(1) If $C$ is the midpoint of $A B$ and $P$ is any point outside $A B$, then
( a ) $\overrightarrow{P A}+\overrightarrow{P B}=2 \overrightarrow{P C}$
(b) $\overrightarrow{P A}+\overrightarrow{P B}=\overrightarrow{P C}$
(c) $\overrightarrow{P A}+\overrightarrow{P B}+2 \overrightarrow{P C}=\overrightarrow{0}$
(d) $\overrightarrow{P A}+\overrightarrow{P B}+\overrightarrow{P C}=\overrightarrow{0}$
(2) For any vector $\vec{a}$, the value of $(\vec{a} \times \hat{i})^{2}+(\vec{a} \times \hat{k})^{2}$ is -qual
(a) $3 \vec{a}^{2}$
(b) $\vec{a}^{2}$
(c) $2 \vec{a}^{2}$
(d) $4 \vec{a}^{2}$
[AIEEE 2005]
(3) Let $a, b$ and $c$ be distinct non-negative nurfors vectors $a \hat{i}+a \hat{j}+\hat{\mathbf{k}}$, $\hat{\mathbf{i}}+\hat{\mathbf{k}}$ and $\mathbf{c} \hat{\mathbf{i}}+\mathbf{c} \hat{\mathbf{j}}+\mathbf{b \hat { k }}$ lie in a plo, (e) $\hat{\mathbf{c}}$ is
(a) the Geometric Mean of $a$ and $O$ ( $b$ the Arithmetic Mean of $a$ and $b$ (c) equal to zero
the Harmonic Mean of $a$ and $b$
[ AIEEE 2005]
(4) If $\vec{a}, \vec{b}, \vec{c}$ are andanar vectors and $\lambda$ is a real number, then $\lambda(\vec{a}+\vec{b}) \cdot[\lambda b \lambda]=\vec{a} \cdot[(\vec{b}+\vec{c}) \times \vec{b}]$ for
(a) exactlw one vane of $\lambda$
(b) no value of $\lambda$
(c) exactly thre values of $\lambda$ (d) exactly two values of $\lambda$
[ AIEEE 2005]

Then $[\vec{a} \vec{b} \vec{c}]$ depends on
(a) only y
(b) only $x$
(c) both $x$ and $y$
(d) neither $x$ nor $y$
[ AIEEE 2005]
(6) Let $\overline{\mathbf{a}}, \overline{\mathbf{b}}, \overline{\mathbf{c}}$, be three non-zero vectors such that no two of these are collinear. If the vector $\overline{\mathbf{a}}+2 \overline{\mathbf{b}}$ is collinear with $\overline{\mathbf{c}}$, and $\overline{\mathbf{b}}+3 \overline{\mathbf{c}}$ is collinear with $\overline{\mathrm{a}}$, then $\overline{\mathbf{a}}+2 \overline{\mathbf{b}}+\mathbf{6} \overline{\mathbf{c}}$, for some non-zero scalar $\lambda$ equals
(a) $\lambda \overline{\mathbf{a}}$
(b) $\lambda \overline{\mathbf{b}}$
(c) $\lambda \bar{c}$
(d) 0
[ AIEEE 2004]
(7) A particle is acted upon by constant forces $4 \hat{\mathbf{i}}+\hat{\mathbf{j}}-3 \hat{\mathbf{k}}$ and $3 \hat{\mathbf{i}}+\hat{\mathbf{j}}-\hat{\mathbf{k}}$ which displace it from a point $\hat{\mathbf{i}}+2 \hat{\mathbf{j}}+3 \hat{\mathbf{k}}$ to the point $5 \hat{\mathbf{i}}+4 \hat{\mathbf{j}}+\hat{\mathbf{k}}$. The w ron done in standard units by the forces is given by
(a) 40
(b) 30
(c) 25
(d) 15
[AIDEE 2004]
(8) If $\overline{\mathrm{a}}, \overline{\mathrm{b}}, \overline{\mathrm{c}}$ are non-coplanar vectors and $\lambda$ is a real numb $r$, the the vectors $\overline{\mathrm{a}}+2 \overline{\mathrm{~b}}+3 \overline{\mathrm{c}}, \lambda \overline{\mathrm{b}}+4 \overline{\mathrm{c}}$ and $(2 \lambda-1) \overline{\mathrm{c}}$ are non-coplanar
[ ALEE 2004 ]
(9) Let $\bar{u}, \overline{\mathbf{v}}, \overline{\mathbf{w}}$ be such that $I \bar{u} I=1$, along $\bar{u}$ is equal to that of $\overline{\mathbf{w}}$ along ana $\bar{v}, \bar{w}$ are perpendicular to each other, then $\mathbf{l} \bar{u}-\bar{v}+\bar{w} \mathbf{l}$ equals
(a) 2
(b) $\sqrt{7}$
(c) 4
(d) 14
[AIEEE 2004]
(10) Let $\bar{a}, \bar{b}, \bar{c}$ beninthe acute angle $b \sim \bar{f}$ the vectors $\bar{b}$ and $\bar{c}$, then $\sin \theta$ equals
(a) $\frac{1}{3}$
b) $\frac{\sqrt{2}}{3}$
(c) $\frac{2}{3}$
(d) $\frac{2 \sqrt{2}}{3}$
[ AIEEE 2004]

