

**ΘΕΜΑ Α**

- A1) γ A2) β A3) γ A4) β A5) λ, λ, σ, λ, σ

**ΘΕΜΑ Β**

B1)  $x_1 = \frac{1}{2} a t_1^2 = \frac{1}{2} \cdot 4 \cdot 1^2 \Rightarrow x_1 = 2m$   
 $x_2 = \frac{1}{2} a t_2^2 = \frac{1}{2} \cdot 4 \cdot 2^2 \Rightarrow x_2 = 8m$

$\Delta x = x_2 - x_1 = 6m$   
Σωστή η απάντηση (β)

B2) Με εφαρμογή των σχέσεων  $v = at$  και  $s = \frac{1}{2} at^2$  βρίσκουμε:

t (s)	v (m/s)	s (m)
0	0	0
1	8	4
2	16	16
4	32	64

B3) α) Αποδειξέτε το θεώρημα

β)  $s_{2stop} = \frac{v_{2,stop}^2}{2|a|} \Rightarrow d_2 = \frac{v_2^2}{2|a|} = \frac{(2v_1)^2}{2|a|} = \frac{4v_1^2}{2a} = 4d_1$

Σωστή η απάντηση (β)

B4)  $s_{tot} = s_1 + s_2 \Rightarrow 100 = \frac{1}{2} a \Delta t_1^2 + v_1 \Delta t_2 \Rightarrow 100 = \frac{1}{2} a \Delta t_1^2 + a \Delta t_1 \cdot \Delta t_2$   
 $\Rightarrow 100 = \frac{1}{2} a \cdot 4^2 + a \cdot 4 \cdot 6 \Rightarrow 100 = 8a + 24a \Rightarrow 100 = 32a \Rightarrow$   
 $\Rightarrow a = \frac{100}{32} = \frac{25}{8} m/s^2$ . Σωστή η απάντηση (β)

# ΘΕΜΑ Γ

1η ΚΙΝΗΣΗ:

$$v_1 = a_1 \Delta t_1 = 2 \cdot 5 \Rightarrow v_1 = 10 \text{ m/s}$$

$$s_1 = \frac{1}{2} a_1 \Delta t_1^2 = \frac{1}{2} \cdot 2 \cdot 5^2 \Rightarrow s_1 = 25 \text{ m}$$

$$\Delta x_1 = 25 \text{ m}, \quad x_1 = \Delta x_1 + x_0 = 25 \text{ m} + 25 \text{ m} \Rightarrow x_1 = 50 \text{ m}$$

2η ΚΙΝΗΣΗ

$$v_2 = v_1 = 10 \text{ m/s}$$

$$s_2 = v_2 \Delta t_2 = 10 \cdot 4 \Rightarrow s_2 = 40 \text{ m}$$

$$\Delta x_2 = 40 \text{ m}, \quad x_2 = \Delta x_2 + x_1 = 40 \text{ m} + 50 \text{ m} \Rightarrow x_2 = 90 \text{ m}$$

3η ΚΙΝΗΣΗ

$$\Delta t_3 = \Delta t_{\text{stop}} = \frac{v_{\text{apx}}}{|a_3|} = \frac{10}{5} \Rightarrow \Delta t_3 = 2 \text{ s}$$

$$s_3 = \frac{v_{\text{apx}}^2}{2|a_3|} = \frac{10^2}{2 \cdot 5} \Rightarrow s_3 = 10 \text{ m}$$

