PHYSICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 10

Total Marks : 27

Max. Time : 28 min.

Topics : Rectilinear Motion, Vector, Mathematical Tools

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to Q.5	(3 marks, 3 min.)	[15, 15]
Multiple choice objective ('–1' negative marking) Q.6 to Q.7	(4 marks, 4 min.)	[8, 8]
Subjective Questions ('–1' negative marking) Q.8	(4 marks, 5 min.)	[4, 5]

1. A particle is moving in a straight line with initial velocity u and uniform acceleration f. If the sum of the distances travelled in t^{th} and $(t + 1)^{th}$ seconds is 100cm, then its velocity after t seconds, in cm/s, is

(A) 20 (B) 30 (C) 50 (D) 80

2. If $\vec{A},\vec{B}$ & $\vec{A}+\vec{B}$ are three non–zero vector. Such that $\vec{A}+\vec{B}$ is perpendicular to $\vec{B}$ then which of one is correct :

(A) $A \geq B$ (B) $A \geq \frac{B}{\sqrt{2}}$ (C) $A > B$ (D) $A > \frac{B}{\sqrt{2}}$

3. A car covers a distance of 2 km in 2.5 minutes. If it covers half of the distance with speed 40 km/hr, the rest distance it shall cover with a speed of:

(A) 56 km/hr (B) 60 km/hr (C) 48 km/hr (D) 50 km/hr

4. The displacement of a body is given by $r = \sqrt{a^2 - t^2}$ + t cos t^2, where t is the time and a is constant. Its velocity is:

(A) $\frac{-t}{\sqrt{a^2-t^2}}$ + cos t^2 – t sin 2t (B) $\frac{-t}{\sqrt{a^2-t^2}}$ + cos t^2 – 2 t^2 sin t^2

(C) $\frac{-a}{(a^2 - t^2)}$ + 2 t cos t^2 sin t + sin t (D) a – t^2 – t sin t^2

5. A body goes 30 km south and then 40 km east. What will be the displacement from initial point ?

(A) 50 km, 37° South of East (B) 30 km, 37° South of East

(C) 40 km, 53° South of East (D) 70 km, 53° South of East

6. The displacement of a body from a reference point is given by, $\sqrt{x}$ = 2 t – 3, where 'x' is in metres and it is non negative number, t in seconds. This shows that the body :

(A) is at rest at t = 3/2 (B) is speeding up for t > 3/2

(C) is retarded for t < 3/2 (D) is in uniform motion

7. Pick the correct statements:

(A) Average speed of a particle in a given time interval is never less than the magnitude of the average velocity.

(B) It is possible to have a situation in which $\left|\frac{d\vec{v}}{dt}\right| \neq 0$ but $\frac{d}{dt}|\vec{v}| = 0$.

(C) The average velocity of a particle is zero in a time interval. It is possible that the instantaneous velocity is never zero in the interval.

(D) The average velocity of a particle moving on a straight line is zero in a time interval. It is possible that the instantaneous velocity is never zero in the interval. (Infinite acceleration are not allowed)

8. A body moves with uniformly accelerated motion and travels 200 cm in the first two seconds and 220 cm in the next four seconds. What will be the velocity at the end of 7 seconds from start?

Answers Key

DPP NO. - 10

1. (C) **2.** (C) **3.** (B) **4.** (B) **5.** (A)
6. (A,B,C) **7.** (A,B,C) **8.** 10 cm s^{-1}

Hint & Solutions

DPP NO. - 10

1. $S_t + S_{t+1} = 100$

$$u + \frac{1}{2}f(2t-1) + u + \frac{1}{2}f[2(t+1)-1] = 100$$

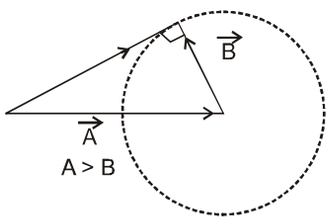
$$2u + \frac{1}{2}f(2t-1+2t+1) = 100$$

$2u + 2ft = 100$

$u + ft = 50$

$v = 50$ cm/s.

2.



So, A > B

3. time taken by car to cover first half distance.

$$= \frac{1}{40}\text{ hr} = \frac{1}{40} \times 60\text{ min} = 1.5\text{ min.}$$

Remaining time = 2.5 – 1.5 = 1 min.

$$\text{required speed} = \frac{1\text{km}}{1\text{min}} = 60\text{ km/hr}$$

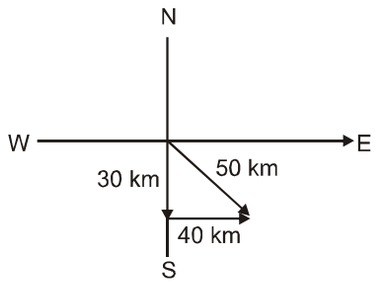
4. $r = \sqrt{a^2 - t^2} + t\cos t^2$

$$V = \frac{dr}{dt} = \frac{1}{2}(a^2 - t^2)^{-1/2}(-2t) + t(-\sin t^2)2t.$$

$+ \cos t^2.$

$$V = -\frac{t}{\sqrt{a^2 - t^2}} - 2t^2 \sin t^2 + \cos t^2.$$

5.



Net displacement = 50 km

6. $\sqrt{x} = (2t - 3)$ for B option

$x = (2t - 3)^2$ accelerated

for $t > 3/2$

$\frac{dx}{dt} = 2(2t - 3)\,(2) = 4(2t - 3)$

$V = 4(2t - 3) = 0$

rest at $t = 3/2$

$a = 8$ m/s.

7. since $\frac{\text{Distance}}{\Delta t} \geq \frac{|\text{Displacement}|}{\Delta t}$

aV speed $\geq$ | aV. velocity |

in uniform circular motion speed is constant

but acc. $\neq 0$

in uniform circle motion after one round average velocity becomes zero.

8. Let u be initial velocity & a be its acceleration

Distance in first 2 sec = $S_1 = 200$ cm

$\Rightarrow \quad u(2) + \frac{1}{2}a(2)^2 = 200$ cm

$\Rightarrow \quad u + a = 100 \qquad .....(i)$

Distance in next 4 sec. = $S_2 = 220$ cm

Distance in first 6 sec. = $S_1 + S_2 = 200 + 220$ cm

$\Rightarrow \quad u(6) + \frac{1}{2}a(6)^2 = 420$

$\Rightarrow \quad u + 3a = 70 \qquad .....(ii)$

From equations (i) & (ii), we get

$a = -15$ cm/s^2 , $u = 115$ cm/s

Hence, velocity at the end of 7 sec. from start

$= \quad u + 7a$

$= \quad 115 + 7(-15) \quad = \quad 10$ cm/s.