$$
\text { ( }\left|\begin{array}{lll}
a & 1+a^{2} \\
c & b^{2} & 1+b^{2} \\
c & c^{2} & 1+c^{2}
\end{array}\right|=0 \text { and vectors }\left(1, a, a^{2}\right),\left(1, b, b^{2}\right) \text { and }\left(1, c, c^{2}\right) \text { are }
$$

non-coplanar, then the product abc equals
(a) 2
(b) -1
(c) 1
(d) 0
[AIEEE 2003]
(12) $\vec{a}, \vec{b}, \vec{c}$ are three vectors, such that $\vec{a}+\vec{b}+\vec{c}=0,|\vec{a}|=1,|\vec{b}|=2,|\vec{c}|=3$, then $\vec{a} \cdot \vec{b}+\vec{b} \cdot \vec{c}+\vec{c} \cdot \vec{a}$ is equal to
(a) 0
(b) - 7
(c) 7
(d) 1
[AIEEE 2003]
(13) A particle acted on by constant forces $4 \vec{i}+\vec{j}-3 \vec{k}$ and $3 \vec{i}+\vec{j}-\vec{k}$ is displaced from the point $5 \vec{i}+4 \vec{j}+\vec{k}$. The total work done by the forces is
(a) 20 units
(b) 30 units
(c) 40 units
(d) 50 units

IEE. 2003 ]
(14) If $\vec{u}, \vec{v}$ and $\vec{w}$ are three non-coplanar vectors, then $(\vec{u}+\vec{v}-\vec{w}) \cdot(\vec{u}-\vec{v}) \times(\vec{v}-\vec{w})$ equals
(a) 0
(b) $\vec{u} \cdot \vec{v} \times \vec{w}$
(a)
(b) u.v×w
(c) $\vec{u} \cdot \vec{w} \times \vec{v}$

