



National University
of computer and emerging sciences

Foundation of Advancement
of Science and Technology



ASSIGNMENT # 03

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COURSE NAME: APPLIED PHYSICS

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Assignment 3

Q#1 $x = 5 + 2t + 4t^2 - t^3$

a) $v = \frac{d}{dt}(5 + 2t + 4t^2 - t^3)$

$v = 2 + 8t - 3t^2$

b) At $t = 0$
 $x = 5 + 2(0) + 4(0)^2 - (0)^3$
 $x = 5 \text{ m}$

At $t = 1 \text{ sec}$
 $x = 5 + 2(1) + 4(1)^2 - (1)^3$
 $x = 10 \text{ m}$

\Rightarrow At $t = 0.1$
 $x = 5 + 2(0.1) + 4(0.1)^2 - (0.1)^3$
 $= 5 + 0.2 + 0.04 - 0.001$
 $x = 5.2 \text{ m}$

At $t = 0.01 \text{ sec}$
 $x = 5 + 2(0.01) + 4(0.01)^2 - (0.01)^3$
 $x = 5 + 0.02 + 0.0004 - 0.000001$
 $x = 5.02 \text{ m}$

c) $d = 10 - 5$ ($t = 0, t = 1 \text{ sec}$)
 $= 5 \text{ m}$
 $v = 5 \text{ m/s}$

At $t = 0$ to $t = 0.1 \text{ s}$
 $d = 5.23 - 5$
 $d = 0.23 \text{ m}$

At $t = 0, t = 0.01 \text{ s}$

$d = 5.02 - 5$
 $= 0.02 \text{ m}$

$v = \frac{0.02}{0.01}$

$v = 2 \text{ m/s}$

$v = \frac{0.239}{0.1}$
 $v = 2.39 \text{ m/s}$

d) $v = 2 + 8t - 3t^2$
 $v = 2 + 8(0) - 3(0)^2$
 $v = 2 \text{ m/s}$

At $t = 0$

Q.4.2

Given

$$S = ?$$

$$\text{Initial Speed } U = 0$$

$$\text{Final Speed } V = 25 \text{ m/s}$$

$$a = ?$$

$$t = 8 \text{ Sec}$$

Sol.

(a)

$$a = \frac{V - U}{t}$$

$$= \frac{25 - 0}{8}$$

$$a = 25/8$$

$$a = 3.13 \text{ m/s}^2$$

(b)

$$S = \frac{1}{2}(U + V)t$$

$$= \frac{1}{2}(0 + 25)(8)$$

$$S = 100 \text{ m}$$

$$S = 100 \text{ m}$$

Data

Q# 3

$$S = 17.35 \text{ m}$$

$$U = 12.0 \text{ m/s}$$

$$V = 0$$

$$g = -9.8 \text{ m/s}^2$$

Sol

$$S = Ut + \frac{gt^2}{2}$$

$$17.35 = 0 + \frac{4.9t^2}{x}$$

$$\sqrt{\frac{(17.35)}{(4.9)}} = t$$

$$t_2 = 1.88 \text{ sec}$$

$$a = \frac{V - U}{t_1}$$

$$t_1 = \frac{0 - 12}{-9.8}$$

$$t_1 = 1.22 \text{ sec}$$

a) Total Time

$$T = 1.88 + 1.22$$

$$T = 3.1 \text{ sec}$$

$$\Rightarrow -2gs = V^2 - U^2$$

$$\Rightarrow 2(9.8)S = 0 - 144$$

$$S = \frac{144}{19.6}$$

$$S = 7.35 \text{ m}$$

b) Velocity

$$\Rightarrow 2gs = V^2 - U^2$$

$$\Rightarrow 2(9.8)(17.35) = V^2 - 0$$

$$V = 18.44 \text{ m/s}$$

Ans

Q# 4

Data

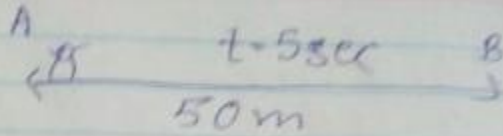
$$S = 50 \text{ m}$$

$$U = ?$$

$$V = 16 \text{ m/s}$$

$$a = ?$$

$$t = 5 \text{ s}$$



Sol:

