MATHS

BOOKS - MODERN PUBLICATION MATHS (KANNADA ENGLISH)

VECTOR ALGEBRA

Multiple Choice Question Level I

1. The value of $'\lambda'$ which the vectors :

$3\hat{i} - 6\hat{j} + \hat{k}$ and $2\hat{i} - 4\hat{j} + \lambda\hat{k}$ are parallel is :

A. $\frac{2}{3}$

B. $\frac{3}{2}$

C. $\frac{5}{2}$

D. $\frac{2}{5}$

Answer: A

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2. The position vector of the point, which divides the join of the points with position vectors $\vec{a} + \vec{b}$ and $2\vec{a} - \vec{b}$ in the ratio $1:2$ is :

A. $\dfrac{3\vec{a} + 2\vec{b}}{3}$

B. $\vec{a}$

C. $\dfrac{5\vec{a} - \vec{b}}{3}$

D. $\dfrac{4\vec{a} + \vec{b}}{3}$.

Answer: D

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3. The angle between the vector $\hat{i} - \hat{j}$ and $\hat{j} - \hat{k}$ is :

A. $\frac{\pi}{3}$

B. $\frac{2\pi}{3}$

C. $-\frac{\pi}{3}$

D. $\frac{5\pi}{6}$.

Answer: B

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4. The area of the parallelogram whose adjacent sides are $\hat{i}+\hat{k}$ and $2\hat{i}+\hat{j}+\hat{k}$ is :

A. $\sqrt{2}$

B. $\sqrt{3}$

C. 3

D. 4.

Answer: B

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5. If $\left|\vec{a}\right| = 8, \left|\vec{b}\right| = 3$ and $\left|\vec{a} \times \vec{b}\right| = 12$, then $\vec{a} . \vec{b}$ is :

A. $6\sqrt{3}$

B. $8\sqrt{3}$

C. $12\sqrt{3}$

D. None of these.

Answer: C

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6. The projection of vector $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ along $\vec{b} = \hat{i} + 2\hat{j} + 2\hat{k}$ is

A. $\frac{2}{3}$

B. $\frac{1}{3}$

C. 2

D. $\sqrt{6}$.

Answer: A

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7. If $\vec{a}$ and $\vec{b}$ are unit vectors, then what is the angle between $\vec{a}$ and $\vec{b}$ for $\sqrt{3}veva - \vec{b}$ to be a unit vectors ?

A. 30°

B. 45°

C. 60°

D. 90°.

Answer: A

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8. The unit vector perpendicular to the vectors $\hat{i} - \hat{j}$ and $\hat{i} + \hat{j}$ forming a right-handed system is :

A. $\hat{k}$

B. $-\hat{k}$

C. $\frac{\hat{i} - \hat{j}}{\sqrt{2}}$

D. $\frac{\hat{i} + \hat{j}}{\sqrt{2}}$.

Answer: A

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9. If $\left|\vec{a}\right| = 3$ and $-1 \leq k \leq 2$, then $\left|k\vec{a}\right|$ lies in the interval :

A. $[0, 6]$

B. $[-3, 6]$

C. $[3, 6]$

D. $[1, 2]$.

Answer: A

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10. If $\vec{a}, \vec{b}, \vec{c}$ are three vectors such that $\vec{a}+\vec{b}+\vec{c}=\vec{0}$ and $|\vec{a}|=2, |\vec{b}|=3, |\vec{c}|=5,$ then value of $\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}$ is :

A. 0

B. 1

C. -19

D. $38.$

Answer: C

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11. The valur of $'\lambda'$ for which the two vectors :

$2\hat{i}-ahtj+2\hat{k}$ and $3\hat{i}+\lambda\hat{j}+ahtk$ are perpendicular is :

A. 2

B. 4

C. 6

D. 8

Answer: D

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12. If P and Q be two given points on the curve $y = x + \frac{1}{x}$, such that $\vec{O}P.\ Hati = 1nad\overrightarrow{OQ}.\ Hati = -1$, where $\hat{i}$ is the unit vector along X-axis, then the length of vector $\overrightarrow{2OP} + \overrightarrow{3OQ}$ is :

