matrix} M = \rho\cdot\pi\cdot R^2\cdot h \\ m = \rho\cdot\pi\cdot r^2\cdot h \end{matrix}\right\} \Rightarrow \frac{M}{m} = \frac{R^2}{r^2} \Rightarrow m = M\cdot\frac{r^2}{R^2}$$

$$I' = \frac{1}{2}mr^2 \Rightarrow I' = \frac{1}{2}M\cdot\frac{r^2}{R^2}r^2 \Rightarrow I' = \frac{1}{2}M\cdot\frac{r^4}{R^2}$$

$$I_{\kappa o\iota\lambda} = I - I' = \frac{1}{2}MR^2 - \frac{1}{2}M\cdot\frac{r^4}{R^2} = \frac{1}{2}MR^2\cdot\left(1 - \frac{r^4}{R^4}\right)$$

Δ3.

$$\Sigma F = M\alpha_{cm}$$

$$Mg\eta\mu\varphi - T = M\alpha_{cm} \quad (1)$$

$$\Sigma\tau = I_{\kappa o\iota\lambda}\cdot\alpha_{\gamma}$$

$$T\cdot R = \frac{1}{2}MR^2\cdot\left(1 - \frac{r^4}{R^4}\right)\cdot\alpha_{\gamma}$$

$$T = \frac{1}{2}M\cdot\alpha_{cm}\cdot\left(1 - \frac{r^4}{R^4}\right)$$

$$(1) \Rightarrow Mg\eta\mu\varphi - \frac{1}{2}M\alpha_{cm}\left(1 - \frac{r^4}{R^4}\right) = M\alpha_{cm} \Rightarrow$$

$$\alpha_{cm} = \frac{2g\eta\mu\varphi}{3 - \frac{r^4}{R^4}}$$

Δ4.

$$\frac{K_{\mu\varepsilon\tau}}{K_{\pi\varepsilon\rho}} = \frac{\frac{1}{2}Mu_{cm}^2}{\frac{1}{2}\cdot\frac{1}{2}MR^2\cdot\left(1 - \frac{r^4}{R^4}\right)\cdot\frac{u_{cm}^2}{R^2}} \overset{R = 2r}{\Rightarrow} \frac{K_{\mu\varepsilon\tau}}{K_{\pi\varepsilon\rho}} = \frac{32}{15}$$