[ AIEEE 2003]
(15) The vectors $\overrightarrow{A B}=3 \vec{i}+4 \vec{k}$ and $\overrightarrow{A C}=\vec{i} 2 \vec{j}+4 \vec{k}$ are the sides of $a$ triangle $A B C$. The length of a median threagb
(a) $\sqrt{18}$
(b) $\sqrt{72}$
(c) $\sqrt{33}$
[ AIEEE 2003]
(16) Consider points A, B, C and 1 $\vec{i}-6 \vec{j}+10 \vec{k},-\vec{i}-7$ and $5 \vec{i}-\vec{j}+5 \vec{k}$ respectively. Then ABCD is a
(a) square
(b) rhol bus
(c) rectangle
(d) parallelogram
[ AIEEE 2003]
(17) Let $\vec{u}=\vec{i}+\vec{v}=\vec{i}-\vec{j}$ and $\vec{w}=\vec{i}+2 \vec{j}+3 \vec{k}$. If $\hat{n}$ is a unit vector such $\vec{n} \cdot \hat{n}=0$ and $\vec{v} \cdot \hat{n}=0$, then $\vec{w} \cdot \hat{n}$
(b) 1
(c) 2
(d) 3
[ AIEEE 2003]
angle between any two diagonals of a cube is
(a) $45^{\circ}$
(b) $60^{\circ}$
(c) $90^{\circ}$
(d) $\tan ^{-1} 2 \sqrt{2}$
[ AIEEE 2003]
(19) If vector $\vec{a}=\vec{i}+\vec{j}-\vec{k} ; \quad \vec{b}=\vec{i}-\vec{j}+\vec{k} \quad$ and $\quad \vec{c}=\vec{i}-\vec{j}-\vec{k}$, then the value of $\vec{a} \times(\vec{b} \times \vec{c})$ is
(a) $\overrightarrow{\mathbf{i}}-\overrightarrow{\mathbf{j}}+\overrightarrow{\mathbf{k}}$
(b) $2 \vec{i}-2 \vec{j}$
(c) $3 \vec{i}-\vec{j}+\vec{k}$
(d) $2 \vec{i}+2 \vec{j}-\vec{k}$
[ AIEEE 2002]
(20) If $\vec{a}=\vec{i}+\vec{j}-2 \vec{k} ; \quad \vec{b}=-\vec{i}+2 \vec{j}+\vec{k}$ and $\vec{c}=\vec{i}-2 \vec{j}+2 \vec{k}$, then a unit vector parallel to $\vec{a}+\vec{b}+\vec{c}$ is
(a) $\frac{\overrightarrow{\mathbf{i}}+\overrightarrow{\mathbf{j}}+\overrightarrow{\mathbf{k}}}{\sqrt{3}}$
(b) $\frac{\vec{i}-2 \vec{j}+\vec{k}}{\sqrt{6}}$
(c) $\frac{\vec{i}-\vec{j}+\vec{k}}{\sqrt{3}}$
(d) $\frac{2 \vec{i}+\vec{j}+\vec{k}}{\sqrt{6}}$
(21) If $\vec{a}=2 \vec{i}+\vec{j}+2 \vec{k}$ and $\vec{b}=5 \vec{i}-3 \vec{j}+\vec{k}$, orthogonal projection of $\vec{a}$ on $\vec{b}$ is
(a) $5 \overrightarrow{\mathbf{i}}-3 \overrightarrow{\mathbf{j}}+\overrightarrow{\mathbf{k}}$
(b) $9(5 \vec{i}-3 \vec{j}$
(c) $\frac{5 \vec{i}-3 \vec{j}+\vec{k}}{35}$
(d) $\frac{9(5 \vec{i}-<\vec{j}+\vec{k})}{35}$
[AIEEE 2002 ]
(22) If the angle between two vec $r \vec{s}+\vec{k}$ and $\vec{i}-\vec{j}+\mathbf{a} \vec{k}$ is $\frac{\pi}{3}$, then the value of $a$ is
(a) $2(b) 4, c)-2$
(d) 0
[ AIEEE 2002]
(23)

If $\vec{a}=\vec{i}+2 \vec{k}$ and $\vec{b}=3 \vec{i}-\vec{j}+2 \vec{k}$, then angle between $(\vec{a}+\vec{b})$ and $(\vec{a}-\vec{b})$ is
(a) $0^{\circ} \rightarrow b$ ) $30^{\circ}$
(c) $60^{\circ}$
(d) $90^{\circ}$
[ AIEEE 2002]
value of sine of the angle between the vectors $\vec{i}-2 \vec{j}+3 \vec{k}$ and $2 \vec{i}+\vec{j}+\vec{k}$ is
(a) $\frac{5}{21}$
(b) $\frac{5}{\sqrt{7}}$
(c) $\frac{5}{\sqrt{14}}$
(d) $\frac{5}{2 \sqrt{7}}$
[ AIEEE 2002]
(25) If vectors $\mathbf{a} \overrightarrow{\mathbf{i}}+\vec{j}+\vec{k}, \quad \vec{i}+\mathbf{b} \vec{j}+\vec{k}$ and $\vec{i}+\vec{j}+\mathbf{c} \vec{k}$ are coplanar, then
(a) $a+b+c=0$
(b) $a b c=-1$
(c) $a+b+c=a b c+2$
(d) $a b+b c+c a=0$
[ AIEEE 2002]
(26) If $\vec{a}, \vec{b}, \vec{c}$ are three non-zero, noncoplanar vectors and $\overrightarrow{b_{1}}=\vec{b}-\frac{\vec{b} \cdot \vec{a}}{|\vec{a}|^{2}} \vec{a}$,