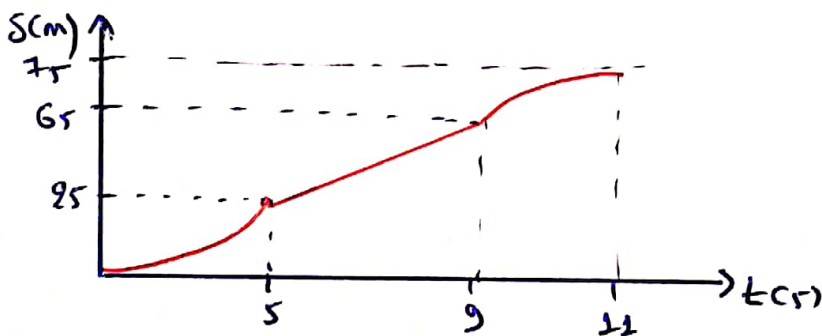
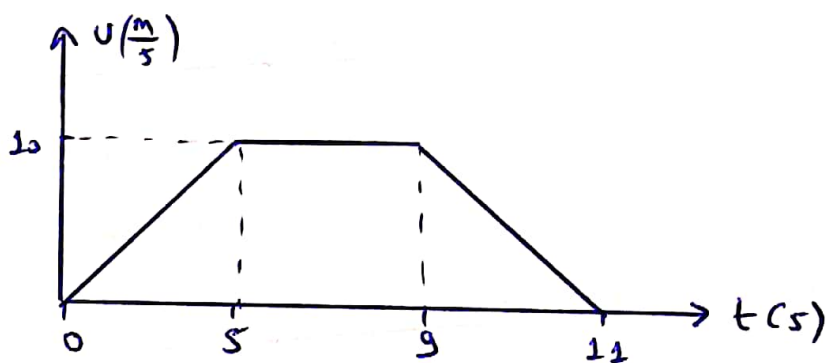
$$\Delta x_3 = 10 \text{ m}, \quad x_3 = \Delta x_3 + x_2 = 10 \text{ m} + 90 \text{ m} \Rightarrow x_3 = 100 \text{ m}$$

Γ1)  $s_{\text{ολ}} = s_1 + s_2 + s_3 = 25 \text{ m} + 40 \text{ m} + 10 \text{ m} \Rightarrow s_{\text{ολ}} = 75 \text{ m}$

$\Delta t_{\text{ολ}} = \Delta t_1 + \Delta t_2 + \Delta t_3 = 5 \text{ s} + 4 \text{ s} + 2 \text{ s} \Rightarrow \Delta t_{\text{ολ}} = 11 \text{ s}$

$v_{\mu} = \frac{s_{\text{ολ}}}{t_{\text{ολ}}} = \frac{75}{11} \text{ m/s}$

Γ2)



Γ3)  $x_3 = 100 \text{ m}$

Γ4)  $t_1 = 8 \text{ s}: v_1 = 10 \text{ m/s}$

$t_2 = 10 \text{ s}: v_2 = v_{\text{apx}} - |a_3| t = 10 - 5 \cdot 2 \Rightarrow v_2 = 5 \text{ m/s}$

Αρα  $\frac{v_1}{v_2} = \frac{10}{5} = \frac{2}{1}$

**ΘΕΜΑ Δ**

Δ1)  $a_1 = \frac{\Delta v}{\Delta t} = \frac{60-0}{15-0} \text{ m/s}^2 \Rightarrow \boxed{a_1 = 4 \text{ m/s}^2}$

$v_1 = a_1 t_1 \Rightarrow 40 = 4 \cdot t_1 \Rightarrow \boxed{t_1 = 10 \text{ s}}$

Δ2)  $s_1 = \frac{1}{2} a_1 \Delta t^2 = \frac{1}{2} \cdot 4 \cdot 10^2 \Rightarrow s_1 = 200 \text{ m}$

$s_2 = v_2 \cdot \Delta t = 40 \cdot 10 \Rightarrow s_2 = 400 \text{ m}$

$d = s_2 - s_1 \Rightarrow \boxed{d = 200 \text{ m}}$

Δ3) \* Για  $t_2 > 15 \text{ s}$  ισχύει:

