1. A (1, –1, –3), B (2, 1, –2) & C (–5, 2, –6) are the position vectors of the vertices of a triangle ABC. The length of the bisector of its internal angle at A is :

(A) $\sqrt{10}/4$ (B) $3\sqrt{10}/4$ (C) $\sqrt{10}$ (D) none

2. Let $\vec{p}$ is the p.v. of the orthocentre & $\vec{g}$ is the p.v. of the centroid of the triangle ABC where circumcentre is the origin. If $\vec{p} = K\vec{g}$, then K =

(A) 3 (B) 2 (C) 1/3 (D) 2/3

3. A vector $\vec{a}$ has components 2p & 1 with respect to a rectangular cartesian system. The system is rotated through a certain angle about the origin in the counterclockwise sense. If with respect to the new system, $\vec{a}$ has components p + 1 & 1 then ,

(A) p = 0 (B) p = 1 or p = – 1/3 (C) p = – 1 or p = 1/3 (D) p = 1 or p = – 1

4. The number of vectors of unit length perpendicular to vectors $\vec{a} = (1, 1, 0)$ & $\vec{b}$ (0, 1, 1) is:

(A) 1 (B) 2 (C) 3 (D) ∞

5. Four points A(+1, –1, 1) ; B(1, 3, 1) ; C(4, 3, 1) and D(4, – 1, 1) taken in order are the vertices of

(A) a parallelogram which is neither a rectangle nor a rhombus

(B) rhombus

(C) an isosceles trapezium

(D) a cyclic quadrilateral.

6. Let α, β & γ be distinct real numbers. The points whose position vector's are $\alpha\hat{i} + \beta\hat{j} + \gamma\hat{k}$; $\beta\hat{i} + \gamma\hat{j} + \alpha\hat{k}$ and $\gamma\hat{i} + \alpha\hat{j} + \beta\hat{k}$

(A) are collinear (B) form an equilateral triangle

(C) form a scalene triangle (D) form a right angled triangle

7. 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 ΔABC, then the length of the median bisecting the vector $\vec{c}$ is

(A) $\sqrt{2}$ (B) $\sqrt{14}$ (C) $\sqrt{74}$ (D) $\sqrt{6}$

8. Let A(0, –1, 1), B(0, 0, 1), C(1, 0, 1) are the vertices of a ΔABC. If R and r denotes the circumradius and inradius of ΔABC, then $\frac{r}{R}$ has value equal to

AB = 1 AC = √2 BC = 1

$r = \frac{\Delta}{s}$

(A) $\tan\frac{3\pi}{8}$ (B) $\cot\frac{3\pi}{8}$ (C) $\tan\frac{\pi}{12}$ (D) $\cot\frac{\pi}{12}$

9. $\vec{a}, \vec{b}, \vec{c}$ are three non-zero vectors, no two of which are collinear and the vector $\vec{a} + \vec{b}$ is collinear with $\vec{c}$, $\vec{b} + \vec{c}$ is collinear with $\vec{a}$, then $\vec{a} + \vec{b} + \vec{c}$ is equal to -

(A) $\vec{a}$ (B) $\vec{b}$ (C) $\vec{c}$ (D) none of these

10. If the three points with position vectors (1, a, b) ; (a, 2, b) and (a, b, 3) are collinear in space, then the value of a + b is

(A) 3 (B) 4 (C) 5 (D) none

11. Consider the following 3 lines in space

$L_1 : \vec{r} = 3\hat{i} - \hat{j} + 2\hat{k} + \lambda(2\hat{i} + 4\hat{j} - \hat{k})$

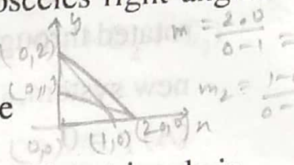
$L_2 : \vec{r} = \hat{i} + \hat{j} - 3\hat{k} + \mu(4\hat{i} + 2\hat{j} + 4\hat{k})$

$L_3 : \vec{r} = 3\hat{i} + 2\hat{j} - 2\hat{k} + t(2\hat{i} + \hat{j} + 2\hat{k})$

Then which one of the following pair(s) are in the same plane.