$$
\begin{aligned}
& \overrightarrow{b_{2}}=\vec{b}+\frac{\vec{b} \cdot \vec{a}}{|\vec{a}|^{2}} \vec{a}, \quad \overrightarrow{c_{1}}=\vec{c}-\frac{\vec{c} \cdot \vec{a}}{|\vec{a}|^{2}} \vec{a}-\frac{\vec{c} \cdot \vec{b}}{|\vec{b}|^{2}} \vec{b}, \\
& \overrightarrow{c_{2}}=\vec{c}-\frac{\vec{c} \cdot \vec{a}}{|\vec{a}|^{2}} \vec{a}-\frac{\vec{c} \cdot \overrightarrow{b_{1}}}{\left|\overrightarrow{b_{1}}\right|^{2}} \overrightarrow{b_{1}}, \quad \text { and } \quad \overrightarrow{c_{3}}=\vec{c}-\frac{\vec{c} \cdot \vec{a}}{\left|\overrightarrow{b_{2}}\right|^{2}}, \overrightarrow{b_{2}},
\end{aligned}
$$

then the set of orthogonal vectors is
( a ) $\left(\vec{a}, \overrightarrow{b_{1}} \overrightarrow{c_{1}}\right)$
(b) $\left(\vec{a}, \overrightarrow{b_{1}} \overrightarrow{c_{2}}\right)$
(c) $\left(\vec{a}, \overrightarrow{b_{1}} \overrightarrow{c_{3}}\right)$
(d) $\left(\vec{a}, \overrightarrow{b_{2}} \overrightarrow{c_{2}}\right)$

