TEST

1. If the position vectors of the points A, B, C be $\mathbf{i}+\mathbf{j}$, $\mathbf{i}-\mathbf{j}$ and $a\,\mathbf{i}+b\,\mathbf{j}+c\,\mathbf{k}$ respectively, then the points A, B, C are collinear if

(a) $a=b=c=1$
(b) $a=1$, b and c are arbitrary scalars
(c) $a=b=c=0$
(d) $c=0$, $a=1$ and b is arbitrary scalars

2. The points with position vectors $10\mathbf{i}+3\mathbf{j}$, $12\mathbf{i}-5\mathbf{j}$ and $a\mathbf{i}+11\mathbf{j}$ are collinear, if $a=$

(a) -8 (b) 4
(c) 8 (d) 12

3. $(\mathbf{r}.\mathbf{i})^2+(\mathbf{r}.\mathbf{j})^2+(\mathbf{r}.\mathbf{k})^2=$

(a) $3r^2$ (b) r^2
(c) 0 (d) None of these

4. The vector $\mathbf{a}$ coplanar with the vectors $\mathbf{i}$ and $\mathbf{j}$, perpendicular to the vector $\mathbf{b}=4\mathbf{i}-3\mathbf{j}+5\mathbf{k}$ such that $|\mathbf{a}|=|\mathbf{b}|$ is

(a) $\sqrt{2}(3\mathbf{i}+4\mathbf{j})$ or $-\sqrt{2}(3\mathbf{i}+4\mathbf{j})$
(b) $\sqrt{2}(4\mathbf{i}+3\mathbf{j})$ or $-\sqrt{2}(4\mathbf{i}+3\mathbf{j})$
(c) $\sqrt{3}(4\mathbf{i}+5\mathbf{j})$ or $-\sqrt{3}(4\mathbf{i}+5\mathbf{j})$
(d) $\sqrt{3}(5\mathbf{i}+4\mathbf{j})$ or $-\sqrt{3}(5\mathbf{i}+4\mathbf{j})$

5. Let $\mathbf{a}$ and $\mathbf{b}$ be two unit vectors inclined at an angle θ, then $\sin(\theta/2)$ is equal to

(a) $\frac{1}{2}|\mathbf{a}-\mathbf{b}|$ (b) $\frac{1}{2}|\mathbf{a}+\mathbf{b}|$
(c) $|\mathbf{a}-\mathbf{b}|$ (d) $|\mathbf{a}+\mathbf{b}|$

6. A unit vector in the $xy-$plane which is perpendicular to $4\mathbf{i}-3\mathbf{j}+\mathbf{k}$ is

(a) $\frac{\mathbf{i}+\mathbf{j}}{\sqrt{2}}$ (b) $\frac{1}{5}(3\mathbf{i}+4\mathbf{j})$
(c) $\frac{1}{5}(3\mathbf{i}-4\mathbf{j})$ (d) None of these

7. A particle acted on by two forces $3\mathbf{i}+2\mathbf{j}-3\mathbf{k}$ and $2\mathbf{i}+4\mathbf{j}+2\mathbf{k}$ is displaced from the point $\mathbf{i}+2\mathbf{j}+\mathbf{k}$ to $5\mathbf{i}+4\mathbf{j}+2\mathbf{k}$. The total work done by the forces is equal to

(a) 63 *unit* (b) 39 *unit*
(c) 33 *unit* (d) 31 *unit*

8. If $\mathbf{a}$, $\mathbf{b}$, $\mathbf{c}$ are any vectors, then the true statement is

(a) $\mathbf{a}\times(\mathbf{b}\times\mathbf{c})=(\mathbf{a}\times\mathbf{b})\times\mathbf{c}$ (b) $\mathbf{a}\times\mathbf{b}=\mathbf{b}\times\mathbf{a}$
(c) $\mathbf{a}.(\mathbf{b}\times\mathbf{c})=\mathbf{a}.\mathbf{b}\times\mathbf{a}.\mathbf{c}$ (d) $\mathbf{a}.(\mathbf{b}-\mathbf{c})=\mathbf{a}.\mathbf{b}-\mathbf{a}.\mathbf{c}$

9. $(\mathbf{a}-\mathbf{b})\times(\mathbf{a}+\mathbf{b})=$

(a) $2(\mathbf{a}\times\mathbf{b})$ (b) $\mathbf{a}\times\mathbf{b}$
(c) a^2-b^2 (d) None of these