(A) only L_1L_2 (B) only L_2L_3 (C) only L_3L_1 (D) L_1L_2 and L_2L_3

12. The acute angle between the medians drawn from the acute angles of an isosceles right angled triangle is:



(A) $\cos^{-1}(2/3)$ (B) $\cos^{-1}(3/4)$ (C) $\cos^{-1}(4/5)$ (D) none

13. The vectors $3\hat{i} - 2\hat{j} + \hat{k}$, $\hat{i} - 3\hat{j} + 5\hat{k}$ & $2\hat{i} + \hat{j} - 4\hat{k}$ form the sides of a triangle. Then triangle is

(A) an acute angled triangle (B) an obtuse angled triangle

(C) an equilateral triangle (D) a right angled triangle

14. If the vectors $3\bar{p} + \bar{q}\,;\, 5\bar{p} - 3\bar{q}$ and $2\bar{p} + \bar{q}\,;\, 4\bar{p} - 2\bar{q}$ are pairs of mutually perpendicular vectors then $\sin(\widehat{\bar{p}\,\bar{q}})$ is

(A) $\sqrt{55}/4$ (B) $\sqrt{55}/8$ (C) 3/16 (D) $\sqrt{247}/16$

15. Consider the points A, B and C with position vectors $(-2\hat{i} + 3\hat{j} + 5\hat{k})$, $(\hat{i} + 2\hat{j} + 3\hat{k})$ and $7\hat{i} - \hat{k}$ respectively.

Statement-1: The vector sum, $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CA} = \vec{0}$

because

Statement-2: A, B and C form the vertices of a triangle.

(A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.

(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.

(C) Statement-1 is true, statement-2 is false.

(D) Statement-1 is false, statement-2 is true.

16. The set of values of c for which the angle between the vectors $cx\hat{i} - 6\hat{j} + 3\hat{k}$ & $x\hat{i} - 2\hat{j} + 2cx\hat{k}$ is acute for every $x \in R$ is

(A) (0, 4/3) (B) [0, 4/3] (C) (11/9, 4/3) (D) [0, 4/3)

17. Let $\vec{u} = \hat{i} + \hat{j}$, $\vec{v} = \hat{i} - \hat{j}$ and $\vec{w} = \hat{i} + 2\hat{j} + 3\hat{k}$. If $\hat{n}$ is a unit vector such that $\vec{u} \cdot \hat{n} = 0$ and $\vec{v} \cdot \hat{n} = 0$, then $|\vec{w} \cdot \hat{n}|$ is equal to

(A) 1 (B) 2 (C) 3 (D) 0

18. 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 :

(A) $-(\hat{i}+\hat{j}+\hat{k})$ & $7\hat{i}-2\hat{j}-5\hat{k}$ (B) $-2(\hat{i}+\hat{j}+\hat{k})$ & $8\hat{i}-\hat{j}-4\hat{k}$

(C) $+2(\hat{i}+\hat{j}+\hat{k})$ & $4\hat{i}-5\hat{j}-8\hat{k}$ (D) none

19. Let $\vec{r}=\vec{a}+\lambda\vec{l}$ and $\vec{r}=\vec{b}+\mu\vec{m}$ be two lines in space where $\vec{a}=5\hat{i}+\hat{j}+2\hat{k}$, $\vec{b}=-\hat{i}+7\hat{j}+8\hat{k}$, $\vec{l}=-4\hat{i}+\hat{j}-\hat{k}$ and $\vec{m}=2\hat{i}-5\hat{j}-7\hat{k}$ then the p.v. of a point which lies on both of these lines, is

(A) $\hat{i}+2\hat{j}+\hat{k}$ (B) $2\hat{i}+\hat{j}+\hat{k}$

(C) $\hat{i}+\hat{j}+2\hat{k}$ (D) non existent as the lines are skew

20. Let A(1, 2, 3), B(0, 0, 1), C(–1, 1, 1) are the vertices of a ΔABC.

(i) The equation of internal angle bisector through A to side BC is.