[ IIT 2005]
(27) If $\vec{a}=\hat{i}+\hat{j}+\hat{k}, \quad \vec{a} \cdot \vec{b}=$ ana $\quad \vec{a} \times \vec{b}=\hat{j}-\hat{k}$, then $\vec{b}$ is equal to
(a) $2 \hat{i}$
(b) $\hat{i}-\hat{j}+$
(c) $\hat{i}$
(d) $2 \hat{j}-\hat{k}$
[ IT 2004 ]
(28) A unit vector is and to $5 \hat{i}+2 \hat{j}+6 \hat{k}$ and is coplanar to $2 \hat{i}+\hat{j}+\hat{k}$ and $\hat{\mathbf{i}}-\hat{\mathbf{j}}+\hat{\mathbf{k}}$, the tr ye io r
(a)
(b) $\frac{2 \hat{i}+5 \hat{j}}{\sqrt{29}}$
(c) $\frac{6 \hat{i}-5 \hat{k}}{\sqrt{61}}$
(d) $\frac{2 \hat{i}+2 \hat{j}-\hat{k}}{3}$
[ IIT 2004]
(29) value of $\mathbf{a}$ so that the volume of parallelopiped formed by vectors $\hat{i}+\mathbf{a} \hat{\mathbf{j}}+\hat{\mathbf{k}}$, $a k$ and $a i+k$ becomes minimum is
(a) $\sqrt{3}$
(b) 2
(c) $\frac{1}{\sqrt{3}}$
(d) 3
[ IIT 2003]
(30) If $\vec{a}$ and $\vec{b}$ are two unit vectors such that $\vec{a}+2 \vec{b}$ and $5 \vec{a}-4 \vec{b}$ are perpendicular to each other, then the angle between $\vec{a}$ and $\vec{b}$ is
(a) $45^{\circ}$
(b) $60^{\circ}$
(c) $\cos ^{-1} \frac{1}{3}$
(d) $\cos ^{-1} \frac{2}{7}$
[ lIT 2002 ]
(31) If $\vec{V}=2 \vec{i}+\vec{j}-\vec{k}, \quad \vec{W}=\vec{i}+3 \vec{k}$ and $\vec{U}$ is a unit vector, then the maximum value of the scalar triple product $[\vec{U} \vec{V} \vec{W}]$ is
(a) - 1
(b) $\sqrt{10}+\sqrt{6}$
(c) $\sqrt{59}$
(d) $\sqrt{60}$
[ IIT 2002 ]
(32) If $\vec{a}, \vec{b}$ and $\vec{c}$ are unit vectors, then $|\vec{a}-\vec{b}|^{2}+\vec{b}-\left.\vec{c}\right|^{2}+|\vec{c}-\vec{a}|^{2}$
does not exceed
(a) 4
(b) 9
(c) 8
(d) 6
[ IIT 2001]
(33) If $\overrightarrow{\mathbf{a}}=\hat{\mathbf{i}}-\hat{\mathbf{k}}, \overrightarrow{\mathbf{b}}=\mathbf{x} \hat{\mathbf{i}}+\hat{\mathbf{j}}+(1-\hat{\mathbf{n}} \mathbf{~} \mathbf{c}=\hat{\mathbf{i}}+\mathbf{x} \hat{\mathbf{j}}+(1+\mathbf{x}-\mathbf{y}) \hat{\mathbf{k}}$, then $\left[\begin{array}{lll}\vec{a} & \vec{b} & \vec{c}\end{array}\right]$ depends on
(a) only $x$
(b) only y
neithry $x$ nor $y$
(d) both $x$ and $y$
[ IIT 2001]
(34) Let the vectors $a, b, c a n$ d $d$ such that $(a \times b) \times(c \times d)=0$. Let $P_{1}$ and $P_{2}$ be planes determined by the $s$ of vectors $a, b$ and $c$, $d$ respectively, then the angle between
(a) 0
(c) $\frac{\pi}{3}$
(d) $\frac{\pi}{2}$
[ IIT 2000]
( 35 ) 2a $b, 2 b-c, 2 c-a]=$
(b) 1
(c) $-\sqrt{3}$
(d) $\sqrt{3}$
[ IIT 2000]