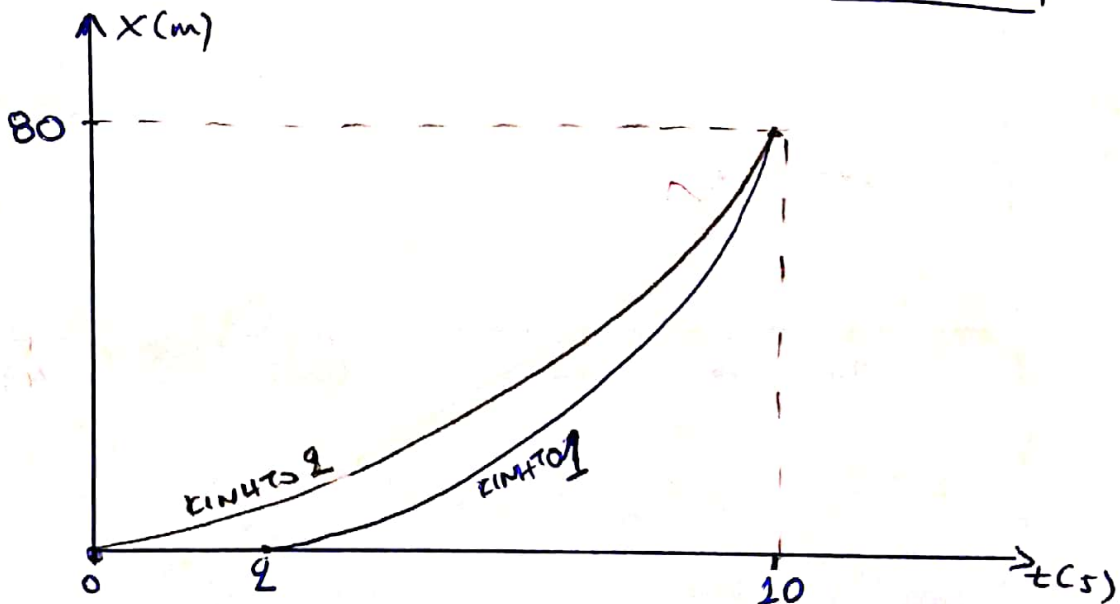
$s_1 = s_2 \Rightarrow E_1 = E_2 \Rightarrow \text{ΕΤΡΑΠΕΖΙΟΥ} = \text{ΕΠΡΟΒΟΛΙΣ} \Rightarrow (B+B)u = 40t_2 \Rightarrow$   
 $\Rightarrow [t_2 + (t_2 - 15)] \cdot 60 = 40t_2 \Rightarrow (2t_2 - 15)30 = 40t_2 \Rightarrow 2$   
 $\Rightarrow 60t_2 - 450 = 40t_2 \Rightarrow 20t_2 = 450 \Rightarrow \boxed{t_2 = 22.5 \text{ s}}$

Δ4)  $s_1 = s_2 \Rightarrow \frac{1}{2} a_1 (t-q)^2 = \frac{1}{2} a_2 t^2 \Rightarrow \frac{a_1}{a_2} = \frac{t^2}{(t-q)^2} \Rightarrow \frac{2.5}{4.6} = \left(\frac{t}{t-q}\right)^2 \Rightarrow$   
 $\Rightarrow \left(\frac{t}{t-q}\right)^2 = \frac{25}{46} \Rightarrow \frac{t}{t-q} = \pm \sqrt{\frac{25}{46}} \Rightarrow \frac{t}{t-q} = \pm \frac{5}{\sqrt{46}}$

•  $\frac{t}{t-q} = -\frac{5}{\sqrt{46}} \Rightarrow 5(t-q) = -4t \Rightarrow 5t - 10 = -4t \Rightarrow 9t = 10 \Rightarrow t = \frac{10}{9} \text{ s}$  Απορριπτό  
 (\* Δευτές για  $t > 15 \text{ s}$ )

•  $\frac{t}{t-q} = \frac{5}{\sqrt{46}} \Rightarrow 5(t-q) = 4t \Rightarrow 5t - 10 = 4t \Rightarrow t = 10 \text{ s}$  Δέκτη  
 \*Από  $\boxed{t_4 = 10 \text{ s}}$

Δ5)



Για  $t = t_4 = 10 \text{ s} : X_q = \frac{1}{2} a_2 t_4^2 = \frac{1}{2} \cdot 4.6 \cdot 10^2 = 80 \text{ m}$

και  $x_1 = x_2 = 80 \text{ m}$ , όταν βρεθούν.

\* Για  $t = 15 \text{ s}$

$s_2 = v_2 t = 40 \cdot 15 = 600 \text{ m}$

$s_1 = \frac{1}{2} a_1 t^2 = \frac{1}{2} \cdot 4 \cdot 15^2 = 450 \text{ m}$

Επειδή  $s_2 > s_1$ , το  $\Sigma_2$  ακούει προηγουμένως το  $\Sigma_1$ .

Η συνθήκη να γίνει για  $t_2 > 15 \text{ sec}$ .