Θέμα Α

Α1 –α , Α2 – β , Α3 – δ , Α4 – δ ,
Α5 – α. Σ , β. Σ, γ. Λ , δ. Σ, ε. Λ

Θέμα Β

Β1. Σωστή απάντηση είναι η (γ).

$$\left.\begin{array}{l} x = 8t + 4t^2 \\ x = \upsilon_0 t + \dfrac{1}{2}\alpha t^2 \end{array}\right\} \xrightarrow{\text{ΤΑΥΤΟΠΟΙΗΣΗ}} \upsilon_0 = 8\,m/s \ \ και \ \ \frac{1}{2}\alpha = 4 \Rightarrow \alpha = 8\,m/s^2$$

$$\upsilon = \upsilon_0 + \alpha t \Rightarrow \upsilon = 8 + 8\cdot 3 \Rightarrow \boxed{\upsilon = 32\,m/s}$$

$$x = \upsilon_0 t + \frac{1}{2}\alpha t^2 \Rightarrow x = 8\cdot 3 + \frac{1}{2}\cdot 8 \cdot 3^2 \Rightarrow \boxed{x = 60\,m}$$

Β2. i) Σωστή απάντηση είναι η (β).

$$\left.\begin{array}{l} \alpha_1 = \dfrac{\Delta\upsilon}{\Delta t} \Rightarrow \alpha_1 = \dfrac{5\upsilon_0 - \upsilon_0}{t} \Rightarrow \alpha_1 = \dfrac{4\upsilon_0}{t} \\ \alpha_2 = \dfrac{\Delta\upsilon}{\Delta t} \Rightarrow |\alpha_2| = \dfrac{|2\upsilon_0 - 4\upsilon_0|}{t} \Rightarrow |\alpha_2| = \dfrac{2\upsilon_0}{t} \end{array}\right\} \overset{\div}{\Rightarrow} \frac{\alpha_1}{a_2} = \frac{\frac{4\upsilon_0}{t}}{\frac{2\upsilon_0}{t}} \Rightarrow \frac{\alpha_1}{a_2} = \frac{4\upsilon_0 t}{2\upsilon_0 t} \Rightarrow \frac{\alpha_1}{a_2} = 2 \Rightarrow \boxed{\alpha_1 = 2a_2}$$

ii) Σωστή απάντηση είναι η (α).

$$\left.\begin{array}{l} S_1 = Εμβαδόν(1) = \dfrac{(5\upsilon_0 + \upsilon_0)t}{2} \Rightarrow S_1 = 3\upsilon_0 t \\ S_2 = Εμβαδόν(2) = \dfrac{(4\upsilon_0 + 2\upsilon_0)t}{2} \Rightarrow S_2 = 3\upsilon_0 t \end{array}\right\} \overset{\div}{\Rightarrow} \frac{S_1}{S_2} = \frac{3\upsilon_0 t}{3\upsilon_0 t} \Rightarrow \frac{S_1}{S_2} = 1 \Rightarrow \boxed{S_1 = S_2}$$

Β3. *Από την εξίσωση ταχύτητας-χρόνου:*

$$\upsilon = \upsilon_0 - |\alpha|\cdot t \xrightarrow{\upsilon = 0} 0 = \upsilon_0 - |\alpha|\cdot t_{stop} \Rightarrow |\alpha|\cdot t_{stop} = \upsilon_0 \Rightarrow \boxed{t_{stop} = \frac{\upsilon_0}{|\alpha|}}\ (1)$$

Από την εξίσωση κίνησης του σώματος:

$$s = \upsilon_o \cdot t - \frac{1}{2}\cdot|\alpha|\cdot t^2 \xrightarrow{t = t_{ολ.} = \frac{\upsilon_0}{|\alpha|}} S_{stop} = \upsilon_o \cdot \frac{\upsilon_0}{|\alpha|} - \frac{1}{2}\cdot\cancel{|\alpha|}\cdot\frac{\upsilon_0^{\,2}}{\cancel{|\alpha|^2}} \Rightarrow S_{stop} = \frac{\upsilon_0^{\,2}}{|\alpha|} - \frac{\upsilon_0^{\,2}}{2|\alpha|} \Rightarrow \boxed{S_{stop} = \frac{\upsilon_0^{\,2}}{2|\alpha|}}$$

