

(1) If C is the midpoint of AB and P is any point outside AB, then

(a)  $\vec{PA} + \vec{PB} = 2\vec{PC}$

(b)  $\vec{PA} + \vec{PB} = \vec{PC}$

(c)  $\vec{PA} + \vec{PB} + 2\vec{PC} = \vec{0}$

(d)  $\vec{PA} + \vec{PB} + \vec{PC} = \vec{0}$

[ AIEEE 2005 ]

(2) For any vector  $\vec{a}$ , the value of  $(\vec{a} \times \hat{i})^2 + (\vec{a} \times \hat{k})^2$  is equal to

(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 numbers. If the vectors  $a\hat{i} + a\hat{j} + \hat{k}$ ,  $\hat{i} + \hat{k}$  and  $c\hat{i} + c\hat{j} + b\hat{k}$  lie in a plane, then c is

(a) the Geometric Mean of a and b

(b) the Arithmetic Mean of a and b

(c) equal to zero

(d) the Harmonic Mean of a and b

[ AIEEE 2005 ]

(4) If  $\vec{a}$ ,  $\vec{b}$ ,  $\vec{c}$  are non-coplanar vectors and  $\lambda$  is a real number, then

$$\lambda(\vec{a} + \vec{b}) \cdot [\lambda^2 \vec{b} \times \lambda \vec{c}] = \vec{a} \cdot [(\vec{b} + \vec{c}) \times \vec{b}] \text{ for}$$

(a) exactly one value of  $\lambda$

(b) no value of  $\lambda$

(c) exactly three values of  $\lambda$

(d) exactly two values of  $\lambda$

[ AIEEE 2005 ]

(5) Let  $\vec{a} = \hat{i} - \hat{k}$ ,  $\vec{b} = x\hat{i} + \hat{j} + (1-x)\hat{k}$  and  $\vec{c} = y\hat{i} + x\hat{j} + (1+x-y)\hat{k}$ .

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  $\vec{a}$ ,  $\vec{b}$ ,  $\vec{c}$ , be three non-zero vectors such that no two of these are collinear. If the vector  $\vec{a} + 2\vec{b}$  is collinear with  $\vec{c}$ , and  $\vec{b} + 3\vec{c}$  is collinear with  $\vec{a}$ , then  $\vec{a} + 2\vec{b} + 6\vec{c}$ , for some non-zero scalar  $\lambda$  equals

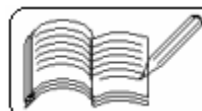
(a)  $\lambda\vec{a}$

(b)  $\lambda\vec{b}$

(c)  $\lambda\vec{c}$

(d) 0

[ AIEEE 2004 ]



(7) A particle is acted upon by constant forces  $4\hat{i} + \hat{j} - 3\hat{k}$  and  $3\hat{i} + \hat{j} - \hat{k}$  which displace it from a point  $\hat{i} + 2\hat{j} + 3\hat{k}$  to the point  $5\hat{i} + 4\hat{j} + \hat{k}$ . The work done in standard units by the forces is given by

- (a) 40      (b) 30      (c) 25      (d) 15 [ AIEEE 2004 ]

(8) If  $\vec{a}$ ,  $\vec{b}$ ,  $\vec{c}$  are non-coplanar vectors and  $\lambda$  is a real number, then the vectors  $\vec{a} + 2\vec{b} + 3\vec{c}$ ,  $\lambda\vec{b} + 4\vec{c}$  and  $(2\lambda - 1)\vec{c}$  are non-coplanar for

- (a) all values of  $\lambda$                       (b) all except one value of  $\lambda$   
(c) all except two values of  $\lambda$       (d) no value of  $\lambda$  [ AIEEE 2004 ]

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

- (a) 2      (b)  $\sqrt{7}$       (c)  $\sqrt{14}$       (d) 14 [ AIEEE 2004 ]

(10) Let  $\vec{a}$ ,  $\vec{b}$ ,  $\vec{c}$  be non-zero vectors such that  $(\vec{a} \times \vec{b}) \times \vec{c} = \frac{1}{3} |\vec{b}| |\vec{c}| \vec{a}$ . If  $\theta$  is the acute angle between the vectors  $\vec{b}$  and  $\vec{c}$ , then  $\sin \theta$  equals

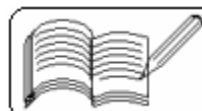
- (a)  $\frac{1}{3}$       (b)  $\frac{\sqrt{2}}{3}$       (c)  $\frac{2}{3}$       (d)  $\frac{2\sqrt{2}}{3}$  [ AIEEE 2004 ]

