QUESTIONS

1) If $\vec{a} = i+j-2k$, $\vec{b} = -i+2j+k$ and $\vec{c} = i-2j+2k$, then a unit vector parallel to $\vec{a} + \vec{b} + \vec{c}$ is

1) $(2i+j+k)/\sqrt{6}$ 2) $(i+j+k)/\sqrt{3}$

3) $(i-2j+k)/\sqrt{6}$ 4) $(i-j+k)/\sqrt{3}$

2) The volume of the parallelopiped whose co-terminus edges are $2i - 3j + 5k$, $i+2j - 2k$ and $6i + j - k$ in cubic units is

1) 44 2) 33 3) 11 4) 22

3) The cosine of the angle between the vectors $2i -3j + 6k$ and $4i + 8j -8k$ is

1) 16/21 2) –16/21 3) 15/28 4) –15/28

4) The value of $[\, i-j, j-k, k-i\,]$ is equal to

1) $2(i+j+k)$ 2) 0 3) 1 4) -1

5) If $\vec{a} = i+2j$, $\vec{b} = j+2k$, $\vec{c} = 2i-k$, then $\vec{a} \cdot (\vec{b} \times \vec{c})$ is

1) 2 2) –4 3) 7 4) 6

6) The unit vector is

1) $\cos\alpha\, i + \cos\beta\, j$ 2) $\cos\alpha\, i + \sin\alpha\, j + k$

3) $\cos\alpha \cos\beta\, i + \cos\alpha \sin\beta\, j + \sin\alpha\, k$ 4) $i + j$

7) If $\vec{a} = 6i+2j+k$, $\vec{b} = i-j+2k$ and $\vec{c} = 5i+3j-k$ which one of the following is a null vector?

1) $\vec{a} + \vec{b} - \vec{c}$ 2) $\vec{b} + \vec{c} - \vec{a}$ 3) $\vec{c} + \vec{a} - \vec{b}$ 4) $\vec{a} + \vec{b} + \vec{c}$

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8) If a, b, c are the position vectors of the vertices of triangle ABC, then $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CA}$ =

1) 0 2) 2 $\vec{a}$ 3) 2 $\vec{b}$ 4) 3 $\vec{c}$

9) If the dot product of (3, a, -1) and (1,2,1) is 6, then a is

1) 1 2) 2 3) –2 4) 3

10) If $\vec{a} = 2i - j + 3k$, $\vec{b} = i + 2j + k$ and $\vec{c} = 2i + j + k$ then $\vec{a} \cdot (\vec{b} + \vec{c})$ is

1) 12 2) 9 3) 14 4) 10

11) The direction cosines of the line joining (1, 3,-5) and (4,7,7) are

1) 1, 3, -5 2) 4, 7, 7

3)3, 4, 12 4) 3/13, 4/13, 12/13

12) If α, β, γ are the angles made by a line with co-ordinate axes then, $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$ is equal to

1) 2 2) -2 3)1 4) -1

13) The angle between $\vec{a}$ and $\vec{b}$ when $|\vec{a}| = 2$, $|\vec{b}| = 1$, $\vec{a} \cdot \vec{b} = 1$ is

1) $\pi/6$ 2) $\pi/4$ 3) $\pi/3$ 4) $\pi/2$

14) If $\vec{a}$ and $\vec{b}$ are unit vectors, which of the following is correct?

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1) a + b may be a unit vector

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2) a + b is a unit vector if a and b are $\perp$ vectors

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3) a + b is a unit vector if a and b are parallel Vectors

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4) a + b is not at all a unit vector

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15) If a and b are any two vectors, (2a + b) x (a + 2b) is equal to

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1) 6(a x b) 2) 3(a x b) 3) 2(a x b) 4) 3(b x a)

16) The value [i + j j + k k + i] is

1) 0 2) 2 3) 1 4) 3

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17) If a = (1,-2), b = (2,1), c = (3, -1), then a vector of length 15 units in the direction of $2\vec{a} + 3\vec{b} - \vec{c}$ is

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1) 15(1,1) 2) 15(1,-1) 3) 15(1,0) 4)15(0,1)

