PHYSICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 12

Total Marks : 26

Max. Time : 28 min.

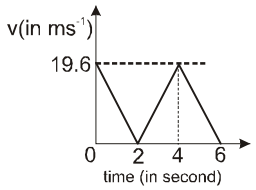
Topic : Rectilinear Motion

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to Q.6	(3 marks, 3 min.)	[18, 18]
Subjective Questions ('–1' negative marking) Q.7 to Q.8	(4 marks, 5 min.)	[8, 10]

1. A bird flies for 4 seconds with a velocity of |t – 2| m/sec. in a straight line, where t = time in seconds. It covers a distance of

(A) 4 m (B) 6 m (C) 8m (D) none of these

2. The velocity - time graph of a particle is as shown in figure



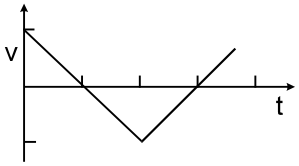
(A) It moves with a constant acceleration throughout

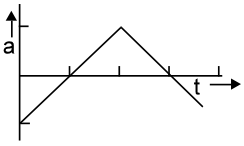
(B) It moves with an acceleration of constant magnitude but changing direction at the end of every two second

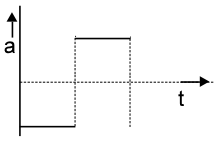
(C) The displacement of the particle is zero

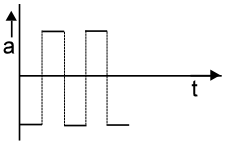
(D) The velocity becomes zero at t = 4 second

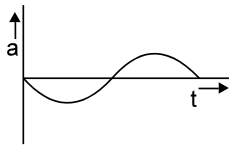
3. The graph shown in the figure shows the velocity v versus time t of a body. Which of the graphs shown in figure represents the corresponding acceleration versus time graphs?



(A) 

(B) 

(C) 

(D) 

4. The position vector of a particle is given as $= (t^2 - 4t + 6)\hat{i} + (t^2)\hat{j}$. The time after which the velocity vector and acceleration vector becomes perpendicular to each other is equal to

(A) 1sec (B) 2 sec (C) 1.5 sec (D) not possible

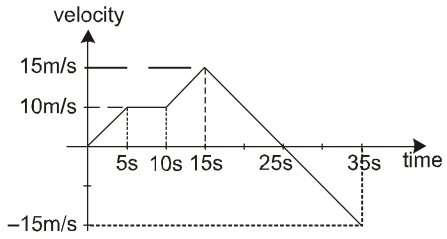
5. A car starts from rest and moves with constant acceleration. The ratio of the distance covered in the n^{th} second to distance covered in n seconds is :

(A) $\frac{2}{2} - \frac{1}{n}$ (B) $\frac{2}{2} + \frac{1}{n}$ (C) $\frac{2}{n} - \frac{1}{2}$ (D) $\frac{2}{n} + \frac{1}{2}$

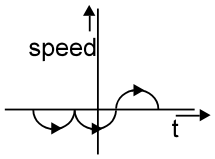
6. An ant is at a corner of a cubical room of side ' a '. The ant can move with a constant speed u. The minimum time taken to reach the farthest corner of the cube is:

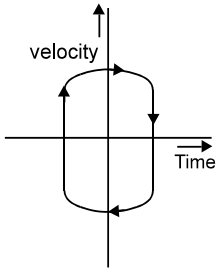
(A) $\frac{3a}{u}$ (B) $\frac{\sqrt{3}a}{u}$ (C) $\frac{\sqrt{5}a}{u}$ (D) $\frac{(\sqrt{2}+1)a}{u}$

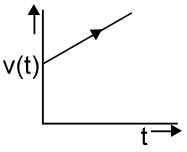
7. A person starts from origin and for his linear motion velocity is given as shown in figure. Draw displacement and acceleration graph with respect to time. Also find maximum displacement of the person.