(36) If the vectors $\vec{a}, \vec{b}$ and $\vec{c}$ form the sides $\overline{B C}, \overline{C A}$ and $\overline{A B}$ of a triangle $A B C$, then
(a) $\vec{a} \cdot \vec{b}+\vec{b} \cdot \vec{c}+\vec{c} \cdot \vec{a}=0$
(b) $\overrightarrow{\mathbf{a}} \times \overrightarrow{\mathbf{b}}+\overrightarrow{\mathbf{b}} \times \overrightarrow{\mathbf{c}}+\overrightarrow{\mathbf{c}} \times \overrightarrow{\mathbf{a}}=\mathbf{0}$
(c) $\vec{a} \cdot \vec{b}=\vec{b} \cdot \vec{c}=\vec{c} \cdot \vec{a}$
(d) $\vec{a} \times \vec{b}+\vec{b} \times \vec{c} \times \vec{a}=0$
[ IIT 2000]
(37) Let $\overrightarrow{\mathbf{a}}=2 \hat{\mathbf{i}}+\hat{\mathbf{j}}-2 \hat{\mathbf{k}}$ and $\overrightarrow{\mathbf{b}}=\hat{\mathbf{i}}+\hat{\mathbf{j}}$. If $\overrightarrow{\mathbf{c}}$ is $\mathbf{a}$ vector such that $\vec{a} \cdot \vec{c}=|\vec{c}|,|\vec{c}-\vec{a}|=2 \sqrt{2}$ and the angle between $(\vec{a} \times \vec{b})$ and $\vec{c}$ is $30^{\circ}$, then $\quad|(\vec{a} \times \vec{b}) \times \vec{c}|=$
(a) $\frac{2}{3}$
(b) $\frac{3}{2}$
(c) 2
(d) 3
[IIT 1999]
(38) Let $\vec{a}=2 \hat{i}+\hat{\mathbf{j}}+\hat{\mathbf{k}}, \quad \overrightarrow{\mathbf{b}}=\hat{\mathbf{i}}+2 \hat{\mathbf{j}}-\hat{\mathbf{k}}$ and a unit vec or $\overrightarrow{\mathrm{c}}$ be coplanar. If $\overrightarrow{\mathbf{c}}$ is perpendicular to $\vec{a}$, then $\vec{c}=$
(a) $\frac{1}{\sqrt{2}}(-\hat{j}+\hat{k})$
(b) $\frac{1}{\sqrt{3}}(-\hat{i}-\hat{j}-\hat{k})$
(c) $\frac{1}{\sqrt{5}}(\hat{i}-2 \hat{j})$
(d) $\frac{1}{\sqrt{3}}(\hat{i}-$
$-\hat{j}$
[ IIT 1999]
(39) Let $\vec{a}$ and $\vec{b}$ be two non ineanit vectors. If $\vec{u}=\vec{a}-(\vec{a} \cdot \vec{b}) \vec{b}$ and $\vec{v}=\vec{a} \times \vec{b}$, then
(a) $|\overrightarrow{\mathbf{u}}| \rightarrow \rightarrow \overrightarrow{\mathbf{b}} \rightarrow \overrightarrow{\mathbf{u}} \cdot \overrightarrow{\mathbf{a} \mid}$
(c) $|\vec{u}|+1 \vec{\longrightarrow}(d)|\vec{u}|+\vec{u} \cdot(\vec{a}+\vec{b})$
[ IIT 1999]
(40) If $\overrightarrow{\mathbf{a}}=\hat{\mathbf{i}}+\hat{\boldsymbol{\phi}}+\hat{\mathbf{k}}, \quad \overrightarrow{\mathbf{b}}=4 \hat{\mathbf{i}}+\hat{\mathbf{j}}+4 \hat{\mathbf{k}} \quad$ and $\quad \overrightarrow{\mathbf{c}}=\hat{\mathbf{i}}+\hat{\alpha j}+\hat{\beta} \mathbf{k} \quad$ are linearly det Vectors and $|\vec{c}|=\sqrt{3}$, then $\alpha$ and $\beta$ respectively are
(b) $1, \pm 1$
(c) $-1, \pm 1$
(d) $\pm 1,1$
[ IIT 1998]