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18) Given $\vec{a} = 2i - 3j + 6k$, $\vec{b} = -2i + 2j - k$ and $\vec{c}$ = projection of $\vec{b}$ on $\vec{a}$, then the value of c is,

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projection of a on b

1) 3 2) 7 3) 3/7 4) 7/3

19) The value of λ for which the vector $\lambda(i + j + k)$ is a unit vector is

1) 1/3 2) $1/\sqrt{3}$ 3) 1 4) $\sqrt{3}$

20) If $\vec{OA} = i+xj+k$, $\vec{OB} = 2i+k$, $\vec{OC} = -i+j+k$ and $\vec{AB}$ is perpendicular to $\vec{BC}$, x is

1) 0 2) 3 3) -3 4) 2

21) A vector of magnitude 10 units perpendicular to $\vec{a} = i+j-k$ and coplanar with the vectors $\vec{b} = 2i-j-k$ and $\vec{c} = i+2j-k$ is

1) $3i-4j-k$ 2) $10(3i-4j-k)$

3) $10(3i-4j-k)/\sqrt{26}$ 4) $4i-3j-k/10$

22) When $\vec{a}$, $\vec{b}$, $\vec{c}$ are three non-coplanar vectors, the value of

$$\frac{\vec{a} \cdot (\vec{b} \times \vec{c})}{\vec{c} \cdot (\vec{a} \times \vec{b})} + \frac{\vec{b} \cdot (\vec{a} \times \vec{c})}{\vec{c} \cdot (\vec{a} \times \vec{b})}$$

1)1 2) 0 3) $[\vec{a}\ \vec{b}\ \vec{c}]$ 4) -1

23) Modulus of sum of three mutually perpendicular unit vectors is

1) $\sqrt{3}$ 2) 3 3) 0 4) none

24) If $\vec{a} \cdot \vec{b} = \vec{a} \cdot \vec{c}$ and $\vec{a} \times \vec{b} = \vec{a} \times \vec{c}$, $a \neq 0$, then

1) $\vec{b} = \vec{c}$ 2) $\vec{b} = 0$ 3) $\vec{b} + \vec{c} = 0$ 4) none

25) If the vectors $\vec{a}$, $\vec{b}$, $\vec{c}$ form the sides BC, CA and AB respectively of a triangle ABC, Then

1) $\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a} = 0$ 2) $\vec{a} \times \vec{b} = \vec{b} \times \vec{c} = \vec{c} \times \vec{a}$

3) $\vec{a} \cdot \vec{b} = \vec{b} \cdot \vec{c} = \vec{c} \cdot \vec{a}$ 4) $\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a} = 0$

26) If θ is the angle between two unit vectors $\vec{a}$ and $\vec{b}$ then $\sin\theta$ is equal to

1) $|\vec{a} + \vec{b}|$ 2) $|\vec{a} - \vec{b}|$ 3) $\vec{a} \cdot \vec{b}$ 4) $|\vec{a} \times \vec{b}|$

27) If θ is the angle between two vectors $\vec{a}$ and $\vec{b}$, then $\vec{a} \cdot \vec{b} > 0$ only if

1) $0 \leq \theta \leq \pi$ 2) $\pi/2 \leq \theta \leq \pi$

3) $0 \leq \theta \leq \pi/2$ 4) $0 \leq \theta < \pi/2$

28) The vector $\vec{b}$ which is collinear with vector $\vec{a} = (1, 2, -1)$ and satisfies $\vec{a} \cdot \vec{b} = 5$, is

1) 1/3(5, 10, -5) 2) 1/6(5,10,-5)

3)(5,10,-5) 4) 6(5,10,-5)

29) For any two vectors $\vec{a}$ and $\vec{b}$

1) $|\vec{a} \cdot \vec{b}| > |\vec{a}||\vec{b}|$ 2) $|\vec{a} \cdot \vec{b}| < |\vec{a}||\vec{b}|$

3) $|\vec{a} \cdot \vec{b}| \geq |\vec{a}||\vec{b}|$ 4) $|\vec{a} \cdot \vec{b}| \leq |\vec{a}||\vec{b}|$