(A) $\vec{r}=\hat{i}+2\hat{j}+3\hat{k}+\mu(3\hat{i}+2\hat{j}+3\hat{k})$ (B) $\vec{r}=\hat{i}+2\hat{j}+3\hat{k}+\mu(3\hat{i}+4\hat{j}+3\hat{k})$

(C) $\vec{r}=\hat{i}+2\hat{j}+3\hat{k}+\mu(3\hat{i}+3\hat{j}+2\hat{k})$ (D) $\vec{r}=\hat{i}+2\hat{j}+3\hat{k}+\mu(3\hat{i}+3\hat{j}+4\hat{k})$

(ii) The equation of median through C to side AB is

(A) $\vec{r}=-\hat{i}+\hat{j}+\hat{k}+p(3\hat{i}-2\hat{k})$ (B) $\vec{r}=-\hat{i}+\hat{j}+\hat{k}+p(3\hat{i}+2\hat{k})$

(C) $\vec{r}=-\hat{i}+\hat{j}+\hat{k}+p(-3\hat{i}+2\hat{k})$ (D) $\vec{r}=-\hat{i}+\hat{j}+\hat{k}+p(3\hat{i}+2\hat{j})$

(iii) The area (ΔABC) is equal to

(A) $\frac{9}{2}$ (B) $\frac{\sqrt{17}}{2}$ (C) $\frac{17}{2}$ (D) $\frac{7}{2}$

$\vec{a}+\vec{b}=-\vec{c}$

$|\vec{a}+\vec{b}|^2=|\vec{c}|^2$

21. If $\vec{a}+\vec{b}+\vec{c}=0$, $|\vec{a}|=3$, $|\vec{b}|=5$, $|\vec{c}|=7$, then the angle between $\vec{a}$ & $\vec{b}$ is :

$|\vec{a}|^2+|\vec{b}|^2+2|\vec{a}||\vec{b}|\cos\theta=|\vec{c}|^2$

(A) $\pi/6$ (B) $2\pi/3$ (C) $5\pi/3$ (D) $\pi/3$

$\cos\theta$

22. A line passes through the point $A(\hat{i}+2\hat{j}+3\hat{k})$ and is parallel to the vector $\vec{V}(\hat{i}+\hat{j}+\hat{k})$. The shortest distance from the origin, of the line is -

(A) $\sqrt{2}$ (B) $\sqrt{4}$ (C) $\sqrt{5}$ (D) $\sqrt{6}$

23. Let $\vec{a}, \vec{b}, \vec{c}$ be vectors of length 3, 4, 5 respectively. Let $\vec{a}$ be perpendicular to $\vec{b}+\vec{c}$, $\vec{b}$ to $\vec{c}+\vec{a}$ & $\vec{c}$ to $\vec{a}+\vec{b}$. Then $|\vec{a}+\vec{b}+\vec{c}|$ is :

(A) $2\sqrt{5}$ (B) $2\sqrt{2}$ (C) $10\sqrt{5}$ (D) $5\sqrt{2}$

24. The set of values of x for which the angle between the vectors $\vec{a}=x\hat{i}-3\hat{j}-\hat{k}$ and $\vec{b}=2x\hat{i}+x\hat{j}-\hat{k}$ acute and the angle between the vector $\vec{b}$ and the axis of ordinates is obtuse, is

(A) $1<x<2$ (B) $x>2$ (C) $x<1$ (D) $x<0$

25. If a vector $\vec{a}$ of magnitude 50 is collinear with vector $\vec{b} = 6\hat{i} - 8\hat{j} - \frac{15}{2}\hat{k}$ and makes an acute angle with positive z-axis then :

(A) $\vec{a} = 4\vec{b}$ (B) $\vec{a} = -4\vec{b}$ (C) $\vec{b} = 4\vec{a}$ (D) none

26. A, B, C & D are four points in a plane with pv's $\vec{a}, \vec{b}, \vec{c}$ & $\vec{d}$ respectively such that $(\vec{a}-\vec{d})\cdot(\vec{b}-\vec{c}) = (\vec{b}-\vec{d})\cdot(\vec{c}-\vec{a}) = 0$. Then for the triangle ABC, D is its

(A) incentre (B) circumcentre (C) orthocentre (D) centroid

27. $\vec{a}$ and $\vec{b}$ are unit vectors inclined to each other at an angle α, $\alpha \in (0, \pi)$ and $|\vec{a} + \vec{b}| < 1$. Then $\alpha \in$