(11) If  $\begin{vmatrix} a & a^2 & 1+a^2 \\ b & b^2 & 1+b^2 \\ c & c^2 & 1+c^2 \end{vmatrix} = 0$  and vectors  $(1, a, a^2)$ ,  $(1, b, b^2)$  and  $(1, c, c^2)$  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 [ AIEEE 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 )  $\vec{u} \cdot \vec{v} \times \vec{w}$  ( c )  $\vec{u} \cdot \vec{w} \times \vec{v}$  ( d )  $3\vec{u} \cdot \vec{v} \times \vec{w}$  [ AIEEE 2003 ]

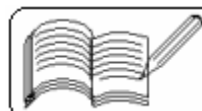
( 15 ) The vectors  $\vec{AB} = 3\vec{i} + 4\vec{k}$  and  $\vec{AC} = 5\vec{i} - 2\vec{j} + 4\vec{k}$  are the sides of a triangle ABC. The length of a median through A is  
( a )  $\sqrt{18}$  ( b )  $\sqrt{72}$  ( c )  $\sqrt{33}$  ( d )  $\sqrt{288}$  [ AIEEE 2003 ]

( 16 ) Consider points A, B, C and D with position vectors  $7\vec{i} - 4\vec{j} + 7\vec{k}$ ,  $\vec{i} - 6\vec{j} + 10\vec{k}$ ,  $-\vec{i} - 3\vec{j} + 4\vec{k}$  and  $5\vec{i} - \vec{j} + 5\vec{k}$  respectively. Then ABCD is a  
( a ) square ( b ) rhombus ( c ) rectangle ( d ) parallelogram [ AIEEE 2003 ]

( 17 ) Let  $\vec{u} = \vec{i} + \vec{j}$ ,  $\vec{v} = \vec{i} - \vec{j}$  and  $\vec{w} = \vec{i} + 2\vec{j} + 3\vec{k}$ . If  $\hat{n}$  is a unit vector such that  $\vec{u} \cdot \hat{n} = 0$  and  $\vec{v} \cdot \hat{n} = 0$ , then  $\vec{w} \cdot \hat{n}$   
( a ) 0 ( b ) 1 ( c ) 2 ( d ) 3 [ AIEEE 2003 ]

( 18 ) The 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  $\vec{a} = \vec{i} + \vec{j} - \vec{k}$ ;  $\vec{b} = \vec{i} - \vec{j} + \vec{k}$  and  $\vec{c} = \vec{i} - \vec{j} - \vec{k}$ , then the value of  $\vec{a} \times (\vec{b} \times \vec{c})$  is  
( a )  $\vec{i} - \vec{j} + \vec{k}$  ( 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  $\vec{a} = \vec{i} + \vec{j} - 2\vec{k}$ ;  $\vec{b} = -\vec{i} + 2\vec{j} + \vec{k}$  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 )  $\frac{\vec{i} + \vec{j} + \vec{k}}{\sqrt{3}}$       ( b )  $\frac{\vec{i} - 2\vec{j} + \vec{k}}{\sqrt{6}}$   
 ( c )  $\frac{\vec{i} - \vec{j} + \vec{k}}{\sqrt{3}}$       ( d )  $\frac{2\vec{i} + \vec{j} + \vec{k}}{\sqrt{6}}$

[ AIEEE 2002 ]

( 21 ) If  $\vec{a} = 2\vec{i} + \vec{j} + 2\vec{k}$  and  $\vec{b} = 5\vec{i} - 3\vec{j} + \vec{k}$ , the orthogonal projection of  $\vec{a}$  on  $\vec{b}$  is

- ( a )  $5\vec{i} - 3\vec{j} + \vec{k}$       ( b )  $9(5\vec{i} - 3\vec{j} + \vec{k})$   
 ( c )  $\frac{5\vec{i} - 3\vec{j} + \vec{k}}{35}$       ( d )  $\frac{9(5\vec{i} - 3\vec{j} + \vec{k})}{35}$

[ AIEEE 2002 ]

( 22 ) If the angle between two vectors  $\vec{i} + \vec{k}$  and  $\vec{i} - \vec{j} + a\vec{k}$  is  $\frac{\pi}{3}$ , then the value of a is

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

[ AIEEE 2002 ]

( 23 ) If  $\vec{a} = \vec{i} + 2\vec{j} - 3\vec{k}$  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 )  $0^\circ$       ( b )  $30^\circ$       ( c )  $60^\circ$       ( d )  $90^\circ$

[ AIEEE 2002 ]