A. $5\sqrt{5}$

B. $3\sqrt{5}$

C. $2\sqrt{5}$

D. $\sqrt{5}$.

Answer: D

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13. If $\vec{a} = \hat{i} + 2\hat{j} + 3\hat{k}$, $\vec{b} = -\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{c} = 3\hat{i} + \hat{j}$, then th

such that $\vec{a} + t\vec{b}$ is at right angles to $\vec{c}$, will be equal to :

A. 5

B. 4

C. 6

D. 2

Answer: A

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14. If $\vec{x} . \vec{a} = 0$, $\vec{x} . Vecb = 0$, $\vec{x} . Ve = 0$ for some non-zero vector,

$\vec{x}$, then $\left[\vec{a}\vec{b}\vec{c}\right] = 0$ is :

A. True

B. False

C. Cannot say anythins

D. None of these.

Answer: A

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15. If $\vec{A} = (1, 1, 1), \vec{C} = (0, 1, -1)$ are two given equation $\vec{A} \times \vec{B} = \vec{C}, \vec{A}.\vec{B}$ =3 is :

A. $(5/3, 2/3, 2/3)$

B. $(-5/3, 2/3, 2/3)$

C. $(5/3, -2/3, 2/3)$

D. $(5/3, 2/3, -2/3)$

Answer: A

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16. $\left(\overrightarrow{a}+\overrightarrow{b}\right)\times\left(\overrightarrow{a}-\overrightarrow{b}\right)$ is :

A. $\left(a^{\overrightarrow{a}}-b^{\overrightarrow{2}}\right.$

B. $2\left(\overrightarrow{a}\times\overrightarrow{b}\right)$

C. $2\left(\overrightarrow{b}\times\overrightarrow{a}\right)$

D. None of these.

Answer: C

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17. The number of vectors of unit length perpendicular to vectors $\overrightarrow{a}=(1,1,0) and \overrightarrow{b}=(0,1,1)$ is a. one b. two c. three d. infinite

A. 1

B. 2

C. 3

D. infinte.

Answer: B

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18. The volume of the parallelopied, whose edge are represented by $-12\hat{i}+\alpha, \hat{k}, 3\hat{j}-\hat{k}2\hat{i}+\hat{j}-15\hat{k},$ is 546, then α is :

A. 3

B. 2

C. -3

D. $-2.$

Answer: C

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19. If $\vec{a} = 4\hat{i} + 6\hat{j}$ and $\vec{b} = 3\hat{j} + 4\hat{k}$, then the vector form of the component of $\vec{a}$ along $\vec{b}$ is :

A. $\frac{18}{10\sqrt{13}}\left(3\hat{j} + 4\hat{k}\right)$

B. $\frac{18}{25}\left(3\hat{j} + 4\hat{k}\right)$

C. $\frac{18}{\sqrt{113}}/\left(3\hat{j} + 4\hat{k}\right)$

D. $3\hat{j} + 4\hat{k}$.

Answer: B

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20. The vectors $2\hat{i} - ahtj + \hat{k}$, $\hat{i} - 3\hat{j} - 5\hat{j}$ and $\sqrt{3}\hat{i} - 4\hat{j} - 4\hat{k}$ are the sides of a triange, which is :

A. equiliateral

B. isosceles only

C. right angled only

D. right angled and isosceles.

Answer: D

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21. The vectors $\hat{i}+2\hat{j}+3\hat{k}, \lambda\hat{i}+4\hat{j}+7\hat{k}, \ -3\hat{i}-2\hat{j}-5\hat{k}$ are collinear if λ is :

A. 3

B. 4

C. 5

D. 6

Answer: A

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22. If $\overrightarrow{x}$ and $\overrightarrow{y}$ are two unit vectors and θ is the angle between them, then $\frac{1}{2}\left|\overrightarrow{x}-\overrightarrow{y}\right|$ is :

A. 0

B. $x/2$

C. $\left|\cos\frac{\theta}{2}\right|$

D. $\left|\sin\frac{\theta}{2}\right|$.

Answer: D

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23. If $\left|\overrightarrow{\alpha}+\overrightarrow{\beta}\right|=\left|\overrightarrow{\alpha}-\overrightarrow{\beta}\right|$, then :

