1. The vector $\hat{i}+x\hat{j}+3\hat{k}$ is rotated through an angle θ and doubled in magnitude, then it becomes $4\hat{i}+(4x-2)\hat{j}+2\hat{k}$. The value of x is

(a) – 2/3 (b) 1/3 (c) 2/3 (d) 2

2. 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 $\cos^{-1}\left(\frac{1}{4}\right)$, then $\vec{b}-2\vec{c}=\lambda\vec{a}$ where λ is equal to

(a) 4 (b) – 4 (c) 2 (d) – 2

3. Let $\vec{a}=2\hat{i}+\hat{j}-2\hat{k}$ and $\vec{b}=\hat{i}+\hat{j}$. If $\vec{c}$ is a vector such that $\vec{a}.\vec{c}=|\vec{c}|.|\vec{c}-\vec{a}|=2\sqrt{2}$ and the angle between $\vec{a}\times\vec{b}$ and $\vec{c}$ is 30º, then $|(\vec{a}\times\vec{b})\times\vec{c}|=$

(a) 2/3 (b) 3/2 (c) 2 (d) 3

4. If G is the centroid of a triangle ABC, then **GA + GB + GC** equals

(a) $\vec{0}$ (b) 3 **GA** (c) 3**GB** (d) 3 **GC**

5. If θ is the angle between vectors $\vec{a}$ and $\vec{b}$ such that $\vec{a}.\vec{b}\geq 0$, then

(a) $0\leq\theta\leq\pi$ (b) $\frac{\pi}{2}\leq\theta\leq\pi$ (c) $0\leq\theta\leq\frac{\pi}{2}$ (d) $0<\theta<\frac{\pi}{2}$

6. The angle between the vectors $2\hat{i}+3\hat{j}+\hat{k}$ and $2\hat{i}-\hat{j}-\hat{k}$ is

(a) π/2 (b) π/4 (c) π/3 (d) none of these

7. If $|\vec{a}+\vec{b}|=|\vec{a}-\vec{b}|$, then

(a) $\vec{a}$ is parallel to $\vec{b}$ (b) $\vec{a}\perp\vec{b}$

(c) $|\vec{a}|=|\vec{b}|$ (d) none of these

8. The two vectors $\vec{a}=2\hat{i}+\hat{j}+3\hat{k}$, $\vec{b}=4\hat{i}-l\hat{j}+6\hat{k}$ are parallel if λ =

(a) 2 (b) – 3 (c) 3 (d) – 2

9. The vectors $2\hat{i}+3\hat{j}-4\hat{k}$ and $a\hat{i}+b\hat{j}+c\hat{k}$ are perpendicular when

(a) a = 2, b = 3, c = – 4 (b) a = 4, b = 4, c = 5

(c) a = 4, b = 4, c = – 2 (d) none of these

10. If $\vec{a}=2\hat{i}+2\hat{j}+3\hat{k}$, $\vec{b}=-\hat{i}+2\hat{j}+\hat{k}$ and $c=3\hat{i}+\hat{j}$, then $\vec{a}+t\vec{b}$ is perpendicular to $\vec{c}$ if t is equal to

(a) 8 (b) 4 (c) 6 (d) 2

11. The projection of the vector $\hat{i}-2\hat{j}+\hat{k}$ on the vector $4\hat{i}-4\hat{j}+7\hat{k}$ is

(a) $\frac{5\sqrt{6}}{10}$ (b) $\frac{19}{9}$ (c) $\frac{9}{19}$ (d) $\frac{\sqrt{6}}{19}$

12. If $\vec{a}$ and $\vec{b}$ are unit vector and q is the angle between them then $\left|\frac{\vec{a}-\vec{b}}{2}\right|$ is

(a) sin θ/2 (b) sin θ (c) 2 sin θ (d) sin 2 θ

13. Let $\vec{a} = 2\vec{i} - \vec{j} + \vec{k}$, $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$ and $\vec{c} = \hat{i} + \hat{j} - 2\hat{k}$ be three vectors. A vector in the plane of $\vec{b}$ and $\vec{c}$ whose projection on a is of magnitude $\sqrt{\frac{2}{3}}$ is

(a) $2\hat{i} + 3\hat{j} - 3\hat{k}$ (b) $2\hat{i} + 3\hat{j} + 3\hat{k}$ (c) $-2\hat{i} - \hat{j} + 5\hat{k}$ (d) $2\hat{i} + \hat{j} + 5\hat{k}$

14. If $\vec{a}, \vec{b}, \vec{c}$ are unit vectors such that $\vec{a} + \vec{b} + \vec{c} = 0$, then the value of $\vec{a}.\vec{b} + \vec{b}.\vec{c} + \vec{c}.\vec{a}$ is

(a) 1 (b) 3 (c) – 3/2 (d) none of these

15. If $|\vec{a}.\vec{b}| = |\vec{a} \times \vec{b}|$, then the angle between $\vec{a}$ and $\vec{b}$ is

(a) 0° (b) 180° (c) 135° (d) 45°

16. If $\vec{a} = 4\hat{i} + 6\hat{j}$ and $\vec{b} = 3\hat{j} + 4\hat{k}$, then the vector form of component of a along b is

(a) $\frac{18}{10\sqrt{3}}(3\hat{j} + 4\hat{k})$ (b) $\frac{18}{25}(3\hat{j} + 4\hat{k})$ (c) $\frac{18}{\sqrt{3}}(3\hat{j} + 4\hat{k})$ (d) $3\hat{j} + 4\hat{k}$