( 24 ) The 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

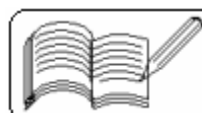
- ( a )  $\frac{5}{21}$       ( b )  $\frac{5}{\sqrt{7}}$       ( c )  $\frac{5}{\sqrt{14}}$       ( d )  $\frac{5}{2\sqrt{7}}$

[ AIEEE 2002 ]

( 25 ) If vectors  $a\vec{i} + \vec{j} + \vec{k}$ ,  $\vec{i} + b\vec{j} + \vec{k}$  and  $\vec{i} + \vec{j} + c\vec{k}$  are coplanar, then

- ( a )  $a + b + c = 0$       ( b )  $abc = -1$   
 ( c )  $a + b + c = abc + 2$       ( d )  $ab + bc + ca = 0$

[ AIEEE 2002 ]



( 26 ) If  $\vec{a}, \vec{b}, \vec{c}$  are three non-zero, noncoplanar vectors and  $\vec{b}_1 = \vec{b} - \frac{\vec{b} \cdot \vec{a}}{|\vec{a}|^2} \vec{a}$ ,

$$\vec{b}_2 = \vec{b} + \frac{\vec{b} \cdot \vec{a}}{|\vec{a}|^2} \vec{a}, \quad \vec{c}_1 = \vec{c} - \frac{\vec{c} \cdot \vec{a}}{|\vec{a}|^2} \vec{a} - \frac{\vec{c} \cdot \vec{b}}{|\vec{b}|^2} \vec{b},$$

$$\vec{c}_2 = \vec{c} - \frac{\vec{c} \cdot \vec{a}}{|\vec{a}|^2} \vec{a} - \frac{\vec{c} \cdot \vec{b}_1}{|\vec{b}_1|^2} \vec{b}_1, \quad \text{and} \quad \vec{c}_3 = \vec{c} - \frac{\vec{c} \cdot \vec{a}}{|\vec{a}|^2} \vec{a} - \frac{\vec{c} \cdot \vec{b}_2}{|\vec{b}_2|^2} \vec{b}_2,$$

then the set of orthogonal vectors is

- ( a )  $(\vec{a}, \vec{b}_1, \vec{c}_1)$       ( b )  $(\vec{a}, \vec{b}_1, \vec{c}_2)$   
( c )  $(\vec{a}, \vec{b}_1, \vec{c}_3)$       ( d )  $(\vec{a}, \vec{b}_2, \vec{c}_2)$

[ IIT 2005 ]

( 27 ) If  $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ ,  $\vec{a} \cdot \vec{b} = 1$  and  $\vec{a} \times \vec{b} = \hat{j} - \hat{k}$ , then  $\vec{b}$  is equal to

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

[ IIT 2004 ]

( 28 ) A unit vector is orthogonal to  $5\hat{i} + 2\hat{j} + 6\hat{k}$  and is coplanar to  $2\hat{i} + \hat{j} + \hat{k}$  and  $\hat{i} - \hat{j} + \hat{k}$ , then the vector is

- ( a )  $\frac{3\hat{j} - \hat{k}}{\sqrt{10}}$       ( 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 ) The value of  $a$  so that the volume of parallelopiped formed by vectors  $\hat{i} + a\hat{j} + \hat{k}$ ,  $\hat{j} + a\hat{k}$  and  $a\hat{i} + \hat{k}$  becomes minimum is

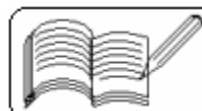
- ( a )  $\sqrt{3}$       ( b ) 2      ( c )  $\frac{1}{\sqrt{3}}$       ( d ) 3

[ 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 )  $\cos^{-1} \frac{2}{7}$

[ IIT 2002 ]



( 31 ) If  $\vec{V} = 2\vec{i} + \vec{j} - \vec{k}$ ,  $\vec{W} = \vec{i} + 3\vec{k}$  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  $|\vec{a} - \vec{b}|^2 + |\vec{b} - \vec{c}|^2 + |\vec{c} - \vec{a}|^2$  does not exceed

- ( a ) 4      ( b ) 9      ( c ) 8      ( d ) 6      [ IIT 2001 ]

( 33 ) If  $\vec{a} = \hat{i} - \hat{k}$ ,  $\vec{b} = x\hat{i} + \hat{j} + (1 - x)\hat{k}$  and  $\vec{c} = y\hat{i} + x\hat{j} + (1 + x - y)\hat{k}$ , then  $[\vec{a} \vec{b} \vec{c}]$  depends on