A. $\overrightarrow{\alpha}$ is parallel to $\overrightarrow{\beta}$

B. $\overrightarrow{\alpha}\perp\overrightarrow{\beta}$

C. $\left|\overrightarrow{\alpha}\right|=\left|\overrightarrow{\beta}\right|$

D. None of these.

Answer: B

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24. If $\overrightarrow{\alpha}$ and $\overrightarrow{\beta}$ are two vectors such atht $\overrightarrow{a}.\overrightarrow{b}=0$ and $\overrightarrow{a}\times\overrightarrow{b}=\overrightarrow{0}$, then:

A. $\overrightarrow{a}$ is parallel to $\overrightarrow{b}$

B. $\overrightarrow{a}\perp\overrightarrow{b}$

C. either $\overrightarrow{a}$ or $\overrightarrow{b}$ is null vector

D. None of these.

Answer: C

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25. The projection of vector $\hat{i}-2\hat{j}+\hat{k}$ on the vector $4\hat{i}-4\hat{j}+7\hat{k}$ is :

A. $\frac{5}{19}\sqrt{5}$

B. $2\frac{1}{9}$

C. $\frac{9}{19}$

D. $\frac{1}{19}\sqrt{6}$.

Answer: B

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26. The three vectors $7\hat{i} - 11\hat{j} + \hat{k}, 5\hat{i} + 3\hat{j} - 2\hat{k}, 12\hat{i} - 8\hat{j} - \hat{k}$ from :

A. an equilateral triangle

B. a right-angled triangle

C. an isosceles triangle

D. collinear vectors.

Answer: B

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27. If the vectors $2\hat{i}-\hat{j}+\lambda\hat{k},\ \hat{i}-\hat{j}+2\hat{k}\ \text{and}\ 3\hat{i}-2\hat{j}+\hat{k}$ are coplanar, then the value of λ is :

A. -1

B. -2

C. -3

D. $-4.$

Answer: A

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28. Angle between vectors $\hat{i}-\hat{j}+\hat{k}\ \text{and}\ \hat{i}+2\hat{j}+\hat{k}$ is :

A. $\frac{\cos^{-1}(1)}{sqrr15}$

B. $\frac{\cos^{-1}(4)}{\sqrt{15}}$

C. $\frac{\cos^{-1}(4)}{15}$

D. $\frac{\pi}{2}$.

Answer: D

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29. The unit vector perpendicular to vectors $\hat{i}-\hat{j}$ and $\hat{i}+\hat{j}$ forming a right-handed system is :

A. $\hat{k}$

B. $-\hat{k}$

C. $\frac{1}{\sqrt{2}}\left(\hat{i}-\hat{j}\right)$

D. $\frac{1}{\sqrt{2}}\left(\hat{i}+\hat{j}\right)$.

Answer: A

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30. If the vectors $\vec{c}$, $\vec{a} = x\hat{i} + y\hat{j} + z\hat{k}$ and $\vec{b} = \hat{j}$ are such that $\vec{a}$, $\vec{c}$ and $\vec{b}$ form a right-handed system, then $\vec{c}$ is :

A. $z\hat{i} - x\hat{k}$

B. $\vec{0}$

C. $-z\hat{i} + x\hat{k}$

D. $y\hat{j}$.

Answer: C

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31. If $\vec{a}$ and $\vec{b}$ are two unit vectors, then the vector $(\vec{a} + \vec{b}) \times (\vec{a} \times \vec{b})$ is parallel to the vector :

A. $\vec{a} - \vec{b}$

B. $\vec{a} + \vec{b}$

C. $2\vec{a} - \vec{b}$

D. $2\vec{a} + \vec{b}$.

Answer: A

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32. Let

$\vec{F} = 2\hat{i} + 2\hat{j} + 5\hat{k}$ and $A = (1, 2, 5), B = (-1, -2, -3)$ and $\overrightarrow{BA} \times \vec{F}$

then the value of λ is :

