VECTOR
EXERCISE

1. If ABCD is a parallelogram $\overrightarrow{AB}=2\hat{i}+4\hat{j}-5\hat{k}$ and $\overrightarrow{AD}=\hat{i}+2\hat{j}+3\hat{k}$, then the unit vector in the direction of BD is :-

(1) $\frac{1}{\sqrt{69}}(\hat{i}+2\hat{j}-8\hat{k})$ (2) $\frac{1}{69}(\hat{i}+2\hat{j}-8\hat{k})$

(3) $\frac{1}{\sqrt{69}}(-\hat{i}-2\hat{j}+8\hat{k})$ (4) $\frac{1}{69}(-\hat{i}-2\hat{j}+8\hat{k})$

2. If **a**, **b** and **c** are perpendicular to **b** + **c**, **c** + **a** and **a** + **b** respectively and if | **a** + **b** | = 6, | **b** + **c** | = 8 and | **c** + **a** | = 10 then | **a** + **b** + **c** | =

(1) $5\sqrt{2}$ (2) 50 (3) $10\sqrt{2}$ (4) 10

3. The position vector of coplanar points A, B, C, D are **a**, **b**, **c** and **d** respectively, in such away that (**a** – **d**).(**b**–**c**)=(**b**–**d**).(**c**–**a**)= 0, then the point D of the triangle ABC is :-

(1) Incentre (2) Circumcentre

(3) Orthocentre (4) None of these

4. Let $\vec{u}$ and $\vec{v}$ are unit vectors 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-

(1) 1 (2) –1

(3) 0 (4) None of these

5. If a, b, c are the p^{th}, q^{th}, r^{th} term of an A.P. and $\vec{x}=(q-r)\hat{i}+(r-p)\hat{j}+(p-q)\hat{k}$ & $\vec{y}=a\hat{i}+b\hat{j}+c\hat{k}$, then -

(1) $\vec{x}, \vec{y}$ are parallel vectors

(2) $\vec{x}\times\vec{y}=\hat{i}+\hat{j}+\hat{k}$

(3) $\vec{x}.\vec{y}=1$

(4) $\vec{x}, \vec{y}$ are orthogonal vectors

6. A straight line is given by $\vec{r}=(1+t)\hat{i}+3t\hat{j}+(1-t)\hat{k}$ where t ∈ R. If this line lies in the plane x+y+cz=d then the value of (c + d) is

(1) 9 (2) 1 (3) –1 (4) 7

7. Value of $\vec{a}.\vec{a}'+\vec{b}.\vec{b}'+\vec{c}.\vec{c}'$, (where $\vec{a}', \vec{b}', \vec{c}'$ form a reciprocal system of vectors with the vectors $\vec{a}, \vec{b}, \vec{c}$)

(1) 1 (2) 2

(3) 3 (4) None

8. If $\bar{a}$, $\bar{b}$ and $\bar{c}$ are three unit vectors then minimum value of $|\bar{a}+\bar{b}|^2+|\bar{b}+\bar{c}|^2+|\bar{c}+\bar{a}|^2$ is :-

(1) 3 (2) 2 (3) 1 (4) 4

9 If four vector $\bar{a},\bar{b},\bar{c}$ and $\bar{d}$ are coplanar then $(\bar{a}\times\bar{b})\times(\bar{c}\times\bar{d})$:-

(1) 3 (2) 1 (3) 2 (4) None

10. Vectors $\hat{i}+\hat{j}+\hat{k}$, $2\hat{i}+6\hat{j}-\hat{k}$ and $9\hat{i}-\hat{j}+3\hat{k}$ are

(1) Linearly dependent (2) Linearly Independent

(3) Parallel vector (4) None

11. If $\vec{p}$ and $\vec{q}$ are two unit vectors inclined at an angle α to each other then $|\vec{P}+\vec{q}|<1$ If :-

(1) $\frac{2\pi}{3}<\alpha<\frac{4\pi}{3}$ (2) $\alpha<\frac{\pi}{3}$

(3) $\alpha>\frac{2\pi}{3}$ (4) $\alpha=\frac{\pi}{2}$

12. If three vectors $\vec{a},\vec{b},\vec{c}$ are such that $\vec{a}\neq 0$ and $\vec{a}\times\vec{b}=2\vec{a}\times\vec{c}$, $|\vec{a}|=|\vec{c}|=1$, $|\vec{b}|=4$ and the angle between $\vec{b}$ and $\vec{c}$ is $\cos^{-1}\frac{1}{4}$ then $\vec{b}-2\vec{c}=\lambda\vec{a}$ where λ is equal to :-

