١

1-

(b) $]0,2[\cup]4,\infty[$ (1)

2-

(c) $t^3 - t^2 + 1$ (1)

3-

$V_1 = -9$ m/sec

$V_2 = 7.2 \times \frac{5}{18} = 2$ m/sec (½)

$I = m(V_2 - V_1)$

$= \frac{100}{1000}[2 - (-9)] = 1.1$ kg.m/sec (½)

$I = F.t$

$1.1 = F \times \frac{1}{10}$

$\therefore F = 11$ N (½)

The pressure of the ball on the wall = F

$= 11$ N (½)

(2)

4-

$\therefore a = v \cdot \frac{dv}{dx}$ ½

$\therefore \frac{3}{8} x^2 \, dx = v \, dv$

$\therefore \frac{3}{8} \int_0^x x^2 \, dx = \int_0^v v \, dv$ ½

$\therefore \left[\frac{1}{2} v^2\right]_0^v = \left[\frac{1}{8} x^3\right]_0^x$ ½

$\therefore \frac{1}{2} v^2 = \frac{1}{8} x^3$

$\therefore v^2 = \frac{1}{4} x^3$ ½

(i) when $x = 2$

$\therefore v^2 = 2 \quad \therefore v = \pm\sqrt{2}$ m/sec ½

(ii) when $v = 4$

$\therefore 16 = \frac{1}{4} x^3$

$\therefore x^3 = 64$

$\therefore x = 4$ m ½

3

(تراعى الحلول الأخرى)

5-

(d) 32 (1)

6-

(c) 35 (1)

7-

$m_1 = 10 \text{ tons} = 10^4 \text{ kg}$, $v_1 = 20 \text{ m/sec}$

$m_2 = 10 \text{ tons} = 10^4 \text{ kg}$, $v_2 = 0$

(i) $\because m_1v_1 + m_2v_2 = (m_1 + m_2)v'$

$10 \times 20 + 10 \times 0 = (10 + 10)v'$ (1/2)

$\therefore v' = 10 \text{ m/sec}$ (1/2)

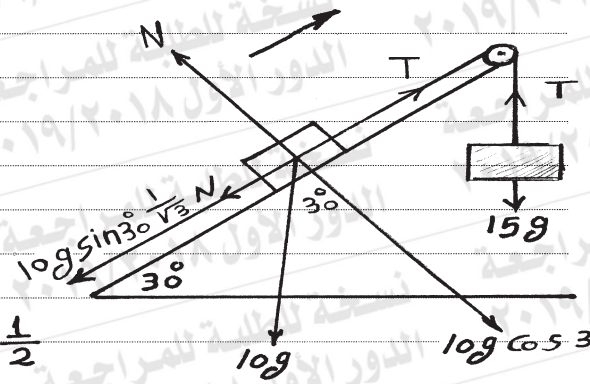
(ii) The Kinetic energy lost by collision

$= \frac{1}{2} \times 10^4 \times 20^2 - \frac{1}{2} \times 2 \times 10^4 \times 10^2$ (1/2)

$= 10^6$ joule (1/2)

(2)

8-



$15 \times 980 > 10 \times 980 \times \frac{1}{2}$

∴ The direction of motion is as shown in Figure

The equations of motion:

$15 \times 980 - T = 15a$ ½

$T - 10 \times 980 \times \frac{1}{2} - 10 \times 980 \times \frac{\sqrt{3}}{2} \times \frac{1}{\sqrt{3}} = 10a$ 1

By adding $4900 = 25a$

$\therefore a = 196 \text{ cm/sec}^2$ ½

$S = v_0 t + \frac{1}{2} a t^2$

$98 = \frac{1}{2} \times 196 t^2$

$\therefore t = 1 \text{ sec}$ ½

$V = V_0 + at$

$= 196 \times 1$

$V = 196 \text{ cm/sec}$ ½ (3)

(تراعى الحلول الأخرى)

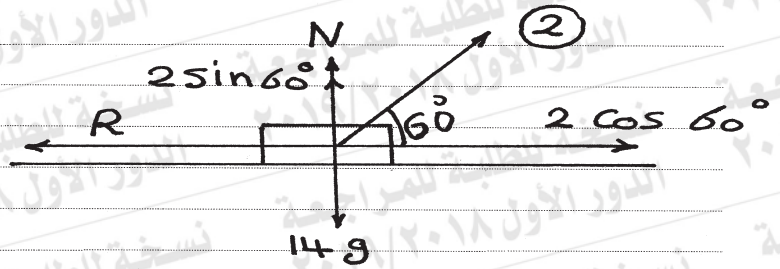
9-

(b) $2.45\ m/sec^2$ up the plane (1)

10-

(c) 0.4 (1)

11-



$2\cos 60° - R = ma$ (1/2)

$2 \times \frac{1}{2} \times 9.8 - 0.95 \times 9.8 = 14a$

$\therefore a = 0.035\ m/sec^2$ (1/2)

