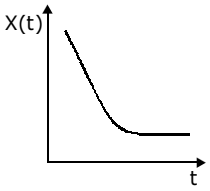
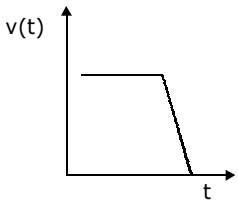
*Dear student following is an Easy level [O ● O O O] test paper. Score of 15 Marks in 10 Minutes would be a satisfactory performance. Questions 1-9 (+3, –1). (All Questions have Single Options correct)*

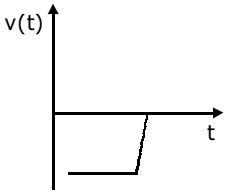
**Q.1** At t = 0 sec, a ball is thrown straight down from a height of 50 m with a velocity of 10 m/sec. There is no resistance. The ball hits the ground at :
(A) t = 1.32 sec. (B) t = 2.32 sec
(C) t = 3.32 sec (D) t = 4.32 sec

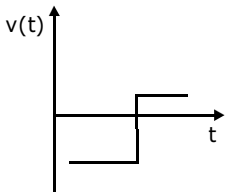
**Q.2** An object falls freely from rest. The time required for it to strike the ground is proportional to its :
(A) Mass (B) Initial height
(C) Square root of mass
(D) Square root of initial height

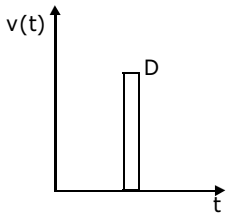
**Q.3** Give the position (x) Vs. time (t) plot select the corresponding velocity (v) Vs. time plot for an object moving in one dimension.



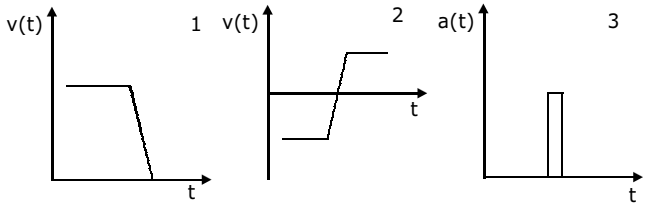

(A)



(B)



(C)


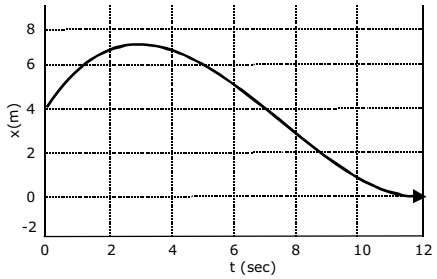

(D)



**Q.4** Consider objects moving in one dimension whose velocities are given by the plots below. Rank the net distances from the initial to the final point and choose the option that best represents the correct rankings :



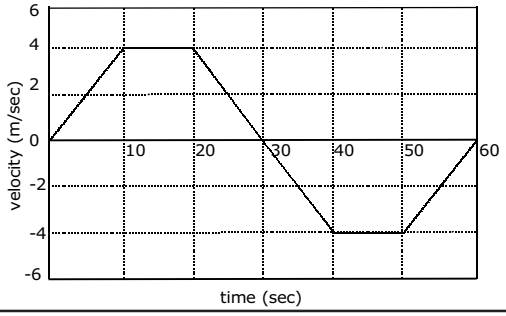

(A) $d_2 > d_3 > d_1$ (B) $d_3 > d_1 > d_2$
(C) $d_2 > d_1 > d_3$ (D) $d_1 > d_2 > d_3$

**Q.5** The position of a particle is given in the graph below as a function of time.




What is the average velocity of the particle over the time interval from 0 to 12 sec.
(A) Zero (B) 0.83 m/s
(C) 0.33 m/s (D) –0.33 m

**The graph below applies to Questions 6 through 9. The graph shows the dependence of velocity on time for a body which is restricted to move in one dimension, along the x-axis. At t = 0 the body is at rest at x = 0.**




**Q.6** At t= 20 sec the body is located at
(A) x = 0 m (B) x = 40 m
(C) x = 60 m (D) x = –60 m

**Q.7** At t = 60 sec the body is located at :
(A) x = 0 m (B) x = 40 m
(C) x = 6 m (D) x = –60 m

**Q.8** From t = 0 sec to t = 60 sec, the average speed of the body is :
(A) 0.0 m/s (B) 2.0 m/s
(C) 2.7 m/s (D) 3.0 m/s

**Q.9** The acceleration is nagative for the following time intervals :
(A) 0 to 10 sec and 50 to 60 sec
(B) 20 to 30 sec and 30 to 40 sec
(C) 0 to 10 sec and 30 to 40 sec
(D) 20 to 30 sec and 50 to 60