30) If $\vec{a}$ and $\vec{b}$ are two vectors such that $\vec{a} \cdot \vec{b} = 0$ and $\vec{a} \times \vec{b} = 0$ then

1) either $\vec{a} = 0$ or $\vec{b} = 0$ 2) $\vec{a} \parallel \vec{b}$

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3) $a \perp b$ **4) none**

31) Four points with the position vectors 7i-4j+7k, i-6j+10k,-i-3j+4k and 5i-j+k form a

1) rhombus **2) rectangle**

3) square **4) parallelogram but not rhombus**

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32) If p.a=p.b=p.c= 0 for some non-zero vector p then

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1) [a, b, c] = 0 **2) [a, b, c]$\neq$ 0**

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3) a, b, c, are non coplanar **4) none**

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33) If a and b are two unit vectors inclined at an angle θ to each other , then $|\rightarrow a + \rightarrow b| < 1$ if

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1) $\theta = \pi/6$ **2) $\theta = \pi/2$** **3) $\theta = \pi/3$** **4) $2\pi/3<\theta<\pi$**

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34) $\rightarrow a . [(\rightarrow b + \rightarrow c) x (\rightarrow a + \rightarrow b + \rightarrow c)] =$

$\rightarrow$ $\rightarrow\rightarrow\rightarrow\rightarrow\rightarrow\rightarrow$ $\rightarrow\rightarrow\rightarrow$

1) 0 **2) [a,b,c][b,c,a]** **3) [a,b,c]** **4) none**

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35) If $|\rightarrow a + \rightarrow b| = |\rightarrow a - \rightarrow b|$, then

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1) $a \perp b$ **2) a ||b** **3) a=0** **4) b = 0**

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36) If $\rightarrow a \times \rightarrow b = \rightarrow c \times \rightarrow b \neq 0$, then

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1) $\rightarrow a = \lambda \rightarrow b$ **2) $\rightarrow a - \rightarrow c = \lambda \rightarrow c$** **3) $\rightarrow a - \rightarrow c = \lambda \rightarrow b$** **4) none**

37) Which of the following expressions are meaningful?

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1) $\vec{u} \cdot (\vec{v} \times \vec{w})$ 2) $(\vec{u} \cdot \vec{v}) \cdot \vec{w}$

3) $(\vec{u} \cdot \vec{v}) \times \vec{w}$ 4) $\vec{u} \times (\vec{v} \cdot \vec{w})$

38) Which of the following is a true statement?

1) $(\vec{a} \times \vec{b}) \times \vec{c}$ is coplanar with $\vec{c}$

2) $(\vec{a} \times \vec{b}) \times \vec{c}$ is perpendicular with $\vec{a}$

3) $(\vec{a} \times \vec{b}) \times \vec{c}$ is perpendicular with $\vec{b}$

4) $(\vec{a} \times \vec{b}) \times \vec{c}$ is perpendicular with $\vec{c}$

39) If $\vec{a} \times \vec{b} = \vec{c}$, $\vec{b} \times \vec{c} = \vec{a}$ and a, b, c are moduli of vectors a, b, c respectively, then

1) $a = 1, b = 1$ 2) $c=1, a = 1$

3) $\vec{a} \cdot (\vec{b} \times \vec{c}) = -1$ 4) $b =1, c = a$

40) If e_1', e_2',e_3' are reciprocal to the non-coplanar vectors e_1,e_2,e_3, then $[e_1', e_2',e_3'][e_1,e_2,e_3]$ =

1) -1/2 2) 1 3) 0 4) 4

41) Value of $(\vec{a} - \vec{b}) \cdot [(\vec{b}-\vec{c}) \times (\vec{c}-\vec{a})]$ =

1) 0 2) 2[a,b,c] 3) 3[a,b,c] 4) none

42) Direction of zero vector

1) does not exist 2) is towards origin

3) is indetminate 4) none of these

43) If $\vec{a}$ is a unit vector perpendicular to $\vec{b}$ and

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(a + 3b) . (2a-b) = -10, then |b| =

1) 5 2) 2 3) 3 4) 4

44) The volume of the tetrahedron whose vertices are A(3,7,4) B(5,-2,3), C(-4,5,6) and D(1,2,3) is