(A) $\left(\frac{\pi}{3}, \frac{2\pi}{3}\right)$ (B) $\left(\frac{2\pi}{3}, \pi\right)$ (C) $\left(0, \frac{\pi}{3}\right)$ (D) $\left(\frac{\pi}{4}, \frac{3\pi}{4}\right)$

28. Image of the point P with position vector $7\hat{i} - \hat{j} + 2\hat{k}$ in the line whose vector equation is, $\vec{r} = 9\hat{i} + 5\hat{j} + 5\hat{k} + \lambda(\hat{i} + 3\hat{j} + 5\hat{k})$ has the position vector

(A) $(-9, 5, 2)$ (B) $(9, 5, -2)$ (C) $(9, -5, -2)$ (D) none

29. Let $\hat{a}, \hat{b}, \hat{c}$ are three unit vectors such that $\hat{a} + \hat{b} + \hat{c}$ is also a unit vector. If pairwise angles between $\hat{a}, \hat{b}, \hat{c}$ are θ_1, θ_2 and θ_3 respectively then $\cos\theta_1 + \cos\theta_2 + \cos\theta_3$ equals

(A) 3 (B) -3 (C) 1 (D) -1

30. A tangent is drawn to the curve $y = \frac{8}{x^2}$ at a point A (x_1, y_1), where $x_1 = 2$. The tangent cuts the x-axis at point B. Then the scalar product of the vectors $\overrightarrow{AB}$ & $\overrightarrow{OB}$ is

(A) 3 (B) -3 (C) 6 (D) -6

31. Cosine of an angle between the vectors $(\vec{a}+\vec{b})$ and $(\vec{a}-\vec{b})$ if $|\vec{a}| = 2$, $|\vec{b}| = 1$ and $\vec{a} \wedge \vec{b} = 60°$ is

(A) $\sqrt{3/7}$ (B) $9/\sqrt{21}$ (C) $3/\sqrt{7}$ (D) none

32. An arc AC of a circle subtends a right angle at the centre O. The point B divides the arc in the ratio 1 : 2. If $\overrightarrow{OA} = \vec{a}$ & $\overrightarrow{OB} = \vec{b}$, then the vector $\overrightarrow{OC}$ in terms of $\vec{a}$ & $\vec{b}$, is

(A) $\sqrt{3}\vec{a} - 2\vec{b}$ (B) $-\sqrt{3}\vec{a} + 2\vec{b}$ (C) $2\vec{a} - \sqrt{3}\vec{b}$ (D) $-2\vec{a} + \sqrt{3}\vec{b}$

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

(A) is 3 (B) is -3 (C) is 0 (D) cannot be evaluated

34. The vector equations of two lines L_1 and L_2 are respectively

$\vec{r} = 17\hat{i} - 9\hat{j} + 9\hat{k} + \lambda(3\hat{i} + \hat{j} + 5\hat{k})$ and $\vec{r} = 15\hat{i} - 8\hat{j} - \hat{k} + \mu(4\hat{i} + 3\hat{j})$

I L_1 and L_2 are skew lines

II $(11, -11, -1)$ is the point of intersection of L_1 and L_2

III $(-11, 11, 1)$ is the point of intersection of L_1 and L_2

IV $\cos^{-1}(3/\sqrt{35})$ is the acute angle between L_1 and L_2

then , which of the following is true?

(A) II and IV (B) I and IV (C) IV only (D) III and IV

35. For two particular vectors $\vec{A}$ and $\vec{B}$ it is known that $\vec{A}\times\vec{B} = \vec{B}\times\vec{A}$. What must be true about the two vectors?

(A) At least one of the two vectors must be the zero vector.

(B) $\vec{A}\times\vec{B} = \vec{B}\times\vec{A}$ is true for any two vectors.

(C) One of the two vectors is a scalar multiple of the other vector.

(D) The two vectors must be perpendicular to each other.

36. For some non zero vector $\vec{V}$, if the sum of $\vec{V}$ and the vector obtained from $\vec{V}$ by rotating it by an angle 2α equals to the vector obtained from $\vec{V}$ by rotating it by α then the value of α, is

(A) $2n\pi \pm \frac{\pi}{3}$ (B) $n\pi \pm \frac{\pi}{3}$ (C) $2n\pi \pm \frac{2\pi}{3}$ (D) $n\pi \pm \frac{2\pi}{3}$

where n is an integer.

