**MATHEMATICS**

# DPP
DAILY PRACTICE PROBLEMS

# DPP No. 54

**Total Marks : 36**

**Max. Time : 34 min.**

**Topic : Vector**

| Type of Questions | | M.M., Min. |
|---|---|---|
| Single choice Objective (no negative marking) Q.1,2,3 | (3 marks, 3 min.) | [9, 9] |
| Multiple choice objective (no negative marking) Q.4,5,6 | (5 marks, 4 min.) | [15, 12] |
| Subjective Questions (no negative marking) Q.7 | (4 marks, 5 min.) | [4, 5] |
| Match the Following (no negative marking) Q.8 | (8 marks, 8 min.) | [8, 8] |

**1.** Let $\vec{u}$ and $\vec{v}$ are unit vectors and $\vec{w}$ is a vector such that $\vec{u}\times\vec{v}+\vec{u}=\vec{w}$ and $\vec{w}\times\vec{u}=\vec{v}$ then the value of $[\vec{u}\ \vec{v}\ \vec{w}]$ is -

(A) –1 (B) 1 (C) 2 (D) None of these

**2.** If a unit vector $\hat{a}$ in the plane of $\vec{b} = 2\hat{i}+\hat{j}$ & $\vec{c} = \hat{i}-\hat{j}+\hat{k}$ is such that $\vec{a} \wedge \vec{b} = \vec{a} \wedge \vec{d}$ where $\vec{d} = \hat{j}+2\hat{k}$, then $\hat{a}$ is

(A) $\frac{\hat{i}+\hat{j}+\hat{k}}{\sqrt{3}}$ (B) $\frac{\hat{i}-\hat{j}+\hat{k}}{\sqrt{3}}$ (C) $\frac{2\hat{i}+\hat{j}}{\sqrt{5}}$ (D) $\frac{2\hat{i}-\hat{j}}{\sqrt{5}}$

**3.** The length of the shortest distance between the lines, $\vec{r}_1 = -3\hat{i}+6\hat{j}+\lambda\left(-4\hat{i}+3\hat{j}+2\hat{k}\right)$ and $\vec{r}_2 = -2\hat{i}+7\hat{k}+\mu\left(-4\hat{i}+\hat{j}+\hat{k}\right)$ is :

(A) 9 (B) 6 (C) 3 (D) None of these

**4.** In a $\Delta$ABC, let M be the mid point of segment AB and let D be the foot of the bisector of $\angle$C. Then the ratio $\frac{\text{Area } \Delta \text{ CDM}}{\text{Area } \Delta \text{ ABC}}$ is :

(A) $\frac{1}{4}\ \frac{a-b}{a+b}$ (B) $\frac{1}{2}\ \frac{a-b}{a+b}$

(C) $\frac{1}{2}\tan\frac{A-B}{2}\cot\frac{A+B}{2}$ (D) $\frac{1}{4}\cot\frac{A-B}{2}\tan\frac{A+B}{2}$

**5.** If $\vec{a}$ and $\vec{b}$ are non-zero and non-collinear vectors, then

(A) $\vec{a}\times\vec{b}=[\vec{a}\ \vec{b}\ \hat{i}]\,\hat{i}+[\vec{a}\ \vec{b}\ \hat{j}]\,\hat{j}+[\vec{a}\ \vec{b}\ \hat{k}]\,\hat{k}$ (B) $\vec{a}\cdot\vec{b}=(\vec{a}\cdot\hat{i})(\vec{b}\cdot\hat{i})+(\vec{a}\cdot\hat{j})(\vec{b}\cdot\hat{j})+(\vec{a}\cdot\hat{k})(\vec{b}\cdot\hat{k})$

(C) If $\vec{u}=\hat{a}-(\hat{a}\cdot\hat{b})\,\hat{b}$ and $\vec{v}=\hat{a}\times\hat{b}$, then $|\vec{v}|=|\vec{u}|$ (D) If $\vec{c}=\vec{a}\times(\vec{a}\times\vec{b})$, then $\vec{c}\cdot\vec{a}=0$

**6.** The value(s) of $\alpha \in [0, 2\pi]$ for which vector $\vec{a} = \hat{i} + 3\hat{j} + (\sin 2\alpha)\hat{k}$ makes an obtuse angle with the Z-axis and the vectors $\vec{b} = (\tan\alpha)\hat{i} - \hat{j} + 2\sqrt{\sin\frac{\alpha}{2}}\,\hat{k}$ and $\vec{c} = (\tan\alpha)\hat{i} + (\tan\alpha)\hat{j} - 3\sqrt{\text{cosec}\frac{\alpha}{2}}\,\hat{k}$ are orthogonal, is/are :

(A) $\tan^{-1} 3$ (B) $\pi - \tan^{-1} 2$ (C) $\pi + \tan^{-1} 3$ (D) $2\pi - \tan^{-1} 2$

**7.** A function y = f(x) is represented parametrically as follow

$x = \phi(t) = t^5 - 5t^3 - 20t + 7$

$y = \psi(t) = 4t^3 - 3t^2 - 18t + 3, \; -2 < t < 2$

Find the extrema of this function

**8.** **Match the column**

| **Column – I** | **Column – II** |
|---|---|
| (A) The possible value of a if $\vec{r} = (\hat{i} + \hat{j}) + \lambda(\hat{i} + 2\hat{j} - \hat{k})$ and $\vec{r} = (\hat{i} + 2\hat{j}) + \mu(-\hat{i} + \hat{j} + a\hat{k})$ are two skew lines where $\lambda$, $\mu$ are scalars | (p) – 4 |
| (B) The angle between the vectors $\vec{a} = \lambda\hat{i} - 3\hat{j} - \hat{k}$ and $\vec{b} = 2\lambda\hat{i} + \lambda\hat{j} - \hat{k}$ is acute, whereas the vector $\vec{b}$ makes an obtuse angle with positive direction of axes of coordinates , then $\lambda$ may be | (q) – 2 |
| (C) The possible value of a such that $2\hat{i} + \hat{j} + \hat{k}$, $\hat{i} + 2\hat{j} + (1+a)\hat{k}$ and $3\hat{i} + a\hat{j} + 5\hat{k}$ are coplanar is | (r) 2 |
| (D) If $\vec{A} = 2\hat{i} + \lambda\hat{j} + 3\hat{k}$, $\vec{B} = 2\hat{i} + \lambda\hat{j} + \hat{k}$, $\vec{C} = 3\hat{i} + \hat{j}$ and $\vec{A} + \lambda\vec{B}$ is perpendicular to $\vec{C}$, then $\|2\lambda\|$ is | (s) 3 |

# Answers Key

**1.** (B) **2.** (B) **3.** (A) **4.** (B)(C)

**5.** (A)(B)(C)(D) **6.** (B)(D)

**7.** y is maximum at t = –1 , y = 14, x = 31

y is minimum at $t = \frac{3}{2}$; $y = -17\frac{1}{4}$ , $x = \frac{-1033}{32}$

**8.** (A)→(p, q, r, s), (B)→(p, q), (C)→(q, s), (D)→(r)