1) 44/3 c.c 2) 46/3 c.c 3) 47/3 c.c 4) none

45) If a line makes angles of 60^0 and 120^0 with the positive directions of x-axis and y- axis respectively, then the acute angle made by the line with the +ve direction of z – axis is

1) 45^0 2) 30^0 3) 60^0 4) none

46) Let the vectors 2i+3j-4k and ai+bj+ck be perpendicular. Then

1) a = 2, b = 3, c = -4 2) a = 4, b = 4, c = 5

3) a = 4, b = 4, c = -5 4) none

47) The sum of two unit vectors is a unit vector. The magnitude of their difference is

1) 2 2) $\sqrt{3}$ 3) $\sqrt{2}$ 4) 1

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48) If a.b = b.c = c.a = 0, then a . (b x c) is equal to

1) a non zero vector 2) 1

3) -1 4) |a||b||c|

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49) Let a , b, c be the position vectors of three vertices A, B, C of a triangle respectively. Then the area of this triangle is given by

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1) a x b + b x c + c x a

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2) (½)(a x b) . c

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3) (1/2) | a x b + b x c + c x a |

4) none

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50) The vector a x (b x a) is

1) a null vector

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2) perpendicular to both a and b

$\rightarrow$

3) perpendicular to a

$\rightarrow$

4) perpendicular to b

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51) If $| a + b |^2 = | a|^2 + | b |^2$, then

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1) a is parallel to b

$\rightarrow \rightarrow$

2) a is perpendicular to b

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3) a = b

4) | a + b | = | a| + | b|

$\rightarrow \rightarrow$

52) If | a | = 3, | b| =4, then a value of λ for which

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a + λb is perpendicular to a - λb is

1) 9/16 2) ¾ 3) 3/2 4) 4/3

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53) If a, b, c are non-coplanar unit vectors such that

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a x (b x c) = (b + c)/$\sqrt{2}$, then the angle between

$\rightarrow \rightarrow$

a and b is

1) 3π/4 2) π/4 3) π/2 4) π

$\rightarrow$ $\rightarrow$ $\rightarrow$

54) Let v = 2i + j – k and w = i + 3k. If u is a unit vector, then the maximum value of the scalar triple product $[\vec{u}, \vec{v}, \vec{w}]$ is

1) -1 **2) $\sqrt{10} + \sqrt{6}$** **3) $\sqrt{59}$** **4) $\sqrt{6}$**

55) 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

1) 45^0 **2) 60^0** **3) $\cos^{-1}(1/3)$** **4) $\cos^{-1}(2/7)$**

56) If $\vec{a} = 3i - 5j$ and $\vec{b} = 6i + 3j$ are two vectors and $\vec{c}$ is a vector such that $\vec{c} = \vec{a} \times \vec{b}$, then $|a| : |b| : |c| =$

1) $\sqrt{34} : \sqrt{45} : \sqrt{39}$ **2) $\sqrt{34} : \sqrt{45} : 39$**

3) 34 : 39 : 45 **4) 39 : 35 : 34**

57) If $\vec{a}$ and $\vec{b}$ are unit vectors such that $\vec{a} \cdot \vec{b} = \cos\theta$, then the value of $|\vec{a} + \vec{b}|$ is

1) $2\sin(\theta/2)$ **2) $2\sin\theta$** **3) $2\cos(\theta/2)$** **4) $2\cos\theta$**

58) The value of a so that the volume of parallelepiped formed by the vectors $i + aj + k$, $j + ak$, $ai + k$ becomes minimum is

1) $\sqrt{3}$ **2) 2** **3) $1/\sqrt{3}$** **4) 3**

59) The centroid of i, 2j , k is

1) (1/3, 2/3, 1/3) **2) (1/3, -2/3, -1/3)**

3) (1/3, -2/3, 1/3) 4) (1/3, 2/3, -1/3)

60) If the position vectors of the points A and B are $5i-3j+4k$ and $-3i+\lambda j+3k$ and $|\overrightarrow{AB}| = 9$, then the value of λ is

1) 1 or -7 2) -1 or 7

3) -1 or -7 4) 1 or 7