37. Let $\vec{u}, \vec{v}, \vec{w}$ be such that $|\vec{u}| = 1$, $|\vec{v}| = 2$, $|\vec{w}| = 3$. If the projection of $\vec{v}$ along $\vec{u}$ is equal to that of $\vec{w}$ along $\vec{u}$ and vectors $\vec{v}$, $\vec{w}$ are perpendicular to each other then $|\vec{u} - \vec{v} + \vec{w}|$ equals

(A) 2 (B) $\sqrt{7}$ (C) $\sqrt{14}$ (D) 14

38. If $\vec{a}$ and $\vec{b}$ are non zero, non collinear, and the linear combination

$(2x - y)\vec{a} + 4\vec{b} = 5\vec{a} + (x - 2y)\vec{b}$ holds for real x and y then x + y has the value equal to

(A) – 3 (B) 1 (C) 17 (D) 3

39. Given an equilateral triangle ABC with side length equal to 'a'. Let M and N be two points respectively on the side AB and AC such that $\overrightarrow{AN} = K\overrightarrow{AC}$ and $\overrightarrow{AM} = \frac{\overrightarrow{AB}}{3}$. If $\overrightarrow{BN}$ and $\overrightarrow{CM}$ are orthogonal then the value of K is equal to

(A) $\frac{1}{5}$ (B) $\frac{1}{4}$ (C) $\frac{1}{3}$ (D) $\frac{1}{2}$

40. If $\vec{p}$ & $\vec{s}$ are not perpendicular to each other and $\vec{r}\times\vec{p} = \vec{q}\times\vec{p}$ & $\vec{r}\cdot\vec{s} = 0$, then $\vec{r} =$

(A) $\vec{p}\cdot\vec{s}$ (B) $\vec{q} + \left(\frac{\vec{q}\cdot\vec{p}}{\vec{p}\cdot\vec{s}}\right)\vec{p}$ (C) $\vec{q} - \left(\frac{\vec{q}\cdot\vec{s}}{\vec{p}\cdot\vec{s}}\right)\vec{p}$ (D) $\vec{q} + \mu\vec{p}$ for all scalars μ

41. If $\vec{u}$ and $\vec{v}$ are two vectors such that $|\vec{u}| = 3$; $|\vec{v}| = 2$ and $|\vec{u}\times\vec{v}| = 6$ then the correct statement is

(A) $\vec{u}\wedge\vec{v} \in (0, 90°)$ (B) $\vec{u}\wedge\vec{v} \in (90°, 180°)$ (C) $\vec{u}\wedge\vec{v} = 90°$ (D) $(\vec{u}\times\vec{v})\times\vec{u} = 6\vec{v}$

42. Given a parallelogram OACB. The lengths of the vectors $\overrightarrow{OA}$, $\overrightarrow{OB}$ & $\overrightarrow{AB}$ are a, b & c respectively. The scalar product of the vectors $\overrightarrow{OC}$ & $\overrightarrow{OB}$ is :

(A) $\frac{a^2 - 3b^2 + c^2}{2}$ (B) $\frac{3a^2 + b^2 - c^2}{2}$ (C) $\frac{3a^2 - b^2 + c^2}{2}$ (D) $\frac{a^2 + 3b^2 - c^2}{2}$

43. Vectors $\vec{a}$ & $\vec{b}$ make an angle $\theta = \frac{2\pi}{3}$. If $|\vec{a}| = 1$, $|\vec{b}| = 2$ then $\left\{\left(\vec{a} + 3\vec{b}\right) \times \left(3\vec{a} - \vec{b}\right)\right\}^2 =$

(A) 225 (B) 250 (C) 275 (D) 300

44. If the vector product of a constant vector $\vec{OA}$ with a variable vector $\vec{OB}$ in a fixed plane OAB be a constant vector, then locus of B is :

$a \times l) = (|a||l| \sin\theta)\hat{n} = |a|h) \therefore \hat{n}$

(A) a straight line perpendicular to $\vec{OA}$
(B) a circle with centre O radius equal to $|\vec{OA}|$
(C) a straight line parallel to $\vec{OA}$
(D) none of these

