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ESTD: 2015
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Industrial Training Institute

WORKSHOP CALCULATION & SCIENCE CLASS NOTE.

◆Answer The Following Questions :

1) A body is at rest & it start moving with an acceleration of 4 cm/sec^2. what will be the velocity attained by the body after covering 50cm distance? After passing 50cm point , what will be the distance covered by the body in next 10 second.

2)A body of mass 4kg is dropped from a height of 100m. Calculate it's velocity when the body reaches the ground?

3) A stone is at a height of 78.4m. If it is dropped from its height , Calculate the time taken for reaching the ground and velocity of the object as it strikes the ground.

4)The initial speed of a train is 25 km/sec. If the speed is to be decreased to 15 km/sec in 5 second, find the required force. Given mass of the train is 4000 kg.

5)An object when thrown vertically upwards reaches a maximum height of 10 meters. Find out :

(i) Initial velocity with which the body was thrown.

(ii) Time taken by the body to reach the height.

6) The speed of a car has increased from 25 km/hr. To 40 km/hr. In one minute. Find its acceleration.

7) A body fall freely under gravity from a height of 200 meter. Find out the time taken for it to strike the ground and it's velocity when it strikes the ground.

8) A stone dropped from the top of a tower 32.40 meter high. Find the time it takes to reach the ground and the velocity with which it strikes the ground. (g=9.8 m/sec^2.)

9) A body of weight 15.5kg was lifted to a height of 4.4 meter. Find the work done in (i) kg-meter , (ii) joules.

10) A body of mass 100kg was moved through a distance of 16 meter on a horizontal plane. If the coefficient of friction between the body and the plane is 0.025. calculate the work done.

11) What is the work done by a man weighing 70kg who lifited a body of mass of 20kg to the top of the 9 meter high building?

12) What is the force needed for supporting a mass of 100gm ? What amount of work is done in raising it through 20 cm ?

1) Let, u = initial velocity = 0,
v = Final velocity = ?
a = Acceleration = 4 cm/sec²
s = Distance traveled = 50 cm.

We know, $v^2 - u^2 = 2as$
or, $v^2 - 0 = 2 \times 4 \times 50$
or, $v^2 = 400$
or, $v = \sqrt{400}$
or, $v = 20$ cm/sec. Ans:-

∴ Distance Covered in 10 sec.
$= 10 \times 20$
$= 200$ cm. Ansr

2) Let, u = initial velocity = 0, v = final velocity = ?
g = Acceleration due to gravity = 9.8 m/sec², s = Distance = 100 m.

∴ We know, $v^2 - u^2 = 2gs$
or, $v^2 - 0 = 2 \times 9.8 \times 100$
or, $v^2 = 1960$
or, $v = \sqrt{1960}$
or, $v = 44.27$ m/sec. Ans:-

3) Let, u = initial velocity = 0, v = final velocity = ?, $g = 9.8$ m/sec²
$s = 78.4$ meter, t = ?
We know, $s = ut + \frac{1}{2}gt^2$
or, $78.4 = 0 \times t + \frac{1}{2} \times 9.8 \times t^2$
or, $t^2 = \frac{78.4}{4.9}$
or, $t^2 = 16$
or, $t = \sqrt{16}$
or, $t = 4$ sec. Ansr

Again, $v^2 - u^2 = 2gs$
or, $v^2 - 0 = 2 \times 9.8 \times 78.4$
or, $v^2 = 1536.64$
or, $v = \sqrt{1536.64}$
or, $v = 39.2$ m/sec.
Ansr

4) Given That,
Initial Velocity (u) = 25 Km/Hr.
$= \frac{25 \times 1000}{3600}$
$= \frac{125}{18}$ m/sec.

Final velocity (v) = 40 km/Hr.
$= \frac{40 \times 1000}{3600}$
$= \frac{200}{18}$ m/sec.

Time (t) = 1 minute = 60 sec.

We know, $V = u + at$

or, $\frac{200}{18} = \frac{125}{18} + a \times 60$

or, $60a = \frac{200}{18} - \frac{125}{18}$

or, $60a = \frac{200-125}{18}$

or, $60a = \frac{75}{18}$

or, $a = \frac{75}{18} \times \frac{1}{60}$

or, $a = 0.06944 \text{ m/sec}^2$. Ansr

7) Given, Distance (s) = 200m, Initial velocity (u) = 0

We know, $v^2 = u^2 + 2gs$

or, $v^2 = 0 + 2 \times 9.8 \times 200$

or, $v^2 = 400 \times 9.8$

or, $v = \sqrt{3924}$

or, $v = 62.64$ m/sec. Ansr

Again, $v = u + gt$

or, $62.64 = 0 + 9.81t$

or, $9.81t = 62.64$

or, $t = \frac{62.64}{9.81}$

or, $t = 6.38$ sec. Ansr

8) Given, Initial velocity (u) = 0, Time (t) = ?, $g = 9.8 \text{ m/sec}^2$, $s = 32.40$ m.

We know, $s = ut + \frac{1}{2}gt^2$

or, $32.40 = \frac{1}{2} \times 9.8 \times t^2$

or, $t = \frac{18}{7}$ sec. Ansr

Again, $v = gt$

or, $v = 9.8 \times \frac{18}{7}$

or, $v = 25.20$ m/sec. Ansr

9) i) Work Done = Force x Distance moved.

$= 15.5 \times 4.4$

$= 68.2$ kg-m. Ans:-

ii) 68.2 kg-m $= 68.2 \times 9.8$ J

$= 668.36$ J Ansr

10) Force Applied = Co-efficient of friction x Normal Reaction

$= 0.025 \times 100$

$= 2.5$ kg.

∴ Distance moved = 16m.

∴ Work Done = Force Applied x Distance Moved

$= 2.5 \times 16 = 40$ kg-m. Ansr

11) Weight of the man = 70kg.
Weight lifted = 20kg.
Height of building = 9m.
∴ Total Weight = 70 + 20 kg.
= 90 kg.
∴ Work Done = Force × Distance Moved.
= 90 × 9 kg-m.
= 810 kg-m. Ans.

12) Mass (m) = 100 gm, g = 980 cm/sec².
Height (h) = 20 cm, S = 20 cm,
∴ F = m × g
or, F = 100 × 980
or, F = 98000 dynes.
∴ W = F × S
or, W = 98000 × 20
or, W = 1960000 erg. Ans.

4) let, u=25, v= 15 km/sec, t= 5 sec, a= ?

∴ We Know, $a = \frac{v-u}{t}$

$= \frac{15-25}{5}$

$= \frac{-10}{5}$

$= -2 \text{ km/sec}^2$

∴ Retardation = 2 km/sec²

= 2000 m/sec²

∴ Force Applied = Mass × Retardation

= 4000 × 2000

= 8000000

= 8000 Kilo Newton.

∴ Force applied to being down the speed = 8000 KN. Ans

5) let, v=0, u=?, t=?, g=9.8 m/sec², s=10 m.

(i) $v^2 - u^2 = 2gs$

or, $0 - u^2 = 2 \times 9.8 \times 10$ or, $-u^2 = -196$ or, $u = \sqrt{196}$

or, u = 14 m/sec. Ansr

(ii) $v = u - gt$

or, $0 = 14 - 9.8 \times t$

or, $9.8t = 14$

or, $t = \frac{14}{9.8}$

or, t = 1.429 sec. Ansr