17. Let $\vec{a}, \vec{b}, \vec{c}$ be unit vectors such that $\vec{a}.\vec{b} = 0 = \vec{a}.\vec{c}$. If the angle between $\vec{b}$ and $\vec{c}$ is π/6, then $\vec{a}$ equals

(a) $\pm 2\ (\vec{b} \times \vec{c})$ (b) $2(\vec{b} \times \vec{c})$ (c) $\pm\frac{1}{2}(\vec{b} \times \vec{c})$ (d) $-\frac{1}{2}(\vec{b} \times \vec{c})$

18. If $|\vec{a}| = 7, |\vec{b}| = 11, |\vec{a} + \vec{b}| = 10\sqrt{3}$, then $|\vec{a} - \vec{b}|$ =

(a) 10 (b) $\sqrt{10}$ (c) $2\sqrt{10}$ (d) 20

19. If $\vec{a}.\vec{b} = 0$ and $\vec{a} + \vec{b}$ makes an angle of $30°$ with $\vec{a}$, then

(a) $|\vec{b}| = 2|\vec{a}|$ (d) $|\vec{a}| = 2|\vec{b}|$ (c) $|\vec{a}| = \sqrt{3}|\vec{b}|$ (d) none of these

20. The unit vector perpendicular to vectors $\hat{i} - \hat{j}$ and $\hat{i} + \hat{j}$ forming a right handed system is

(a) $\hat{k}$ (d) $-\hat{k}$ (c) $\frac{1}{\sqrt{2}}(\hat{i} - \hat{j})$ (d) $\frac{1}{\sqrt{2}}(\hat{i} + \hat{j})$

21. If $\vec{a}, \vec{b}, \vec{c}$ are vectors such that $\vec{a}.\vec{b} = 0$ and $\vec{a} + \vec{b} = \vec{c}$, then

(a) $|\vec{a}|^2 + |\vec{b}|^2 = |\vec{c}|^2$ (b) $|\vec{a}|^2 = |\vec{b}|^2 + |\vec{c}|^2$ (c) $|\vec{b}|^2 = |\vec{a}|^2 + |\vec{c}|^2$ (d) none of these

22. The value of $[\vec{a} - \vec{b}, \vec{b} - \vec{c}, \vec{c} - \vec{a}]$ where $|\vec{a}| = 1, |\vec{b}| = 5 |\vec{c}| = 3$ is

(a) 0 (b) 1 (c) 6 (d) none of these

23. If $\vec{a} = 2\hat{i} + 3\hat{j} + \hat{k}, \vec{b} = 2\hat{i} + p\hat{j} + 3\hat{k}$ and $\vec{c} = 2\hat{i} + 17\hat{j} - 3\hat{k}$ are coplanar vectors, then the value of p is
(a) – 4 (b) – 1 (c) 4 (d) – 2

24. The work done by the force $\vec{F} = 2\hat{i} - \hat{j} - \hat{k}$ in moving an object along the vector $3\hat{i} + 2\hat{j} - 5\hat{k}$ is
(a) – 9 units (b) 15 units (c) 9 units (d) – 9 units

25. The moment of the couple formed by the forces $5\hat{i} + \hat{k}$ and $-5\hat{i} - \hat{k}$ acting at the points (9, – 1, 2) and (3, –2, 1) respectively, is
(a) $-\hat{i} + \hat{j} + 5\hat{k}$ (b) $\hat{i} - 11\hat{j} - 5\hat{k}$ (c) $-\hat{i} + 11\hat{j} + 5\hat{k}$ (d) $\hat{i} - \hat{j} - 5\hat{k}$

26. If $\vec{a}, \vec{b}, \vec{c}$ are non-coplanar unit vectors such that $\vec{a} x (\vec{b} \times \vec{c}) = \frac{\vec{b} + \vec{c}}{\sqrt{2}}$, then the angle between $\vec{a}$ and $\vec{b}$ is
(a) $\frac{3\pi}{4}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{2}$ (d) π

27. A unit vector in xy– plane makes an angle of 45º with the vector $\hat{i} + \hat{j}$ and an angle of 60º with the vector $3\hat{i} - 4\hat{j}$ **is**
(a) $\hat{i}$ (b) $\frac{\hat{i} + \hat{j}}{\sqrt{2}}$ (c) $\frac{\hat{i} - \hat{j}}{\sqrt{2}}$ (d) none of these

28. A unit vector perpendicular to $4\hat{i} - \hat{j} + 3\hat{k}$ and $-2\hat{i} + \hat{j} - 2\hat{k}$ is
(a) $\frac{1}{3}(\hat{i} - 2\hat{j} + 3\hat{k})$ (b) $\frac{1}{3}(-\hat{i} + 2\hat{j} + 2\hat{k})$ (c) $\frac{1}{3}(2\hat{i} + \hat{j} + 2\hat{k})$ (d) $\frac{1}{3}(2\hat{i} - \hat{j} + 2\hat{k})$

29. If S is the circumcentre, G the centroid, O the orthocenter of a triangle ABC, then SA + SB + SC =
(a) SG (b) OS (c) So (d) OG

30. If $(\vec{a} \times \vec{b})^2 + (\vec{a}.\vec{b})^2 = 144$ and $|\vec{a}| = 4$, then $|\vec{b}| =$
(a) 16 (b) 8 (c) 3 (d) 12