ASSIGNMENT - VECTORS (ENTER THE CORRECTION INTHE BOX

1. A particle starts from rest at the origin with a constant acceleration $\vec{a} = 2\hat{i} + 8\hat{j} - 6\hat{k}\ ms^{-2}$. Its position at $t = 5$ s is
   (A) $\left(25\hat{i} + 100\hat{j} - 75\hat{k}\right)$ m
   (B) $\left(25\hat{i} - 100\hat{j} - 75\hat{k}\right)$ m
   (C) $\left(100\hat{i} - 25\hat{j} + 75\hat{k}\right)$ m
   (D) $\left(25\hat{i} - 100\hat{j} + 75\hat{k}\right)$ m

2. Three forces $\vec{F}_1 = \left(3\hat{i} + 2\hat{j} - \hat{k}\right)$ N, $\vec{F}_2 = \left(3\hat{i} + 4\hat{j} - 5\hat{k}\right)$ N and $\vec{F}_3 = A\left(\hat{i} + \hat{j} - \hat{k}\right)$ N act simultaneously on a particle. In order that the particle remains in equilibrium, the value of A should be
   (A) -6 (B) 6
   (C) 9 (D) -9

3. The magnitude of vector product of two non zero vectors $\vec{A}$ and $\vec{B}$ is zero. The scalar product of $\vec{A}$ and $\vec{A} + \vec{B}$ is equal to
   (A) ZERO (B) AB
   (C) A^2 (D) $A^2 + AB$

4. The magnitude of resultant of two equal forces is equal to either of two forces. The angle between forces is
   (A) $\frac{\pi}{3}$ (B) $\frac{2\pi}{3}$
   (C) $\frac{\pi}{2}$ (D) $\frac{3\pi}{4}$

5. The condition under which the vectors $\left(\vec{a} + \vec{b}\right)$ and $\left(\vec{a} - \vec{b}\right)$ are parallel is
   (A) $\vec{a} \perp \vec{b}$ (B) $|\vec{a}| = |\vec{b}|$
   (C) $\vec{a} \neq \vec{b}$ (D) $\vec{a} \parallel \vec{b}$

6. The two vectors $\vec{A}$ and $\vec{B}$ that are parallel to each other are
   (A) $\vec{A} = 3\hat{i} + 6\hat{j} + 9\hat{k}$, $\vec{B} = \hat{i} + 2\hat{j} + 3\hat{k}$
   (B) $\vec{A} = 3\hat{i} - 6\hat{j} + 9\hat{k}$, $\vec{B} = \hat{i} + 2\hat{j} + 3\hat{k}$
   (C) $\vec{A} = \hat{i} + 2\hat{j} + 3\hat{k}$, $\vec{B} = \hat{i} + 2\hat{j} - 3\hat{k}$
   (D) $\vec{A} = 3\hat{i} + 6\hat{j} - 9\hat{k}$, $\vec{B} = \hat{i} - 2\hat{j} - 3\hat{k}$

7. The sum, difference and cross product of two vectors $\vec{A}$ and $\vec{B}$ are mutually perpendicular if
   (A) $\vec{A}$ and $\vec{B}$ are perpendicular to each other
   (B) $\vec{A}$ and $\vec{B}$ are perpendicular but their magnitudes are arbitrary
   (C) $|\vec{A}| = |\vec{B}|$ and their directions are arbitrary
   (D) $\vec{A} \perp \vec{B}$ and $|\vec{A}| = |\vec{B}|$

8. Three forces 9, 12 and 15 N acting at a point are in equilibrium. The angle between 9 N and 15 N is
   (A) $\cos^{-1}\left(\frac{3}{5}\right)$ (B) $\cos^{-1}\left(\frac{4}{5}\right)$
   (C) $\pi - \cos^{-1}\left(\frac{3}{5}\right)$ (D) $\pi - \cos^{-1}\left(\frac{4}{5}\right)$

9. The condition that $\left(\vec{a} \cdot \vec{b}\right)^2 = a^2 b^2$ is satisfied when
   (A) $\vec{a} \parallel \vec{b}$ (B) $\vec{a} \neq \vec{b}$
   (C) $\vec{a} \cdot \vec{b} = 1$ (D) $\vec{a} \perp \vec{b}$

10. The sides of the triangle representing three force vectors are in the ratio 2000 : 1732 : 1000. The angles of the triangle (in degrees) are
    (A) 70, 65, 45 (B) 80, 55, 45
    (C) 90, 60, 30 (D) 90, 61, 39

11. A force $\vec{F} = \left(-3\hat{i} + \hat{j} + 5\hat{k}\right)$ N acts at a point (7,3,1). The torque about the origin (0, 0, 0) will be
    (A) $14\hat{i} - 38\hat{j} + 16\hat{k}$ (B) $14\hat{i} + 38\hat{j} - 16\hat{k}$
    (C) $14\hat{i} - 38\hat{j} - 16\hat{k}$ (D) $14\hat{i} + 38\hat{j} + 16\hat{k}$

12. A vector $\vec{C} = \vec{A} - \vec{B}$ has a magnitude equal to $A + B$, the angle between $\vec{A}$ and $\vec{B}$ is
    (A) ZERO (B) $\frac{\pi}{2}$
    (C) π (D) 2π