10. If $\mathbf{a}\neq\mathbf{0}$, $\mathbf{b}\neq\mathbf{0}$, $\mathbf{c}\neq\mathbf{0}$, then true statement is

(a) $\mathbf{a}\times(\mathbf{b}+\mathbf{c})=(\mathbf{c}+\mathbf{b})\times\mathbf{a}$ (b) $\mathbf{a}.(\mathbf{b}+\mathbf{c})=-(\mathbf{b}+\mathbf{c}).\mathbf{a}$
(c) $\mathbf{a}\times(\mathbf{b}-\mathbf{c})=(\mathbf{c}-\mathbf{b})\times\mathbf{a}$ (d) $\mathbf{a}.(\mathbf{b}-\mathbf{c})=(\mathbf{c}-\mathbf{b}).\mathbf{a}$

11. If $\mathbf{a}$ and $\mathbf{b}$ are two vectors, then $(\mathbf{a}\times\mathbf{b})^2$ equals

(a) $\begin{vmatrix}\mathbf{a}.\mathbf{b} & \mathbf{a}.\mathbf{a}\\ \mathbf{b}.\mathbf{b} & \mathbf{b}.\mathbf{a}\end{vmatrix}$ (b) $\begin{vmatrix}\mathbf{a}.\mathbf{a} & \mathbf{a}.\mathbf{b}\\ \mathbf{b}.\mathbf{a} & \mathbf{b}.\mathbf{b}\end{vmatrix}$
(c) $\begin{vmatrix}\mathbf{a}.\mathbf{b}\\ \mathbf{b}.\mathbf{a}\end{vmatrix}$ (d) None of these

12. If $\mathbf{a}.\mathbf{b}=\mathbf{a}.\mathbf{c}$, $\mathbf{a}\times\mathbf{b}=\mathbf{a}\times\mathbf{c}$ and $\mathbf{a}\neq\mathbf{0}$, then

(a) $\mathbf{b}=\mathbf{0}$ (b) $\mathbf{b}\neq\mathbf{c}$
(c) $\mathbf{b}=\mathbf{c}$ (d) None of these

13. The area of triangle whose vertices are $(1,2,3)$, $(2,5,-1)$ and $(-1,1,2)$ is

(a) 150 *sq. unit* (b) 145 *sq. unit*
(c) $\frac{\sqrt{155}}{2}$ *sq. unit* (d) $\frac{155}{2}$ *sq. unit*

14. If $\mathbf{a}$ and $\mathbf{b}$ be parallel vectors, then $[\mathbf{a}\;\mathbf{c}\;\mathbf{b}]=$

(a) 0 (b) 1
(c) 2 (d) None of these

15. If $\mathbf{a}=\mathbf{i}-\mathbf{j}+\mathbf{k}$, $\mathbf{b}=\mathbf{i}+2\mathbf{j}-\mathbf{k}$ and $\mathbf{c}=3\mathbf{i}+p\mathbf{j}+5\mathbf{k}$ are coplanar then the value of p will be

(a) -6 (b) -2
(c) 2 (d) 6

16. $\mathbf{i}.(\mathbf{j}\times\mathbf{k})+\mathbf{j}.(\mathbf{k}\times\mathbf{i})+\mathbf{k}.(\mathbf{i}\times\mathbf{j})=$

(a) 1 (b) 3
(c) -3 (d) 0

17. For three vectors $\mathbf{u}$, $\mathbf{v}$, $\mathbf{w}$ which of the following expressions is not equal to any of the remaining three

(a) $\mathbf{u}.(\mathbf{v}\times\mathbf{w})$ (b) $(\mathbf{v}\times\mathbf{w}).\mathbf{u}$
(c) $\mathbf{v}.(\mathbf{u}\times\mathbf{w})$ (d) $(\mathbf{u}\times\mathbf{v}).\mathbf{w}$

18. The value of $[\mathbf{a}-\mathbf{b}\;\;\mathbf{b}-\mathbf{c}\;\;\mathbf{c}-\mathbf{a}]$, where $|\mathbf{a}|=1$, $|\mathbf{b}|=5$ and $|\mathbf{c}|=3$ is

(a) 0 (b) 1
(c) 2 (d) 4

19. If $\mathbf{a},\mathbf{b},\mathbf{c}$ are vectors such that $[\mathbf{a}\,\mathbf{b}\,\mathbf{c}]=4$, then $[\mathbf{a}\times\mathbf{b}\;\;\mathbf{b}\times\mathbf{c}\;\;\mathbf{c}\times\mathbf{a}]=$