Θέμα Γ

Α) Γ1. $\upsilon_4 = \upsilon_0 + at \Rightarrow \upsilon_4 = 10 + 4\cdot 4 \Rightarrow \boxed{\upsilon_4 = 26\,m/s}$

Γ2. $S = \upsilon_0 t + \frac{1}{2}at^2 \Rightarrow S = 10t + 2t^2$

Για t=2 s: $S_2 = 10\cdot 2 + 2\cdot 2^2 \Rightarrow S_2 = 28\,m$

Για t=3 s: $S_3 = 10\cdot 3 + 2\cdot 3^2 \Rightarrow S_2 = 48\,m$

Άρα: $S = S_3 - S_2 \Rightarrow S = 48 - 28 \Rightarrow \boxed{S = 20\,m}$

Γ3. $S=\upsilon_0 t+\frac{1}{2}\alpha t^2 \Rightarrow 12=10\cdot t+\frac{1}{2}\cdot 4\cdot t^2 \Rightarrow 2\cdot t^2+10\cdot t-12=0$

$\Delta=\beta^2-4\cdot\alpha\cdot\gamma \Rightarrow \Delta=10^2-4\cdot 2\cdot(-12) \Rightarrow \Delta=100+96 \Rightarrow \Delta=196$

$$t_{1,2}=\frac{-\beta\pm\sqrt{\Delta}}{2\alpha} \Rightarrow t_{1,2}=\frac{-10\pm\sqrt{196}}{2\cdot 2} \Rightarrow t_{1,2}=\frac{-10\pm 14}{4} \begin{cases} t_1=\dfrac{-10+14}{4} \Rightarrow t_1=1\,\text{sec}:\Delta\varepsilon\kappa\tau\acute{\eta} \\ t_2=\dfrac{-10-14}{4} \Rightarrow t_2=-12\,\text{sec}:\text{Απορρίπτεται} \end{cases}$$

$\upsilon_1=\upsilon_0+\alpha t \Rightarrow \upsilon_1=10+4\cdot 1 \Rightarrow \boxed{\upsilon_1=14\,m/s}$

Β) Γ4. $\alpha=\frac{\Delta\upsilon}{\Delta t} \Rightarrow \alpha=\frac{10-60}{5-0} \Rightarrow \alpha=\frac{-50}{5} \Rightarrow \boxed{\alpha=-10\,m/s^2}$

Γ5.

$\bullet\upsilon=\upsilon_0-|\alpha|t \Rightarrow 30=60-10\cdot t \Rightarrow 10\cdot t=30 \Rightarrow t=3\text{sec}$

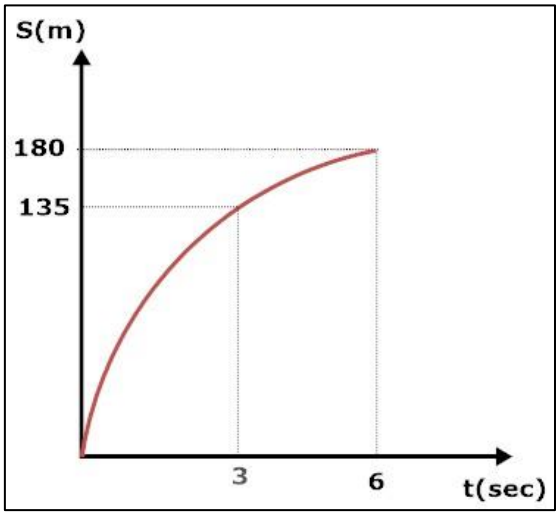
$S_3=\upsilon_0 t-\frac{1}{2}|a|t^2 \Rightarrow S_3=60\cdot 3-\frac{1}{2}\cdot 10\cdot 3^2 \Rightarrow S_3=135\,m$

$\bullet\upsilon=\upsilon_0-|\alpha|t \Rightarrow 10=60-10\cdot t \Rightarrow 10\cdot t=50 \Rightarrow t=5\text{sec}$

$S_5=\upsilon_0 t-\frac{1}{2}|a|t^2 \Rightarrow S_5=60\cdot 5-\frac{1}{2}\cdot 10\cdot 5^2 \Rightarrow S_5=175\,m$