13. The vector having module equal to 3 and perpendicular to the two vectors $\vec{A} = 2\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{B} = 2\hat{i} - 2\hat{j} + 3\hat{k}$ is
    (A) $\pm\left(2\hat{i} - \hat{j} - 2\hat{k}\right)$ (B) $\pm\left(3\hat{i} + \hat{j} - 2\hat{k}\right)$
    (C) $-\left(3\hat{i} - \hat{j} - 3\hat{k}\right)$ (D) $\left(3\hat{i} - \hat{j} - 3\hat{k}\right)$

14. The vector sum of three vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ is zero. If $\hat{i}$ and $\hat{j}$ are unit vectors in the directions of $\vec{a}$ and $\vec{b}$ respectively, then
    (A) $\vec{c}$ is in the plane of $\hat{i}$ and $\hat{j}$
    (B) $\vec{c}$ is along $\left(\hat{i} \times \hat{j}\right)$
    (C) $\vec{c}$ is along $\hat{i}$
    (D) $\vec{c}$ is along $\hat{j}$

15. 12 coplanar forces (all of equal magnitude) maintain a body in equilibrium, then the angle between any two adjacent forces is
    (A) 15° (B) 30°
    (C) 45° (D) 60°

16. If $\left|\vec{F}_1 \times \vec{F}_2\right| = \vec{F}_1 \cdot \vec{F}_2$, then $\left|\vec{F}_1 + \vec{F}_2\right|$ is
    (A) $\left|\vec{F}_1\right| + \left|\vec{F}_2\right|$
    (B) $\sqrt{\left|\vec{F}_1\right|^2 + \left|\vec{F}_2\right|^2}$
    (C) $\sqrt{\left|\vec{F}_1\right|^2 + \left|\vec{F}_2\right|^2 + \frac{\left|\vec{F}_1\right|\left|\vec{F}_2\right|}{\sqrt{2}}}$
    (D) $\sqrt{\left|\vec{F}_1\right|^2 + \left|\vec{F}_2\right|^2 + \sqrt{2}\left|\vec{F}_1\right|\left|\vec{F}_2\right|}$

17. The value of p so that the vectors $2\hat{i} - \hat{j} + \hat{k}$, $\hat{i} + 2\hat{j} - 3\hat{k}$ and $3\hat{i} + p\hat{j} + 5\hat{k}$ are coplanar should be
    (A) 16 (B) -4
    (C) 4 (D) -8

18. $ABCD$ is a quadrilateral. Forces $\overline{BA}$, $\overline{BC}$, $\overline{CD}$ and $\overline{DA}$ act at the point. Their resultant is
    (A) $2\overline{AB}$ (B) $2\overline{DA}$
    (C) $2\overline{BC}$ (D) $2\overline{BA}$

19. Which of the following group of forces will not accelerate a body?
    (A) 5 N, 10 N, 12 N (B) 5 N, 10
    (C) 8 N, 10 N, 20 N (D) 7 N, 5 N

20. Consider the two vectors $\vec{A}$ and $\vec{B}$. The magnitude of their sum, i.e. $|\vec{A}+\vec{B}|$, if $|\vec{A}|>|\vec{B}|$

(A) is equal to $|\vec{A}|+|\vec{B}|$

(B) cannot be less than $|\vec{A}|+|\vec{B}|$

(C) cannot be greater than $|\vec{A}|+|\vec{B}|$

(D) must be equal to $|\vec{A}|-|\vec{B}|$

21. Three vectors $\vec{P}$, $\vec{Q}$ and $\vec{R}$ are such that $|\vec{P}|=|\vec{Q}|$, $|\vec{R}|=\sqrt{2}|\vec{P}|$ and $\vec{P}+\vec{Q}+\vec{R}=\vec{0}$. The angles between $\vec{P}$ & $\vec{Q}$, $\vec{Q}$ & $\vec{R}$ and $\vec{P}$ & $\vec{R}$ are respectively (in degrees)

(A) 90, 135, 135 (B) 90, 45, 45

(C) 45, 90, 90 (D) 45, 135, 135

22. If $\hat{A}$ is a unit vector. The value $\hat{A}\cdot\frac{d\hat{A}}{dt}=$

(A) 0 (B) 1

(C) $\frac{\pi}{2}$ (D) π

23. If four non zero vectors satisfy $\vec{a}\times\vec{b}=\vec{c}\times\vec{d}$ and $\vec{a}\times\vec{c}=\vec{b}\times\vec{d}$ with $|\vec{a}|\neq|\vec{d}|$ and $|\vec{b}|\neq|\vec{c}|$, then

(A) $(\vec{a}-\vec{d})$ and $(\vec{b}-\vec{c})$ are perpendicular

(B) $(\vec{a}-\vec{d})$ and $(\vec{b}-\vec{c})$ are parallel

(C) $(\vec{a}-\vec{d})$ must equal $(\vec{b}-\vec{c})$

(D) $(\vec{a}-\vec{d})$ must equal $-(\vec{b}-\vec{c})$

24. If two non parallel vectors $\vec{A}$ and $\vec{B}$ are equal in magnitude, then the vectors $(\vec{A}-\vec{B})$ and $(\vec{A}+\vec{B})$ will be

(A) parallel to each other

(B) parallel but oppositely directed

(C) perpendicular to each other

(D) inclined at an angle $\theta < 90°$

25. A point of application of force $\vec{F}=-5\hat{i}+3\hat{j}+2\hat{k}$ is moved from $\vec{r}_1=2\hat{i}+7\hat{j}+4\hat{k}$ to $\vec{r}_2=5\hat{i}+2\hat{j}+4\hat{k}$. The work done will be

(A) –22 unit (B) 22 unit

(C) –30 unit (D) +30 unit