- ( a ) only x      ( b ) only y      ( c ) neither x nor y      ( d ) both x and y      [ IIT 2001 ]

( 34 ) Let the vectors  $a$ ,  $b$ ,  $c$  and  $d$  be such that  $(a \times b) \times (c \times d) = 0$ . Let  $P_1$  and  $P_2$  be planes determined by the pairs of vectors  $a$ ,  $b$  and  $c$ ,  $d$  respectively, then the angle between  $P_1$  and  $P_2$  is

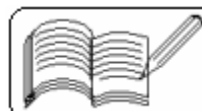
- ( a ) 0      ( b )  $\frac{\pi}{4}$       ( c )  $\frac{\pi}{3}$       ( d )  $\frac{\pi}{2}$       [ IIT 2000 ]

( 35 ) If  $a$ ,  $b$  and  $c$  are unit coplanar vectors, then the scalar triple product  $[2a - b, 2b - c, 2c - a] =$

- ( a ) 0      ( b ) 1      ( c )  $-\sqrt{3}$       ( d )  $\sqrt{3}$       [ IIT 2000 ]

( 36 ) If the vectors  $\vec{a}$ ,  $\vec{b}$  and  $\vec{c}$  form the sides  $\overline{BC}$ ,  $\overline{CA}$  and  $\overline{AB}$  of a triangle ABC, then

- ( a )  $\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a} = 0$       ( b )  $\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a} = 0$   
( 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  $\vec{a} = 2\hat{i} + \hat{j} - 2\hat{k}$  and  $\vec{b} = \hat{i} + \hat{j}$ . If  $\vec{c}$  is a vector such that  $\vec{a} \cdot \vec{c} = |\vec{c}|$ ,  $|\vec{c} - \vec{a}| = 2\sqrt{2}$  and the angle between  $(\vec{a} \times \vec{b})$  and  $\vec{c}$  is  $30^\circ$ , then  $|(\vec{a} \times \vec{b}) \times \vec{c}| =$

(a)  $\frac{2}{3}$       (b)  $\frac{3}{2}$       (c) 2      (d) 3 [ IIT 1999 ]

(38) Let  $\vec{a} = 2\hat{i} + \hat{j} + \hat{k}$ ,  $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$  and a unit vector  $\vec{c}$  be coplanar. If  $\vec{c}$  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)  $\frac{1}{\sqrt{3}}(\hat{i} - \hat{j} - \hat{k})$  [ IIT 1999 ]

(39) Let  $\vec{a}$  and  $\vec{b}$  be two non-collinear unit vectors. If  $\vec{u} = \vec{a} - (\vec{a} \cdot \vec{b})\vec{b}$  and  $\vec{v} = \vec{a} \times \vec{b}$ , then  $\vec{v}$  is

(a)  $|\vec{u}|$       (b)  $|\vec{u}| + |\vec{u} \cdot \vec{a}|$   
(c)  $|\vec{u}| + |\vec{u} \cdot \vec{b}|$       (d)  $|\vec{u}| + \vec{u} \cdot (\vec{a} + \vec{b})$  [ IIT 1999 ]

(40) If  $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ ,  $\vec{b} = 4\hat{i} + 3\hat{j} + 4\hat{k}$  and  $\vec{c} = \hat{i} + \alpha\hat{j} + \beta\hat{k}$  are linearly dependent vectors and  $|\vec{c}| = \sqrt{3}$ , then  $\alpha$  and  $\beta$  respectively are

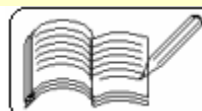
(a) 1, -1      (b) 1,  $\pm 1$       (c) -1,  $\pm 1$       (d)  $\pm 1$ , 1 [ IIT 1998 ]

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

(a)  $\vec{u} \cdot (\vec{v} \times \vec{w})$       (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)  $\vec{u} \cdot (\vec{v} \times \vec{w})$       (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  $p, q, r$  be three mutually perpendicular vectors of the same magnitude. If a vector  $x$  satisfies the equation

$$p \times [(x - q) \times p] + q \times [(x - r) \times q] + r \times [(x - p) \times r] = 0, \text{ then } x \text{ is given by}$$

- ( a )  $\frac{1}{2}(p + q - 2r)$       ( b )  $\frac{1}{2}(p + q + r)$   
 ( c )  $\frac{1}{3}(p + q + r)$       ( d )  $\frac{1}{3}(2p + q - r)$

[ IIT 1997 ]