For three vectors $\vec{u}, \vec{v}$ which of the following expressions is not equal to any of the remaining three?
( a ) $\overrightarrow{\mathbf{u}} \cdot(\overrightarrow{\mathbf{v}} \times \overrightarrow{\mathbf{w}})$
(b) $(\vec{v} \times \vec{w}) \cdot \vec{u}$
(c) $\vec{v} \cdot(\vec{u} \times \vec{w})$
(d) $(\vec{u} \times \vec{v}) \cdot \vec{w}$
[ IIT 1998]
(42) Which of the following expressions are meaningful questions?
(a) $\overrightarrow{\mathbf{u}} \cdot(\overrightarrow{\mathbf{v}} \times \overrightarrow{\mathbf{w}})$
(b) $(\vec{u} \cdot \vec{v}) \cdot \vec{w}$
(c) $(\vec{u} \cdot \vec{v}) \vec{w}$
(d) $\vec{u} \times(\vec{v} \cdot \vec{w})$
[ IIT 1998]
(43) Let $\mathbf{p}, \mathbf{q}, \mathbf{r}$ be three mutually perpendicular vectors of the same magnitude. If a vector $x$ satisfies the equation $p \times[(x-q) \times p]+q \times[(x-r) \times q]+r \times[(x-p) \times r]=0$, then $x$ is given by
(a) $\frac{1}{2}(p+q-2 r)$
(b) $\frac{1}{2}(p+q+r)$
(c) $\frac{1}{3}(p+q+r)$
(d) $\frac{1}{3}(2 p+q-r)$
(44) Let $\overrightarrow{\mathbf{a}}=\hat{\mathbf{i}}-\hat{\mathbf{j}}, \overrightarrow{\mathbf{b}}=\hat{\mathbf{j}}-\hat{\mathbf{k}}$ and $\overrightarrow{\mathbf{c}}=\hat{\mathbf{k}}-\hat{\mathbf{i}}$. If $\hat{\mathbf{d}}$ ( a nit vector such that $\overrightarrow{\mathbf{a}} \cdot \overrightarrow{\mathbf{d}}=\mathbf{0}=[\overrightarrow{\mathbf{b}}, \overrightarrow{\mathbf{c}}, \overrightarrow{\mathrm{d}}]$, then $\hat{\mathbf{d}}$ equals
( a ) $\pm \frac{\hat{i}+\hat{j}-2 \hat{k}}{\sqrt{6}}$
(b) $\pm \frac{\hat{i}+\hat{j}-\hat{k}}{\sqrt{3}}$
(c)
(d) $\pm \hat{\mathbf{k}}$
[ IIT 1997]
[ IIT 1995]
(45) Let $\vec{u}, \vec{v}$ and $\vec{w}$ be vectors suct hat $\vec{v}+\vec{w}=0$. If $|\vec{u}|=3$, $|\vec{v}|=4$ and $|\vec{w}|=5$, then the value $م \vec{u} \cdot \vec{v} \cdot \vec{w}+\vec{w} \cdot \vec{u} \quad$ is
(a) 47
(b) -25
(d) 25
[ IIT 1995]
( 46 ) If $\vec{A}, \vec{B}$ and $\vec{C}$ amee non-coplanar vectors, then $(\vec{A}+\vec{B}+\vec{C}) \cdot(\vec{B})(\vec{A}+\vec{C})$ equals
(a) 0
b) $[\vec{A}, \vec{B}, \vec{c}]$
(c) $2[\vec{A}, \vec{B}, \vec{C}]$
(d) $-[\vec{A}, \vec{B}, \vec{C}]$
[ IIT 1995]
$\vec{b}, \vec{c}$ are non-coplanar unit vectors such that $\vec{a} \times(\vec{b} \times \vec{c})=\frac{\vec{b} \times \vec{c}}{\sqrt{2}}$, then the angle between $\vec{a}$ and $\vec{b}$ is
(a) $\frac{3 \pi}{4}$
(b) $\frac{\pi}{4}$
(c) $\frac{\pi}{2}$
(d) $\pi$
[ IIT 1995]
(48) Let $a, b, c$ be distinct non-negative numbers. If the vectors $a \hat{i}+a \hat{j}+c \hat{\mathbf{k}}, \hat{\mathbf{i}}+\hat{\mathbf{k}}$ and $\mathbf{c} \hat{\mathbf{i}}+\mathbf{c} \hat{\mathbf{j}}+\mathbf{b} \hat{\mathbf{k}}$ lie in a plane, then $\mathbf{c}$ is
(a) AM of a and b
(b) GM of a and b
(c) HM of a and b
(d) 0
[ IIT 1993]
(49) Let $\overrightarrow{\mathbf{a}}=2 \hat{\mathbf{i}}-\hat{\mathbf{j}}+\hat{\mathbf{k}}, \quad \overrightarrow{\mathbf{b}}=\hat{\mathbf{i}}+2 \hat{\mathbf{j}}-\hat{\mathbf{k}}$ and $\overrightarrow{\mathbf{c}}=\hat{\mathbf{i}}+\hat{\mathbf{j}}-2 \hat{\mathbf{k}}$ be three vectors. A vector in the plane of $\vec{b}$ and $\vec{c}$ whose projection on $\vec{a}$ is of magnitude $\sqrt{\frac{2}{3}}$ is
(a) $2 \hat{\mathbf{i}}+\hat{\mathbf{j}}-3 \hat{\mathbf{k}}$
(b) $2 \hat{\mathbf{i}}+3 \hat{\mathbf{j}}+3 \hat{\mathbf{k}}$
(c) $-2 \mathbf{i}-\mathbf{j}+5 k$
(d) $\mathbf{2 i}+\mathbf{j}+5 \mathbf{k}$
[ IIT 1993]
(50) If $\vec{a}, \vec{b}, \vec{c}$ be three non-coplanar vectors and $\rightarrow \overrightarrow{9}$, the relations $\vec{p}=\frac{\vec{b} \times \vec{c}}{\left[\begin{array}{lll}\vec{a} & \vec{b} & \vec{c}\end{array}\right]} ; \quad \vec{q}=\frac{\vec{c} \times \vec{a}}{\left[\begin{array}{ll}\vec{a} & \vec{b}\end{array}\right]} \frac{\vec{a} \times \vec{b}}{\left[\begin{array}{lll}\vec{a} & \vec{b} & \vec{c}\end{array}\right]}$, then the value of the expression $(\vec{a}+\vec{b}) \cdot \vec{p}+(\vec{b}+\vec{c}) \cdot \vec{q}+(\vec{d}+\overrightarrow{+})$ is equal to
(a) 0
(b) 1
(c) 2
(a) 3
[ IIT 1988]
(51) The number of vectera of uni length perpendicular to vectors
$\vec{a}=(1,1,0)$
$\vec{a}=\overrightarrow{0,1,1)}$ is
(a) one
(b)
(c) three
(d) infinite
(e) none of these
[ IIT 1987]
( 52 ) - ${ }_{1}\left(a_{2} j+a_{3} k, \vec{b}=b_{1}+b_{2} j+b_{3} k, c_{1} d+c_{2} j+c_{3} k\right.$ be i. ree non-zero vectors such that $\vec{c}$ is a unit vector perpendicular to both the vectors $\vec{a}$ and $\vec{b}$. If the angle between $\vec{a}$ and $\vec{b}$ is $\frac{\pi}{6}$, then

