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ENG 234.

Question 1 (F12-3).

Solution.

$V = 4t - 3t^2$

$S = \int v\,dt$

$S = \int 4t - 3t^3\,dt$

$\Rightarrow S = \frac{4t^2}{2} - \frac{3t^3}{3} + c$

When $S = 0$ and $t = 0$

$0 = \frac{4(0)^2}{2} - \frac{3(0)^3}{3} + c$

$0 = 0 + c$

$c = 0$

Therefore

$S = \frac{4t^2}{2} - \frac{3t^3}{3} + 0$

$S = 2t^2 - t^3$

At $t = 4s$

$S = 2(4)^2 - (4)^3$

$S = -32m$ //

Question 2 (F12-4)

$V = (0.5t^3 - 8t)\ m/s$

$a = \frac{dv}{dt} = 1.5t^2 - 8$

When $t = 2s$

$a = 1.5(2)^2 - 8$

$\therefore a = -2m/s^2$

Question 3 (F12-7)

$a = (4t^2 - 2)\ m/s^2$

Solution:

At $t = 0$ and $S = 2m$ to the left origin

$S(0) = -2\ m$

At $t = 2s$ and $S = 20m$ to the left origin

$S(2) = -20\ m$

At $t = 4s$ and $S(4) = ?$

$$\int a\,dt = V = \frac{4t^3}{3} - 2t + c$$

$$\int V\,dt = S = \frac{4t^4}{12} - t^2 + c \cdot t + x$$

When $S(0) = -2m$

$$S = \frac{4t^4}{12} - t^2 + c \cdot t + x \Longrightarrow -2 = \frac{4(0)^4}{12} - 0^2 + c \cdot 0 + x$$

$$x = -2 \text{ //}$$

$$S = \frac{4t^4}{12} - t^2 + c \cdot t + x = \frac{t^4}{3} - t^2 + c \cdot t - 2$$

When $S(2) = -20m$

$$S = \frac{4t^4}{12} - t^2 + c \cdot t + x \Rightarrow -20 = \frac{4(2)^4}{12} - (2)^2 + c \cdot 2 - 2$$

$$= -20 = \frac{16}{3} - 4 + 2c - 2$$

$$= -20 - \frac{16}{3} + 6 = 2c$$

$$= \frac{-58}{3} = 2c \Longrightarrow c = -9.67$$

$$\Longrightarrow S = \frac{4t^4}{12} - t^2 + c \cdot t + x = \frac{t^4}{3} - t^2 - 9.67t - 2$$

To Find the position of the particle when $t = 4s$ We Substitute the value of t into the equation below

$$\frac{t^4}{3} - t^2 - 9.67t - 2$$

$$\frac{(4)^4}{3} - 4^2 - 9.67(4) - 2 = 28.65$$

$\therefore S(4) = 28.65\ m$ //

Question 4 (F12-8).

Solution.

$V = (20 - 0.05s^2)\ m/s$

$a\,ds = v\,dv$

$a = v \cdot \frac{dv}{ds}$

$\frac{dv}{ds}(0.05s^2) = 0.1s$

$a = v \cdot \frac{dv}{ds} = (20 - 0.05s^2)(0.1s)$

When $s = 15$

$a = (20 - 0.05(15)^2)(0.1(15))$

$a = 13.125\ m/s^2$