(1) ±2 (2) ±4 (3) $\frac{1}{2}$ (4) $\frac{1}{4}$

13. ABCDEF is a regular hexagon where centre O is the origin. If the position vector of A is $\hat{i}-\hat{j}+2\hat{k}$ then $\overrightarrow{BC}$ is equal to :-

(1) $\hat{i}-\hat{j}+2\hat{k}$ (2) $-\hat{i}+\hat{j}-2\hat{k}$

(3) $3\hat{i}+3\hat{j}-4\hat{k}$ (4) None of these

14. A point I is the centre of a circle inscribed in a triangle ABC, then the vector sum $|\overrightarrow{BC}|\overrightarrow{IA}+|\overrightarrow{CA}|\overrightarrow{IB}+|\overrightarrow{AB}|\overrightarrow{IC}$ is :-

(1) Zero (2) $\dfrac{\overrightarrow{IA}+\overrightarrow{IB}+\overrightarrow{IC}}{3}$

(3) 3 (4) None

15. If $\vec{a}$, $\vec{b}$, $\vec{c}$ are coplanar then the value of the determinant $\begin{vmatrix} \vec{a}.\vec{a} & \vec{b}.\vec{a} & c.\vec{a} \\ \vec{b}.\vec{a} & \vec{b}.\vec{b} & \vec{b}.\vec{c} \\ \vec{c}.\vec{a} & \vec{c}.\vec{b} & \vec{c}.\vec{c} \end{vmatrix}$ is

(1) 0 (2) 3 (3) 1 (4) None

16. The value of $(\vec{a}+2\vec{b}-\vec{c}).\left\{(\vec{a}-\vec{b})\times(\vec{a}-\vec{b}-\vec{c})\right\}$ is equal to :-

(1) $[\vec{a}\ \vec{b}\ \vec{c}]$ (2) $2\,[\vec{a}\ \vec{b}\ \vec{c}]$

(3) $3\,[\vec{a}\ \vec{b}\ \vec{c}]$ (4) $4\,[\vec{a}\ \vec{b}\ \vec{c}]$

17. For any vector $\vec{P}$ the value of

$\dfrac{3}{2}\left\{|\vec{P}\times\hat{i}|^2+|\vec{P}\times\hat{j}|^2+|\vec{P}\times\hat{k}|^2\right\}$ is

where $\vec{P}^2 = \left|\vec{P}\right|^2$:-

(1) $\vec{P}^2$ (2) $2\vec{P}^2$ (3) $3\vec{P}^2$ (4) $4\vec{P}^2$

18. $[\vec{a}\ \vec{b}\ \hat{i}]\hat{i}+[\vec{a}\ \vec{b}\ \hat{j}]\hat{j}+[\vec{a}\ \vec{b}\ \hat{k}]\hat{k}$ is equal to :-

(1) $\vec{a}\times\vec{b}$ (2) $\vec{a}+\vec{b}$

(3) $\vec{a}-\vec{b}$ (4) $\vec{b}\times\vec{a}$

19. Let $\vec{u}$, $\vec{v}$, $\vec{w}$ be vectors such that $\vec{u}+\vec{v}+\vec{w}=\vec{0}$ If $|\vec{u}| = 3$; $|\vec{v}| = 4$ and $|\vec{w}| = 5$ then $\vec{u}.\vec{v}+\vec{v}.\vec{w}+\vec{w}.\vec{u}$ is :-

(1) 47 (2) –25 (3) 0 (4) 25

20. If $\vec{a}$, $\vec{b}$, $\vec{c}$ are coplanar then -

$(\vec{a}+\vec{b}+\vec{c}).((\vec{a}+\vec{b})\times(\vec{a}+\vec{c}))$ equals –

(1) 0 (2) $[\vec{a},\ \vec{b},\ \vec{c}]$

(3) $2[\vec{a},\ \vec{b},\ \vec{c}]$ (4) $-[\vec{a},\ \vec{b},\ \vec{c}]$

21. If vectors $\vec{c}$, $\vec{a} = x\hat{i}+y\hat{j}+z\hat{k}$ and $\vec{b}=\hat{j}$ are such that $\vec{a}$, $\vec{c}$, $\vec{b}$ form a right handed system then $\vec{c}$ is:-

(1) $z\hat{i}-x\hat{k}$ (2) $\vec{0}$

(3) $y\hat{j}$ (4) $-z\hat{i}+x\hat{k}$

22. The vector $\vec{a}$ lies in the plane of vectors $\vec{b}$ and $\vec{c}$ which of the following is correct :-

(1) $\vec{a}\cdot(\vec{b}\times\vec{c}) = 0$ (2) $\vec{a}\cdot\vec{b}\times\vec{c} = 1$

(3) $\vec{a}\cdot\vec{b}\times\vec{c} = -1$ (4) $\vec{a}\cdot\vec{b}\times\vec{c} = 3$