## PHYSICS IIT JEE (05 / 06 / 2007) (ONE-D MOTION) ANSWER KEY

**Name :** ..... **Roll No. :** .....

| | A | B | C | D | | A | B | C | D | | A | B | C | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ○ | ○ | ○ | ○ | 4 | ○ | ○ | ○ | ○ | 7 | ○ | ○ | ○ | ○ |
| 2 | ○ | ○ | ○ | ○ | 5 | ○ | ○ | ○ | ○ | 8 | ○ | ○ | ○ | ○ |
| 3 | ○ | ○ | ○ | ○ | 6 | ○ | ○ | ○ | ○ | 9 | ○ | ○ | ○ | ○ |

## ANSWER KEY

| Que. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Ans. | D | D | B | D | D | C | A | C | B |

# SOLUTIONS

**Sol.1 (D)**

$$S = ut + \frac{1}{2}at^2 \qquad ...(i)$$

S = Hight = 50 m

t = time, u = 10 m/s

a = –g = –10 m/s$^2$

Put the value

$$50 = 10\,t + \frac{1}{2}(-10)t^2$$

$50 = 10t - 5t^2$ or $5t^2 - 10t + 50 = 0$

$t^2 - 2t + 10 = 0$

$$t = \frac{2 \pm \sqrt{4 + 4 \times 10 \times 1}}{2 \times 1} = \frac{2 \pm \sqrt{44}}{2}$$

$$t = \frac{2 \pm 6.64}{2}$$

$$t = \frac{2 + 6.64}{2},\ t = \frac{2 - 6.64}{2}$$

t = 4.32 sec., t = –2.32

We take only possitive value

t = 4.32 sec.

**Sol.2 (D)**

$$h = ut + \frac{1}{2}gt^2 \qquad (s = h)$$

at t = 0, u = 0 (a = g)

$$h = \frac{1}{2}gt^2 \quad \Rightarrow \quad t^2 = \frac{2h}{g}$$

$$\Rightarrow \quad t = \sqrt{\frac{2h}{g}} \quad \Rightarrow \quad t \propto \sqrt{h}\,.$$

**Sol.3 (B)**

The slop on the x verses t plat is first negative and then zero. So the correct plot is.

**Sol.4 (D)**

The distance is proportional to the area under the curve. So the correct ranking is D.

**Sol.5 (D)**

$$\text{Average velocity} = \frac{\text{Total displacement}}{\text{Total time}}$$

Total displacement = 0 – 4 = –4 m.

Total time = 12 sec.

$$\text{Average velocity} = \frac{-4\,m}{12\,sec} = \frac{-1}{3}\,m/s$$

= –0.33 m/s

**Sol.6 (C)**

Area under the curve at

$$t = 20 = \frac{1}{2}(4 \times 10) + 10 \times 4$$

t = 20 + 40 = 60 m

**Sol.7 (A)**

At the t = 60 sec the body is located = Area under the curve of velocity v/s time graph

x = Area(t = 0 to t = 10) + Area (t = 0 to t = 20) + Area (t = 20 to 30) + Area (t = 30 to t = 40) + Area(t = 40 to t = 50) + Area(t = 50 to 60)

$$= \frac{1}{2}(4 \times 10) + 4 \times 10 + \frac{1}{2}(4 \times 10) - \frac{1}{2}(4 \times 10) - 4 \times 10 - \frac{1}{2}(4 \times 10)$$

= 20 + 40 + 20 – 20 – 40 – 20

= 80 – 80 = 0

x = 0 m.

**Sol.8 (C)**

Average speed of the body is

$$= \frac{\text{Total distance}}{\text{Total time}}$$

Total distance = Total area of the curve (t = 0 to t = 60)

total distance

$$= \frac{1}{2}(4 \times 10) + 4 \times 10 + \frac{1}{2}(4 \times 10) + \frac{1}{2}(4 \times 10) + 4 \times 10 + \frac{1}{2}(4 \times 10)$$

= 20 + 40 + 20 + 20 + 40 + 20 = 160 m

Total time = 60 sec.

$$V_{av} = \frac{\text{Total distance}}{\text{Total time}} = \frac{160\ m}{60\ sec}$$

$V_{av}$ = 2.7 m/s.

**Sol.9 (B)**

For t = 0 to t = 10; Acceleration is positive
(v $\rightarrow$ increase with time)

for t = 10 to t = 20, acceleration is zero
(v $\rightarrow$ constant)

For t = 20 to t = 30, acceleration is negative
(v $\rightarrow$ decrease with time)

for t = 30 to t = 40 acceleration is negative
(v $\rightarrow$ decrease with time)

For t = 40 to t = 50, accelerationis zero
(v $\rightarrow$ constant)