a) $a = ?$

$$S = Ut - \frac{1}{2}at^2$$

$$50 = 16(5) - \frac{25}{2}a$$

$$\Rightarrow \frac{25a}{2} = 30$$

$$\Rightarrow 25a = 60$$

$$\Rightarrow \boxed{a = 2.4 \text{ m/s}^2}$$

b) $U = ?$

$$S = \frac{1}{2}(U+V)t$$

$$50 = \frac{1}{2}(U+16)5$$

$$\frac{100}{5} = U+16$$

$$U = 20 - 16$$

$$\boxed{U = 4 \text{ m/s}}$$

Data

$$S = 36.8 \text{ m}$$

$$U = ?$$

$$V = 30 \text{ m/s}$$

$$g = -9.8 \text{ m/s}^2$$

$$t = 2.25 \text{ s}$$

Q#5

Sol:

$$a) S = Ut + \frac{1}{2}at^2$$

$$36.8 = 2.25U + \frac{1}{2}(9.8)(2.25)^2$$

$$36.8 = 2.25U - 24.81$$

$$U = 27.4 \text{ m/s}$$

$$b) S = Vt - \frac{at^2}{2}$$

$$36.8 = V(2.25) - \frac{1}{2}(9.8)(2.25)^2$$

$$36.8 = 2.25V - 24.83$$

$$V = \frac{11.97}{2.25}$$

$$V = 5.3 \text{ m/s}$$

$$c) 2aS = V^2 - U^2$$

$$2(9.8)S = 0 - 53^2$$

$$S = \frac{(5.3)^2}{19.6}$$

$$S = 1.43 \text{ m}$$

Q# 6

Data.

$$V_1 = 60 \text{ Km/h}$$

$$V_2 = 40 \text{ Km/h}$$

$$V_{avg} = ?$$

Sol.

$$V_{avg} = \frac{2V_1V_2}{V_1 + V_2}$$

$$= \frac{2 \times 60 \times 40}{40 + 60}$$

$$V_{avg} = \frac{120 \times 40}{100}$$

$$V_{avg} = 48 \text{ Km/h}$$

Q# 7

Data

$$S = 81.3 \text{ m}$$

$$U = -12.4 \text{ m/s}$$

$$V = ?$$

$$t = ?$$

$$g = 9.8 \text{ m/s}^2$$

Sol:

$$a) 2as = V^2 - U^2$$

$$2(9.8)(81.3) = V^2 - (-12.4)^2$$

$$V^2 = 19.6(81.3) + (12.4)^2$$

$$\boxed{V = 41.8 \text{ m/s}} \quad \checkmark$$

$$b) a = \frac{V - U}{t}$$

$$9.8 = \frac{41.8 - (-12.4)}{t}$$

$$t = \frac{54.2}{9.8}$$

$$\boxed{t = 5.53 \text{ s}} \quad \checkmark$$

Data

Q#8

$$S = 1800 \text{ m}$$

$$U = 0$$

$$V = 100 \text{ m/s}$$

$$a = ?$$

Sol:

$$2as = v^2 - U^2$$

$$2(a)(1800) = 100^2 - 0$$

$$3600a = 10000$$

$$a = \frac{10000}{3600}$$

$$a = 2.8$$

$$\boxed{a = 2.8 \text{ m/s}^2}$$

Q#9,

Q#9

$$s = ?$$

$$U = 24.6 \text{ m/s}$$

$$V = 0$$

$$a = -4.92 \text{ m/s}^2$$

$$t = ?$$

Sol:

(a)

$$a = \frac{V - U}{t}$$

$$-4.92 = \frac{0 - 24.6}{t}$$

$$t = 4.92 - 24.6$$

$$t = 5 \text{ sec}$$

(b)

$$2as = V^2 - U^2$$

$$2(-4.92)(s) = 0 - 24.6^2$$

$$-9.8s = -24.6^2$$

$$s = \frac{(24.6)(24.6)}{9.8}$$

$$s = 61.5 \text{ m}$$

Q#10

Sol.

a) $x = 50t + 10t^2$

At $t = 3\text{ s}$

$$x = 50(3) + 10(3)^2$$

$$x = 240\text{ m}$$

$$v = \frac{d}{t} = \frac{240}{3}$$

$$v_{avg} = 80\text{ m/s}$$

b) $y = 50 + 20t$

$$v = 50 + 20(t)$$

At $t = 3\text{ s}$

$$v = 50 + 60$$

$$v_m = 110\text{ m/s}$$

(c)

~~$a = 0 + 20$~~

$\therefore v = 50 + 20t$

$$\frac{dv}{dt} = \frac{d(50 + 20t)}{dt}$$

$$a = 0 + 20$$

$$a = 20\text{ m/s}^2$$