(a) 16 (b) 64
(c) 4 (d) 8

20. If $\mathbf{a}, \mathbf{b}, \mathbf{c}$ are non-coplanar vectors and λ is a real number then $[\lambda(\mathbf{a}+\mathbf{b}) \ \ \lambda^2\mathbf{b} \ \ \lambda\mathbf{c}] = [\mathbf{a} \ \mathbf{b}+\mathbf{c} \ \mathbf{b}]$ for

(a) Exactly three values of λ
(b) Exactly two values of λ
(c) Exactly one value of λ
(d) No value of λ

21. If $\mathbf{a} = \mathbf{i}+\mathbf{j}+\mathbf{k}$, $\mathbf{b} = \mathbf{i}+\mathbf{j}$, $\mathbf{c} = \mathbf{i}$ and $(\mathbf{a}\times\mathbf{b})\times\mathbf{c} = \lambda\mathbf{a} + \mu\mathbf{b}$, then $\lambda + \mu =$

(a) 0 (b) 1
(c) 2 (d) 3

22. The vector equation of the plane through the point $2\mathbf{i}-\mathbf{j}-4\mathbf{k}$ and parallel to the plane $\mathbf{r}.(4\mathbf{i}-12\mathbf{j}-3\mathbf{k})-7=0$ is

(a) $\mathbf{r}.(4\mathbf{i}-12\mathbf{j}-3\mathbf{k})=0$ (b) $\mathbf{r}.(4\mathbf{i}-12\mathbf{j}-3\mathbf{k})=32$
(c) $\mathbf{r}.(4\mathbf{i}-12\mathbf{j}-3\mathbf{k})=12$ (d) None of these

23. The length of the perpendicular from the origin to the plane passing through the point $\mathbf{a}$ and containing the line $\mathbf{r} = \mathbf{b}+\lambda\mathbf{c}$ is

(a) $\dfrac{[\mathbf{a}\,\mathbf{b}\,\mathbf{c}]}{|\mathbf{a}\times\mathbf{b}+\mathbf{b}\times\mathbf{c}+\mathbf{c}\times\mathbf{a}|}$ (b) $\dfrac{[\mathbf{a}\,\mathbf{b}\,\mathbf{c}]}{|\mathbf{a}\times\mathbf{b}+\mathbf{b}\times\mathbf{c}|}$
(c) $\dfrac{[\mathbf{a}\,\mathbf{b}\,\mathbf{c}]}{|\mathbf{b}\times\mathbf{c}+\mathbf{c}\times\mathbf{a}|}$ (d) $\dfrac{[\mathbf{a}\,\mathbf{b}\,\mathbf{c}]}{|\mathbf{c}\times\mathbf{a}+\mathbf{a}\times\mathbf{b}|}$

24. The line through $\mathbf{i}+3\mathbf{j}+2\mathbf{k}$ and perpendicular to the lines $\mathbf{r} = (\mathbf{i}+2\mathbf{j}-\mathbf{k})+\lambda(2\mathbf{i}+\mathbf{j}+\mathbf{k})$ and $\mathbf{r} = (2\mathbf{i}+6\mathbf{j}+\mathbf{k})+\mu(\mathbf{i}+2\mathbf{j}+3\mathbf{k})$ is

(a) $\mathbf{r} = (\mathbf{i}+2\mathbf{j}-\mathbf{k})+\lambda(-\mathbf{i}+5\mathbf{j}-3\mathbf{k})$
(b) $\mathbf{r} = \mathbf{i}+3\mathbf{j}+2\mathbf{k}+\lambda(\mathbf{i}-5\mathbf{j}+3\mathbf{k})$
(c) $\mathbf{r} = \mathbf{i}+3\mathbf{j}+2\mathbf{k}+\lambda(\mathbf{i}+5\mathbf{j}+3\mathbf{k})$
(d) $\mathbf{r} = \mathbf{i}+3\mathbf{j}+2\mathbf{k}+\lambda(-\mathbf{i}+5\mathbf{j}-3\mathbf{k})$

25. Let the vectors $\mathbf{a}$, $\mathbf{b}$, $\mathbf{c}$ and $\mathbf{d}$ be such that $(\mathbf{a}\times\mathbf{b})\times(\mathbf{c}\times\mathbf{d}) = 0$. Let P_1 and P_2 be planes determined by pair of vectors $\mathbf{a}$, $\mathbf{b}$ and $\mathbf{c}$, $\mathbf{d}$ respectively. Then the angle between P_1 and P_2 is

(a) 0° (b) $\frac{\pi}{4}$
(c) $\frac{\pi}{3}$ (d) $\frac{\pi}{2}$