23. Area of parllologram whose adjacent sides are $\hat{i}+2\hat{j}+3\hat{k}$ and $3\hat{i}-2\hat{j}+\hat{k}$ is :-

(1) $5\sqrt{2}$ (2) $8\sqrt{3}$

(3) 6 (4) None

24. Position vectors of the four angular points of a tetrahedron ABCD are A(3, – 2, 1); B(3, 1, 5); C(4, 0, 3) and D(1, 0, 0). Acute angle between the plane faces ADC and ABC is

(1) $\tan^{-1}(5/2)$ (2) $\cos^{-1}(2/5)$

(3) $\operatorname{cosec}^{-1}(5/2)$ (4) $\cot^{-1}(3/2)$

25. The volume of the tetrahedron formed by the coterminus edges $\vec{a}$, $\vec{b}$, $\vec{c}$ is 3. Then the volume of the parallelepiped formed by the coterminus edges $\vec{a}+\vec{b}$, $\vec{b}+\vec{c}$, $\vec{c}+\vec{a}$ is

(1) 6 (2) 18

(3) 36 (4) 9

26. $\vec{a},\vec{b}$ and $\vec{c}$ be three vectors having magnitudes 1,1 and 2 respectively. If $\vec{a}\times(\vec{a}\times\vec{c})+\vec{b}=0$, then the acute angle between $\vec{a}$ & $\vec{c}$ is :

(1) $\pi/6$ (2) $\pi/4$

(3) $\pi/3$ (4) $5\pi/12$

27. A vector of magnitude $5\sqrt{5}$ coplanar with vectors $\hat{i}+2\hat{j}$ & $\hat{j}+2\hat{k}$ and the perpendicular vector $2\hat{i}+\hat{j}+2\hat{k}$ is

(1) $\pm 5\left(5\hat{i}+6\hat{j}-8\hat{k}\right)$

(2) $\pm \sqrt{5}\left(5\hat{i}+6\hat{j}-8\hat{k}\right)$

(3) $\pm 5\sqrt{5}\left(5\hat{i}+6\hat{j}-8\hat{k}\right)$

(4) $\pm \left(5\hat{i}+6\hat{j}-8\hat{k}\right)$

28. Let $\vec{\alpha}=2\hat{i}+3\hat{j}-\hat{k}$ and $\vec{\beta}=\hat{i}+\hat{j}$. If $\vec{\gamma}$ is a unit vector, then the maximum value of $\left[\vec{\alpha}\times\vec{\beta}\ \ \vec{\beta}\times\vec{\gamma}\ \ \vec{\gamma}\times\vec{\alpha}\right]$ is equal to

(1) 2 (2) 3 (3) 4 (4) 9

29. If the vectors $\vec{a}=3\hat{i}+\hat{j}-2\hat{k}$, $\vec{b}=-\hat{i}+3\hat{j}+4\hat{k}$ & $\vec{c}=4\hat{i}-2\hat{j}-6\hat{k}$ constitute the sides of a Δ ABC, then the length of the median bisecting the vector $\vec{c}$ is

(1) $\sqrt{2}$ (2) $\sqrt{14}$ (3) $\sqrt{74}$ (4) $\sqrt{6}$

30. If the vector $6\hat{i}-3\hat{j}-6\hat{k}$ is decomposed into vectors parallel and perpendicular to the vector $\hat{i}+\hat{j}+\hat{k}$ then the vectors are :

(1) $-\left(\hat{i}+\hat{j}+\hat{k}\right)$ & $7\hat{i}-2\hat{j}-5\hat{k}$

(2) $-2\left(\hat{i}+\hat{j}+\hat{k}\right)$ & $8\hat{i}-\hat{j}-4\hat{k}$

(3) $+2\left(\hat{i}+\hat{j}+\hat{k}\right)$ & $4\hat{i}-5\hat{j}-8\hat{k}$

(4) none

31. Given three vectors $\vec{a}$, $\vec{b}$ & $\vec{c}$ each two of which are non collinear. Further if $\left(\vec{a}+\vec{b}\right)$ is collinear with $\vec{c}$, $\left(\vec{b}+\vec{c}\right)$ is collinear with $\vec{a}$ & $|\vec{a}|=|\vec{b}|=|\vec{c}|=\sqrt{2}$. Then the value of $\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}$:

(1) is 3 (2) is – 3

(3) is 0 (4) cannot be evaluated

ANSWER KEY

Exercise-I

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	3	4	3	1	4	1	3	1	4	2
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	1	2	2	1	1	3	3	1	2	1
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	1	1	2	1	3	1	4	2	4	1
Que.	31									
Ans.	2									