$S=S_5-S_3 \Rightarrow S=175-135 \Rightarrow \boxed{S=40\,m}$

Γ6. $S_{stop}=\frac{\upsilon_0^{\,2}}{2\cdot|\alpha|} \Rightarrow S_{stop}=\frac{60^2}{20} \Rightarrow S_{stop}=\frac{3600}{20} \Rightarrow \boxed{S_{stop}=180\,m}$



Θέμα Δ

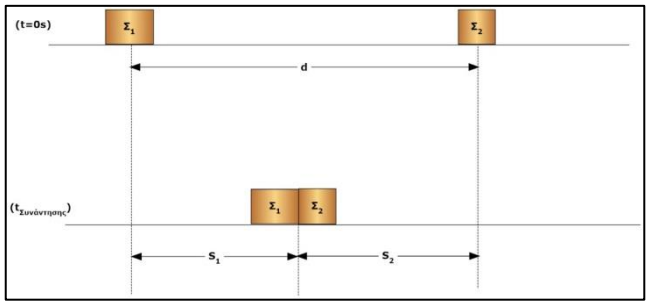
Α)

Δ1.

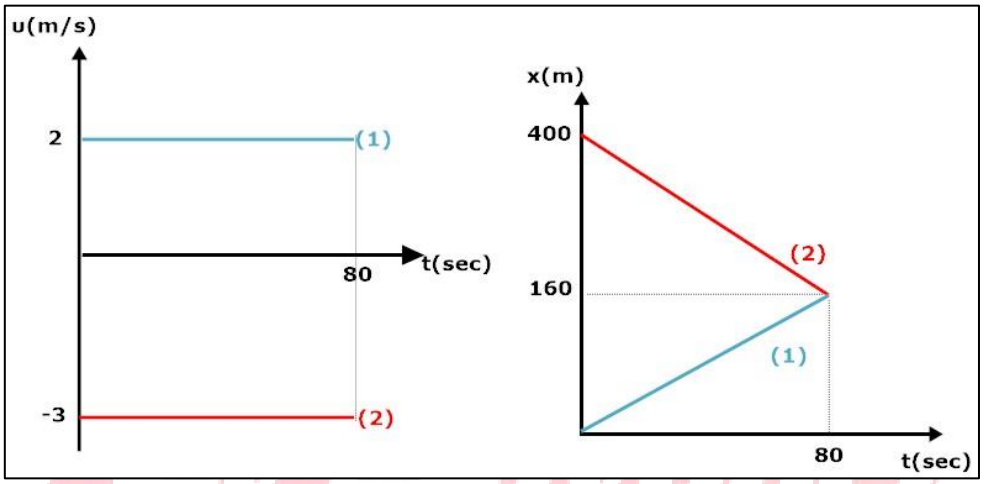
$$S_1 + S_2 = d \Rightarrow 2t + 3t = 400 \Rightarrow 5t = 400 \Rightarrow \boxed{t = 80s}$$

$$S_1 = 2t = 2 \cdot 80 \Rightarrow \boxed{S_1 = 160m}$$

$$S_2 = 3t = 3 \cdot 80 \Rightarrow \boxed{S_2 = 240m}$$



Δ2.



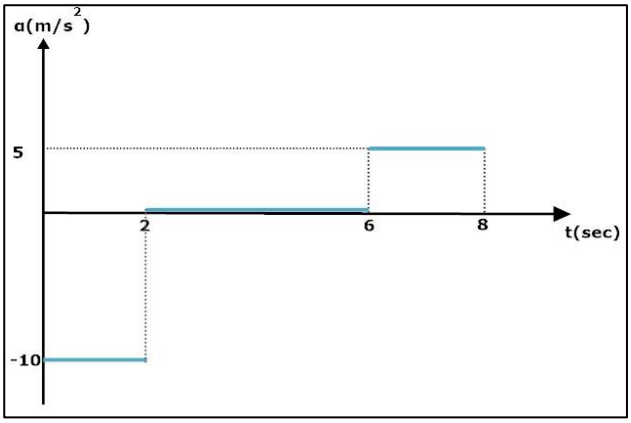
Β) Δ3. Από 0-2 sec: Ε.Ο.Επιβ.Κ. με υ_0=30 m/s
Από 2-6 sec: Ε.Ο.Κ. με υ=10 m/s σταθερή
Από 6-8 sec: Ε.Ο.Επιτ.Κ. με υ_0= 10 m/s