A. 0

B. 1

C. 2

D. -2.

Answer: D

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33. Value of a for which $2\hat{i} - \hat{j} + 1\hat{k}$, $\hat{i} + 2\hat{j} - 3\hat{k}$ and $3\hat{i} + a\hat{j} + 5\hat{k}$ are coplanar is :

A. 2

B. 4

C. -4

D. $3.$

Answer: C

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34. If the vectors a $\hat{i} + 2\hat{j} + 3\hat{k}$ and $-\hat{i} + 5\hat{j} + a\hat{k}$ are perpendicular to each other, then a equals :

A. 6

B. -6

C. 5

D. $-5.$

Answer: D

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35. The area of a parallelogram whose adjacent sides are $\hat{i} - 2\hat{j} + 3\hat{k}$ and $2\hat{i} + \hat{j} - 4\hat{k}$ is :

A. $5\sqrt{3}$

B. $10\sqrt{3}$

C. $5\sqrt{6}$

D. $10\sqrt{6}.$

Answer: C

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36. $\vec{a}.\left(\vec{a}\times\vec{b}\right)=$

A. $\vec{a}.Vecb$

B. a^2b

C. 0

D. $a^2+ab.$

Answer: C

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37. The points with positivon vectors $60\hat{i}+3\hat{j}, 40\hat{i}-8\hat{j}$ and $a\hat{i}-52\hat{j}$ are collinarar if :

A. $a=-40$

B. $a=40$

C. $a=20$

D. None of these.

Answer: A

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38. If the points with position vectors $10\hat{i} + 3\hat{j}, 12\hat{i} - 5\hat{j}$ and $\lambda\hat{i} + 11\hat{j}$ are collinear, then λ is :

A. 4

B. 8

C. 12

D. 22

Answer: B

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39. The vector $2\hat{i}+\hat{j}+\hat{k}$ is peerpendicular to $\hat{i}-4\hat{j}+\lambda\hat{k}, \quad \text{if} \quad \lambda$ is :

A. 0

B. -1

C. 2

D. $-3.$

Answer: C

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40. Let the vectors $\vec{u}, \vec{v}$ and $\vec{w}$ be coplanar. Then $\vec{u}.\left(\vec{v}\times\vec{w}\right)$ is :

A. 0

B. $\vec{0}$

C. a unit vector

D. None of these.

Answer: A

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41. If $\overrightarrow{a}$ and $\overrightarrow{b}$ are position vectors of A and B respectively, then the position vector of a point C in AB produced such ahat $\overrightarrow{AC} = \overrightarrow{3AB}$ is :

A. $\overrightarrow{3}a - \overrightarrow{b}$

B. $\overrightarrow{3b} - \overrightarrow{a}$

C. $\overrightarrow{3}a - \overrightarrow{2}b$

D. $\overrightarrow{3}b - \overrightarrow{2}a.$

Answer: D

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42. If $\overrightarrow{a}$ is non-zero vector and k is a scalar such that $k\overrightarrow{a} = 1,$ then k is :

A. $\left|\vec{a}\right|$

B. 1

C. $\frac{1}{\left|\vec{a}\right|}$

D. None of these.

Answer: C

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43. Two vectors are said to be equal if :

A. They have the same magnitude and direaction

B. They meet at the same point

C. They originate from the same point

D. None of these.

Answer: A

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44. If three coterminous edges of a parallelopiped are represented by $\vec{a}-\vec{b}, \vec{b}-\vec{c}$ and $\vec{c}-\vec{a}$, then its volume is :

A. $\left[\vec{a}\vec{b}\vec{c}\right]$

B. $2\left[\vec{a}\vec{b}\vec{c}\right]$

C. $\left[\vec{a}\vec{b}\vec{c}\right]^2$

D. $0.$

Answer: D

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45. If $\vec{a}$ and $\vec{b}$ are position vectors of A and B respectively, then the position vector of a point C in AB produced such ahat $\overrightarrow{AC}=3\overrightarrow{AB}$ is :

