PHYSICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 4

Total Marks : 33

Max. Time : 35 min.

Topic : Mathematical Tools

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to Q.7	(3 marks, 3 min.)	[21, 21]
Multiple choice Objective ('–1' negative marking) Q.8	(4 marks, 4 min.)	[4, 4]
Subjective Questions ('–1' negative marking) Q.9 to Q.10	(4 marks, 5 min.)	[8, 10]

1. Double differentiation of displacement w.r.t. time is :

(A) acceleration (B) velocity (C) force (D) none

2. If $y = x^3$ then $\frac{d^2y}{dx^2}$ is -

(A) $6x^2$ (B) $6x$ (C) $3x^2$ (D) $3x$

3. If $Q = 4v^3 + 3v^2$, then the value of 'v' such that, there exist maxima of 'Q' -

(A) 0 (B) $-\frac{1}{2}$ (C) $\frac{1}{2}$ (D) none

4. If $y = 2\sin^2\theta + \tan\theta$ then $\frac{dy}{d\theta}$ will be -

(A) $4\sin\theta\cos\theta + \sec\theta\tan\theta$ (B) $2\sin 2\theta + \sec^2\theta$

(C) $4\sin\theta + \sec^2\theta$ (D) $2\cos^2\theta + \sec^2\theta$

5. $\int x^3 dx$ is equal to :

(A) $3x^2$ (B) $\frac{x^4}{4} + C$ (C) $\frac{x^4}{4}$ (D) $4x^3$

6. $\int 2\sin(x)dx$ is equal to :

(A) $-2\cos x + C$ (B) $2\cos x + C$ (C) $-2\cos x$ (D) $2\cos x$

7. If $y = \sin x$, then $\frac{d^2y}{dx^2}$ will be :

(A) $\cos x$ (B) $\sin x$ (C) $-\sin x$ (D) $\sin x + C$

8. Which of the following has value zero ?

(A) Sin 0° (B) tan 0° (C) cos 0° (D) cot 0°

9. $y = x(c - x)$ where c is a constant. Find maximum value of y.

10. If $y = 4\cos 4x$ find $\int y\,dx$

Answers Key

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1. (A) **2.** (B) **3.** (B) **4.** (B)
5. (B) **6.** (A) **7.** (C) **8.** (A), (B)

9. $\frac{c^2}{4}$ **10.** sin 4x + C

Hint & Solutions

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1. $\frac{dx}{dt} = v \Rightarrow \frac{d^2x}{dt^2}$ = acceleration

2. $y = x^3$

$\frac{dy}{dx} = 3x^2 \quad \frac{d^2y}{dx^2} = 6x$

3. $Q = 4V^3 + 3V^2$

$\frac{dQ}{dv} = 12V^2 + 6V$

$\frac{dQ}{dv} = 0 \Rightarrow V = 0, -\frac{1}{2}$

$\frac{d^2Q}{dV^2} = 24\,v + 6 \Rightarrow \left(\frac{d^2Q}{dv^2}\right)_{v=0} = 6$ (+ve)

$\left(\frac{d^2Q}{dv^2}\right)_{v=-1/2} = -12 + 6 = -6$ (-ve)

V = – 1/2 for maximum Q

4. $y = 2\sin^2\theta + \tan\theta$

$\frac{dy}{d\theta} = 2 \times 2 \sin\theta \cos\theta + \sec^2\theta$

$= 2 \sin 2\theta + \sec^2\theta$

5. $\int x^3 dx = \frac{x^4}{4} + C$

6. $\int 2\sin(x)dx = -2\cos x + C$

7. $y = \sin x$

$$\frac{dy}{dx} = \cos x$$

$$\frac{d^2y}{dx^2} = -\sin x$$

8. $\sin° = 0$

$\tan 0° = 0$

9. $$\frac{dy}{dx} = C - 2x = 0 \quad \Rightarrow \quad x = \frac{c}{2}$$

$$\frac{d^2y}{dx^2} = -2$$

$$Y_{max} = \frac{c}{2}\left(c - \frac{c}{2}\right) = \frac{c^2}{4}$$

10. y = 4 cos 4x

$$\int y dx = \int 4\cos t \frac{dt}{4}$$

4x = t

4dx = dt

$$\mathbf{dx = \frac{dt}{4}}$$

$$\int 4\cos t \frac{dt}{4} \mathbf{= \sin t = \sin 4x}$$