$$
\left|\begin{array}{lll}
a_{1} & a_{2} & a_{3} \\
b_{1} & b_{2} & b_{3} \\
c_{1} & c_{2} & c_{3}
\end{array}\right| \text { is equal to }
$$

(a) 0
(b) 1
(c) $\frac{3}{4}\left(a_{1}{ }^{2}+\mathrm{a}_{2}{ }^{2}+\mathrm{a}_{3}{ }^{2}\right)\left(\mathrm{b}_{1}{ }^{2}+\mathrm{b}_{2}{ }^{2}+\mathrm{b}_{3}{ }^{2}\right)\left(\mathrm{c}_{1}{ }^{2}+\mathrm{c}_{2}{ }^{2}+\mathrm{c}_{3}{ }^{2}\right)$
(d) $\frac{1}{4}\left(a_{1}{ }^{2}+a_{2}{ }^{2}+a_{3}{ }^{2}\right)\left(b_{1}{ }^{2}+b_{2}{ }^{2}+b_{3}{ }^{2}\right)$
(e) none of these
[ IIT 1986]
(53) A vector $\vec{a}$ has components $2 p$ and 1 with respect to a rectangular Cartesian system. This system is rotated through a certain angle about the origin in the counterclockwise sense. If, with respect to the new system, $\vec{a}$ has com onerts $p+1$ and 1 , then
(a) $\mathrm{p}=0$
(b) $p=1$ or $p=-\frac{1}{3}$
(c) $\mathrm{p}=-1$ or $\mathrm{p}=\frac{1}{3}$
(d) $\mathrm{p}=1$ or $\mathrm{p}=-1$
(e) none of these
[ IIT 1986]
(54) The volume of the parallelepiped whose sides $\overrightarrow{O L}=2 i-3 j$, $\overrightarrow{O B}=i+j-k, \quad \overrightarrow{O C}=3 i-k$, is
(a) $\frac{4}{13}$
(b) 4
(c) $\frac{2}{7}$
(d) Yng these
[ IIT 1983]
(55) The points with position vector 60, 3j, 40i-8j, ai - 52j are collinear if
( a$) \mathrm{a}=-40$
(b)
$a=20$
(d) none of these
[ IIT 1983]
(56) For non-zero $\vec{a}, \vec{b}, \vec{c},|(\vec{a} \times \vec{b}) \cdot \vec{c}|=|\vec{a}||\vec{b}||\vec{c}|$ holds if and only if
(a) $\overrightarrow{0}=\vec{b} \cdot \vec{c}=0$
(b) $\vec{c} \cdot \vec{a}=0, \quad \vec{a} \cdot \vec{b}=0$
(d) $\vec{a} \cdot \vec{b}=\vec{b} \cdot \vec{c}=\vec{c} \cdot \vec{a}=0$
[ IIT 1982 ]

The scalar $\vec{A} \cdot(\vec{B}+\vec{C}) \times(\vec{A}+\vec{B}+\vec{C})$ equals
(a) 0
(b) $\left[\begin{array}{lll}\vec{A} & \vec{B} & \vec{C}\end{array}\right]+\left[\begin{array}{lll}\vec{B} & \vec{C} & \vec{A}\end{array}\right]$
(c) $[\vec{A} \vec{B} \vec{C}]$
(d) none of these
[ IIT 1981]

## Answers

| $\mathbf{1}$ | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | $\mathbf{1 9}$ | 20 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathbf{a}$ | c | a | b | d | d | a | c | c | d | b | b | c | c | c | b | d | d | b | a |


| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 8 | $\mathbf{b}$ | 40 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| d | d | d | d | c | b | c | a | c | b | c | b | c | a | a | b |  | a | b $\mathbf{c}$ | d |


| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | a | 7 | 8 | 59 | 60 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| c | a, c | b | a | b | d | a | b | c | d | b | d | b | b | a | d | a |  |  |  |