45. For non-zero vectors $\vec{a}, \vec{b}, \vec{c}$, $|\vec{a} \times \vec{b}.\vec{c}| = |\vec{a}||\vec{b}||\vec{c}|$ holds if and only if ;

(A) $\vec{a}.\vec{b} = 0,\ \vec{b}.\vec{c} = 0$
(B) $\vec{c}.\vec{a} = 0,\ \vec{a}.\vec{b} = 0$
(C) $\vec{a}.\vec{c} = 0,\ \vec{b}.\vec{c} = 0$
(D) $\vec{a}.\vec{b} = \vec{b}.\vec{c} = \vec{c}.\vec{a} = 0$

46. The vectors $\vec{a} = \hat{i} + 2\hat{j} + 3\hat{k}$; $\vec{b} = 2\hat{i} - \hat{j} + \hat{k}$ & $\vec{c} = 3\hat{i} + \hat{j} + 4\hat{k}$ are so placed that the end point of one vector is the starting point of the next vector. Then the vectors are -

(A) not coplanar
(B) coplanar but cannot form a triangle
(C) coplanar but can form a triangle
(D) coplanar & can form a right angled triangle

47. Given the vectors

$$\vec{u} = 2\hat{i} - \hat{j} - \hat{k}$$
$$\vec{v} = \hat{i} - \hat{j} + 2\hat{k}$$
$$\vec{w} = \hat{i} - \hat{k}$$

If the volume of the parallelopiped having $-c\vec{u}$, $\vec{v}$ and $c\vec{w}$ as concurrent edges, is 8 then 'c' can be equal to

(A) ± 2 (B) 4 (C) 8 (D) can not be determined

48. Given $\bar{a} = x\hat{i} + y\hat{j} + 2\hat{k}$, $\bar{b} = \hat{i} - \hat{j} + \hat{k}$, $\bar{c} = \hat{i} + 2\hat{j}$; $(\widehat{\bar{a}\ \bar{b}}) = \pi/2$, $\bar{a} \cdot \bar{c} = 4$ then

(A) $[\bar{a}\ \bar{b}\ \bar{c}]^2 = |\bar{a}|$ (B) $[\bar{a}\ \bar{b}\ \bar{c}] = |\bar{a}|$ (C) $[\bar{a}\ \bar{b}\ \bar{c}] = 0$ (D) $[\bar{a}\ \bar{b}\ \bar{c}] = |\bar{a}|^2$

49. Let $\vec{a} = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$; $\vec{b} = b_1\hat{i} + b_2\hat{j} + b_3\hat{k}$; $\vec{c} = c_1\hat{i} + c_2\hat{j} + c_3\hat{k}$ be three non-zero vectors such that $\vec{c}$ is a unit vector perpendicular to both $\vec{a}$ & $\vec{b}$. If the angle between $\vec{a}$ & $\vec{b}$ is $\frac{\pi}{6}$, then

$(|a||b||c| \sin 30°)|\hat{n}|)^2$

$$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}^2 =$$

$= (a_1^2 + a_2^2 + a_3^2)(b_1^2 + b_2^2 + b_3^2) \cdot \frac{1}{4}$

(A) 0
(B) 1
(C) $\frac{1}{4}(a_1^2 + a_2^2 + a_3^2)(b_1^2 + b_2^2 + b_3^2)$
(D) $\frac{3}{4}(a_1^2 + a_2^2 + a_3^2)(b_1^2 + b_2^2 + b_3^2)(c_1^2 + c_2^2 + c_3^2)$

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

(A) $\vec{u}.(\vec{v} \times \vec{w})$ (B) $(\vec{v} \times \vec{w}).\vec{u}$ (C) $\vec{v}.(\vec{u} \times \vec{w})$ (D) $(\vec{u} \times \vec{v}).\vec{w}$

51. Let $\bar{a} = \hat{i} + \hat{j}$, $\bar{b} = \hat{j} + \hat{k}$ & $\bar{c} = \alpha\bar{a} + \beta\bar{b}$. If the vectors , $\hat{i} - 2\hat{j} + \hat{k}$, $3\hat{i} + 2\hat{j} - \hat{k}$ & $\bar{c}$ are coplanar then $\frac{\alpha}{\beta}$ is