( 44 ) Let  $\vec{a} = \hat{i} - \hat{j}$ ,  $\vec{b} = \hat{j} - \hat{k}$  and  $\vec{c} = \hat{k} - \hat{i}$ . If  $\hat{d}$  is a unit vector such that  $\vec{a} \cdot \hat{d} = 0 = [\vec{b}, \vec{c}, \hat{d}]$ , then  $\hat{d}$  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 )  $\frac{\hat{i} + \hat{j} + \hat{k}}{\sqrt{3}}$       ( d )  $\pm \hat{k}$       [ IIT 1995 ]

( 45 ) Let  $\vec{u}, \vec{v}$  and  $\vec{w}$  be vectors such that  $\vec{u} + \vec{v} + \vec{w} = 0$ . If  $|\vec{u}| = 3$ ,  $|\vec{v}| = 4$  and  $|\vec{w}| = 5$ , then the value of  $\vec{u} \cdot \vec{v} + \vec{v} \cdot \vec{w} + \vec{w} \cdot \vec{u}$  is

- ( a ) 47      ( b ) -25      ( c ) 0      ( d ) 25      [ IIT 1995 ]

( 46 ) If  $\vec{A}, \vec{B}$  and  $\vec{C}$  are three non-coplanar vectors, then

$$(\vec{A} + \vec{B} + \vec{C}) \cdot (\vec{A} + \vec{B}) \times (\vec{A} + \vec{C}) \text{ equals}$$

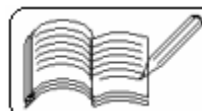
- ( a ) 0      ( b )  $[\vec{A}, \vec{B}, \vec{C}]$       ( c )  $2[\vec{A}, \vec{B}, \vec{C}]$       ( d )  $-[\vec{A}, \vec{B}, \vec{C}]$       [ IIT 1995 ]

( 47 ) If  $\vec{a}, \vec{b}, \vec{c}$  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  $a\hat{i} + a\hat{j} + c\hat{k}$ ,  $\hat{i} + \hat{k}$  and  $\hat{c}\hat{i} + \hat{c}\hat{j} + \hat{b}\hat{k}$  lie in a plane, then  $c$  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  $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ ,  $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$  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  $\vec{a}$  is of magnitude  $\sqrt{\frac{2}{3}}$  is

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

[ IIT 1993 ]

(50) If  $\vec{a}, \vec{b}, \vec{c}$  be three non-coplanar vectors and  $\vec{p}, \vec{q}, \vec{r}$  are vectors defined by the relations  $\vec{p} = \frac{\vec{b} \times \vec{c}}{[\vec{a} \vec{b} \vec{c}]}$ ;  $\vec{q} = \frac{\vec{c} \times \vec{a}}{[\vec{a} \vec{b} \vec{c}]}$ ;  $\vec{r} = \frac{\vec{a} \times \vec{b}}{[\vec{a} \vec{b} \vec{c}]}$ ,

then the value of the expression

$(\vec{a} + \vec{b}) \cdot \vec{p} + (\vec{b} + \vec{c}) \cdot \vec{q} + (\vec{c} + \vec{a}) \cdot \vec{r}$  is equal to

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

[ IIT 1988 ]

(51) The number of vectors of unit length perpendicular to vectors

$\vec{a} = (1, 1, 0)$  and  $\vec{b} = (0, 1, 1)$  is

- (a) one      (b) two      (c) three      (d) infinite      (e) none of these

[ IIT 1987 ]

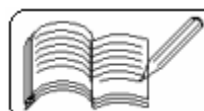
(52) Let  $\vec{a} = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$ ,  $\vec{b} = b_1\hat{i} + b_2\hat{j} + b_3\hat{k}$  and  $\vec{c} = c_1\hat{i} + c_2\hat{j} + c_3\hat{k}$  be three non-zero vectors such that  $\vec{c}$  is a unit vector perpendicular to both the vectors  $\vec{a}$  and  $\vec{b}$ . If the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

$\begin{vmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{vmatrix}$  is equal to

(a) 0      (b) 1      (c)  $\frac{3}{4}(a_1^2 + a_2^2 + a_3^2)(b_1^2 + b_2^2 + b_3^2)(c_1^2 + c_2^2 + c_3^2)$

(d)  $\frac{1}{4}(a_1^2 + a_2^2 + a_3^2)(b_1^2 + b_2^2 + b_3^2)$       (e) none of these

[ IIT 1986 ]





**Answers**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
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	38	39	40
d	d	d	d	c	b	c	a	c	b	c	b	c	a	a	b	b	a	b,c	d
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
c	a,c	b	a	b	d	a	b	c	d	b	d	b	b	a	d	a			