8. Are the following velocity–time graph and speed–time graphs possible ?

(i)


(ii)


(iii)


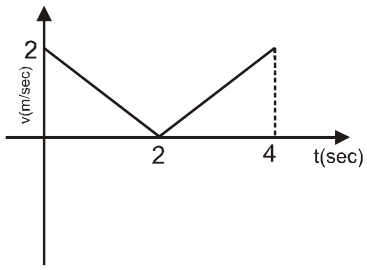
Answers Key

DPP NO. - 12

1. (A) **2.** (B) **3.** (B) **4.** (A) **5.** (C)
6. (C) **7.** 212.5 m. **8.** Only graph (iii) is possible.

Hint & Solutions

1. Plotting velocity v against time t, we get

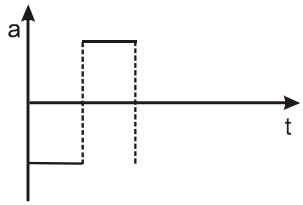


Area under the v–t curve gives distance.

$$\text{Distance} = \frac{1}{2} \times 2 \times 2 + \frac{1}{2} \times 2 \times 2 = 4\text{m}$$

2. Obviously slope of v–t graph is changed at t = 2, 4,6,..... in direction but it has constant magnitude.

3. Instantaneous, acceleration = slope of v–t graph
hence, obviously, a – t graph will be as shown,



4. **(A)**

$$= (t^2 - 4t + 6)\hat{i} + t^2\,\hat{j}\ ; \quad = \frac{dr}{dt} = (2t - 4)\hat{i} + 2t\,\hat{j}$$

$$,\ a = \frac{dv}{dt} = 2\hat{i} + 2\hat{j}$$

if a and are perpendicular

$a\,.\ = 0$

$(2\hat{i} + 2\hat{j}).((2t - 4)\hat{i} + 2t\hat{j}) = 0$

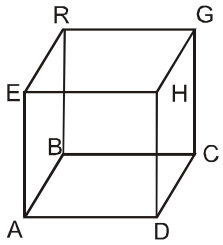
$8t - 8 = 0$

$t = 1$ sec.

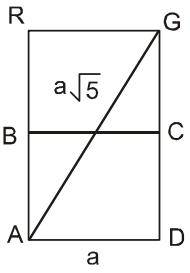
Ans. $t = 1$ sec.

5. $\frac{S_N}{S} = \frac{\frac{1}{2}a(2n-1)}{\frac{1}{2}a\,n^2} = \frac{2n}{n^2} - \frac{1}{n^2}$ $\frac{2}{n} - \frac{1}{n^2}$

6.



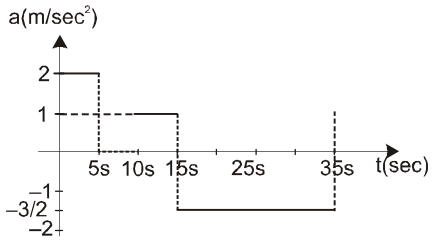
on placing back face and bottom face in same plane.

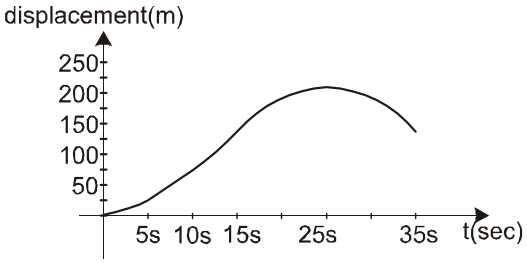


A → starting point G → final point

minimum time = $\frac{\sqrt{5}a}{u}$

7.





Maximum displacement is a 25 sec. displacement =
25 + 50 + 62.5 + 75 = 212.5 m.

8. (i) **Impossible:** Speed is always positive
(ii) **Impossible:** Time never decreases.
(iii) **Possible:** Velocity may increase with time.