(A) 1 (B) 2 (C) 3 (D) – 3

52. A rigid body rotates with constant angular velocity ω about the line whose vector equation is, $\vec{r} = \lambda\left(\hat{i} + 2\hat{j} + 2\hat{k}\right)$. The speed of the particle at the instant it passes through the point with p.v. $2\hat{i} + 3\hat{j} + 5\hat{k}$ is :

(A) $\omega\sqrt{2}$ (B) 2ω (C) $\omega/\sqrt{2}$ (D) none

53. Given 3 vectors $\vec{V}_1 = a\hat{i} + b\hat{j} + c\hat{k}$; $\vec{V}_2 = b\hat{i} + c\hat{j} + a\hat{k}$; $\vec{V}_3 = c\hat{i} + a\hat{j} + b\hat{k}$

In which one of the following conditions $\vec{V}_1$, $\vec{V}_2$ and $\vec{V}_3$ are linearly independent?

(A) $a + b + c = 0$ and $a^2 + b^2 + c^2 \neq ab + bc + ca$

(B) $a + b + c = 0$ and $a^2 + b^2 + c^2 = ab + bc + ca$

(C) $a + b + c \neq 0$ and $a^2 + b^2 + c^2 = ab + bc + ca$

(D) $a + b + c \neq 0$ and $a^2 + b^2 + c^2 \neq ab + bc + ca$

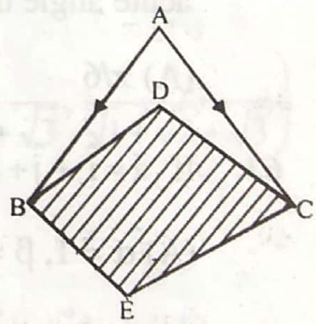
$\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix} \neq 0$

$(a+b+c)\left[(a-b)^2 + (b-c)^2 + (c-a)^2\right]$

54. Given unit vectors $\vec{m}$, $\vec{n}$ & $\vec{p}$ such that angle between $\vec{m}$ & $\vec{n}$ = angle between $\vec{p}$ and $(\vec{m} \times \vec{n}) = \pi/6$, then $[\vec{n}\ \vec{p}\ \vec{m}]$ =

(A) $\sqrt{3}/4$ (B) 3/4 (C) 1/4 (D) none

55. Let $\overrightarrow{AB} = 3\hat{i} - \hat{j}$, $\overrightarrow{AC} = 2\hat{i} + 3\hat{j}$ and $\overrightarrow{DE} = 4\hat{i} - 2\hat{j}$. The area of the shaded region in the adjacent figure, is-



(A) 5 (B) 6

(C) 7 (D) 8

56. The altitude of a parallelopiped whose three coterminous edges are the vectors, $\vec{A} = \hat{i} + \hat{j} + \hat{k}$; $\vec{B} = 2\hat{i} + 4\hat{j} - \hat{k}$ & $\vec{C} = \hat{i} + \hat{j} + 3\hat{k}$ with $\vec{A}$ and $\vec{B}$ as the sides of the base of the parallelopiped, is

(A) $2/\sqrt{19}$ (B) $4/\sqrt{19}$ (C) $2\sqrt{38}/19$ (D) none

57. Consider Δ ABC with A ≡ $(\bar{a})$; B ≡ $(\bar{b})$ & C ≡ $(\bar{c})$. If $\bar{b}\cdot(\bar{a} + \bar{c}) = \bar{b}\cdot\bar{b} + \bar{a}\cdot\bar{c}$; $|\bar{b} - \bar{a}| = 3$; $|\bar{c} - \bar{b}| = 4$ then the angle between the medians $\overrightarrow{AM}$ & $\overrightarrow{BD}$ is

(A) $\pi - \cos^{-1}\left(\frac{1}{5\sqrt{13}}\right)$ (B) $\pi - \cos^{-1}\left(\frac{1}{13\sqrt{5}}\right)$

(C) $\cos^{-1}\left(\frac{1}{5\sqrt{13}}\right)$ (D) $\cos^{-1}\left(\frac{1}{13\sqrt{5}}\right)$