$S = V_0 t + \frac{1}{2} a t^2$

$= \frac{1}{2} \times 0.035 \times (60)^2$

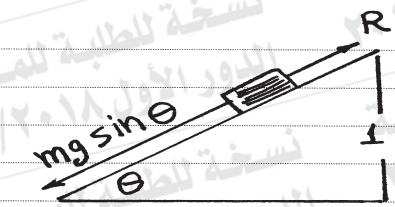
$= 63\ m$ (1/2)

$W = F \times S \times \cos 60°$

$= 2 \times 9.8 \times \frac{1}{2} \times 63$

$= 617.4$ joule (1/2) (2)

12-



$T - T_o = W$ (1/2)

$\frac{1}{2} m v^2 - zero = (mg\sin\theta - R) s$ (1/2)

$\frac{1}{2} \times 0.3 v^2 = 0.3 \times 9.8 \times \frac{1}{5} \times s - R \cdot s$ (1/2)

$\frac{1}{2} \times 0.3 v^2 = 0.3 \times 9.8 - 1.59$ (1/2)

$\therefore v^2 = 9$ (1/2) $\therefore v = 3$ m/sec (1/2)

(3)

Another solution

$\therefore mg\sin\theta - R = ma$ (1/2)

$0.3 \times 9.8 \times \frac{1}{5} - R = 0.3a$ (1/2)

$0.3 \times 9.8 - Rs = 0.3as$ (1/2)

$0.3 \times 9.8 - 1.59 = 0.3as$

$as = 4.5$ (1/2)

$v^2 = v_o^2 + 2as$

$v^2 = 9$ (1/2) $\therefore v = 3$ m/sec (1/2)

(3)

(تراعى الحلول الأخرى)

13-

(b) $5\sqrt{30}$ (1)

14-

(d) 1 joule (1)

15-

(a) $\vec{F} = (a+2)\hat{i} + (b+3)\hat{j} + (3-e)\hat{k}$ (1/2)

$\vec{S} = t\hat{i} + (\frac{1}{2}t^2 + t)\hat{j} + 5\hat{k}$

$\vec{V} = \hat{i} + (t+1)\hat{j}$ (1/2)

$\vec{a} = \hat{j}$ (1/2)

$\vec{F} = m\vec{a}$ (3)

$\therefore \hat{j} = (a+2)\hat{i} + (b+3)\hat{j} + (3-e)\hat{k}$

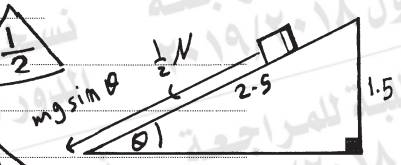
$\therefore a+2 = 0 \quad \therefore a = -2$ (1/2)

$b+3 = 1 \quad \therefore b = -2$ (1/2)

$3-e = 0 \quad \therefore e = 3$ (1/2)

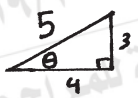
(b)

$-\frac{1}{2}N - mg\sin\theta = ma$ (1/2)



$-\frac{1}{2}mg\cos\theta - mg\sin\theta = ma$ (1/2)

$-\frac{1}{2}\times 9.8\times\frac{4}{5} - 9.8\times\frac{3}{5} = a$ (1/2)



$a = -9.8$ m/sec (1/2)

$V^2 = V_o^2 + 2as$

$0 = V_o^2 + 2\times(-9.8)\times 2.5$ (1/2)

$\therefore V_o = 7$ m/sec (1/2) (3)

Another solution:

$T - T_o = W$ (1/2)

$0 - \frac{1}{2}mV_o^2 = -mgS\sin\theta - \mu_k NS$ (1/2)

$\frac{1}{2}mV_o^2 = mgS\sin\theta + \mu_k NS$

$\frac{1}{2}mV_o^2 = mgS\sin\theta + \frac{1}{2}mg\cos\theta S$ (1/2)

$\frac{1}{2}V_o^2 = 9.8\times 2.5\times\frac{3}{5} + \frac{1}{2}\times 9.8\times\frac{4}{5}\times 2.5$ (1/2)

$V_o^2 = 49$ (1/2)

$V_o = 7$ m/sec (1/2) (3)

(تراعى الحلول الأخرى)

16-

(d) 10^{-1} (1)

17-

(d) 99 (1)

18-

(a) ∵ The motion is uniform

∴ $F = R = 150 \times 2$

$F = 300$ Kg.wt (½)

$V = 108 \times \frac{5}{18}$

$V = 30$ m/sec (½)

Power $= F \times V$

$= 300 \times 30$

$= 9000$ Kg.wt.m/sec (½)

Power $= \frac{9000}{75} = 120$ horse (½)

(2)

(b) $\vec{r} = (3t^2 + 2)\hat{i} + (2t^2 + 1)\hat{j}$

$\vec{s} = \vec{r} - \vec{r_o}$

$= (3t^2)\hat{i} + (2t^2)\hat{j}$ ½

The change in the potential energy $= -W$

$= -(\vec{F} \cdot \vec{s})$ ½

$= -(6, 2) \cdot (3t^2, 2t^2)$

$= -22t^2$ ½ , $t = 2$

$= -22 \times 4$

$= -88$ joule ½

2

(تراعى الحلول الأخرى)

(انتهت الإجابة وتراعى الحلول الأخرى)