Δ4.

$$a_1 = \frac{\Delta\upsilon}{\Delta t} \Rightarrow a_1 = \frac{10-30}{2-0} \Rightarrow \boxed{a_1 = -10\ m/s^2}$$

$$a_1 = \frac{\Delta\upsilon}{\Delta t} \Rightarrow a_2 = \frac{10-10}{6-2} \Rightarrow \boxed{a_2 = 0\ m/s^2}$$

$$a_3 = \frac{\Delta\upsilon}{\Delta t} \Rightarrow a_3 = \frac{20-10}{8-6} \Rightarrow \boxed{a_3 = 5\,m/s^2}$$

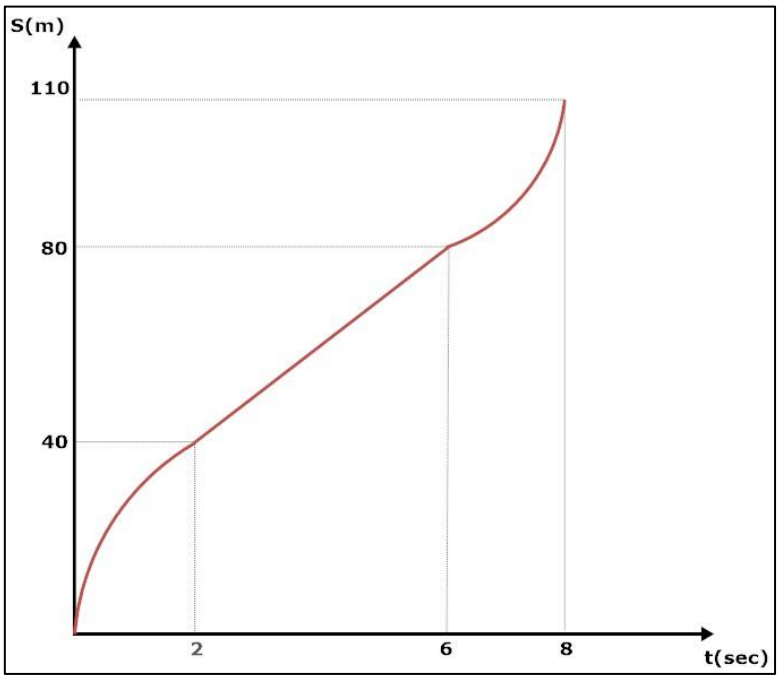


Δ5. α) Από 0-2 s: $E_1 = \frac{(B+\beta)\cdot\upsilon}{2} = \frac{(30+10)\cdot 2}{2} = 40 \rightarrow \Delta x_1 = 40\,m$ *και* $S_1 = |\Delta x_1| = 40\,m$

Από 2-6 s: $E_2 = \beta\cdot\upsilon = 10\cdot 4 = 40 \rightarrow \Delta x_2 = 40\ m$ *και* $S_2 = |\Delta x_2| = 40\ m$

Από 6-8 s: $E_3 = \frac{(B+\beta)\cdot\upsilon}{2} = \frac{(20+10)\cdot 2}{2} = 30 \rightarrow \Delta x_3 = 30\,m$ *και* $S_3 = |\Delta x_3| = 30\ m$

$$S_{ολ.}=|\Delta x_1|+|\Delta x_2|+|\Delta x_3| \Rightarrow S_{ολ.}=40+40+30 \Rightarrow \boxed{S_{ολ.}=110\,m}$$



Δ6.

Την t=7s: $\upsilon_7=\upsilon_0+a_3\cdot\Delta t \Rightarrow \upsilon_7=10+5\cdot(7-6) \Rightarrow \boxed{\upsilon_7=15\ m/s}$

Μέχρι τη χρονική στιγμή t=6 s, το σώμα έχει διανύσει 80 m(από ερώτημα Δ5), άρα: $x_6=80m$

$$\Delta x=\upsilon_0\Delta t+\frac{1}{2}a_3\Delta t^2 \xrightarrow{t=7sec} \Delta x=10\cdot(7-6)+\frac{1}{2}\cdot5\cdot(7-6)^2 \Rightarrow \Delta x=12,5m$$

$$\Delta x=x_7-x_6 \Rightarrow 12,5=x_7-80 \Rightarrow \boxed{x_7=92,5\,m}$$