A. $3\vec{a}-\vec{b}$

B. $3\vec{a}-2\vec{b}$

C. $\vec{a} - 3\vec{b}$

D. $3\vec{b} - 2\vec{a}$.

Answer: D

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46. If $\left|\vec{a}\right| = 2, \left|\vec{b}\right| = 5$ and $\left|\vec{a} \times \vec{b}\right| = 8$, then $\vec{a}.\vec{b}$ equals :

A. 4

B. 6

C. 5

D. None of these.

Answer: B

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47. For three vectors $\vec{u}, \vec{v}, \vec{w}$, which of the following expression is not equal to any of the remaining three :

A. $\vec{u}.\left(\vec{c} \times \vec{w}\right)$

B. $\left(\vec{v} \times \vec{w}\right).\vec{u}$

C. $\vec{a}.\left(\vec{u} \times \vec{w}\right)$

D. $\left(\vec{u} \times \vec{v}\right).\vec{w}.$

Answer: C

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48. Which of the following expressions are meaningul :

A. $\vec{u}.\left(\vec{c} \times \vec{w}\right)$

B. $\left(\vec{u} \times \vec{v}\right).\vec{w}.$

C. $\left(\vec{v} \times \vec{w}\right).\vec{u}$

D. $\vec{u} \times \left(\vec{v}.\vec{w}\right).$

Answer: A

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49. The vector $\vec{a} = \hat{i} + \hat{j} + (m+1)\hat{k}$, $\vec{b} = \hat{i} + \hat{j} + m\hat{k}$. $\vec{c} = \hat{i} - \hat{j} + m\hat{k}$ are coplanar for :

A. $m = \frac{1}{2}$

B. $m = -\frac{1}{2}$

C. $m = 2$

D. no value of m.

Answer: D

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50. The projection of the vector $\overrightarrow{a} = 3\hat{i} - \hat{j} - 2\hat{k}$ on the vector $\overrightarrow{b} = \hat{i} + 2\hat{j} - 3\hat{k}$ is :

A. $\frac{\sqrt{14}}{2}$

B. $\frac{14}{\sqrt{2}}$

C. $\sqrt{14}$

D. 7.

Answer: A

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51. The vectors $\lambda\hat{i} + \hat{j} + 2\hat{k}$, $\hat{i} + \lambda\hat{j} - \hat{k}$ and $2\hat{i} - \hat{j} + \lambda\hat{k}$ are coplanar if :

A. $\lambda = -2$

B. $\lambda = 2$

C. $\lambda = 1$

D. $\lambda = -1$.

Answer: A

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52. 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 $\left[\vec{a}\ \vec{b}\ \vec{c}\right]$ depends on:

A. only x

B. only y

C. neither x or y

D. both x or y.

Answer: C

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53. $\vec{a} \times \left[\vec{a} \times \left(\vec{a} \times \vec{b}\right)\right]$ equals :

A. $\left(\vec{a} \,.\, \vec{a}\right)\left(\vec{a} \times \vec{b}\right)$

B. $\left(\vec{a} \,.\, \vec{a}\right)\left(\vec{b} \times \vec{a}\right)$

C. $\left(\vec{b} \,.\, \vec{b}\right)\left(\vec{a} \times \vec{b}\right)$

D. $\left(\vec{b} \,.\, Vecb\right)\left(\vec{b} \times \vec{a}\right)$.

Answer: B

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54. The vector $\hat{i} + \hat{j} + 3\hat{k}$ is rotated through an angle θ and is doubled in magnitude, then it becomes $4\hat{i} + (4x - 2)\hat{j} + 2\hat{k}$. The value of x is :

A. $-\frac{2}{3}, 2$

B. $\frac{1}{3}, 2$

C. $\frac{2}{3}, 0$

D. $2, 7$.

Answer: A

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55. If the vectors $\vec{c}$, $\vec{a} = x\hat{i} + y\hat{j} + z\hat{k}$ and $\vec{b} = \hat{j}$ are such that $\vec{a}$, $\vec{c}$ and $\vec{b}$ form a right-handed system, then $\vec{c}$ is :

A. $z\hat{i} - x\hat{k}$

B. $\vec{0}$

C. $y\hat{i}$

D. $-z\hat{i} - x\hat{k}$.

Answer: A

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56. Consider A, B, C or D with position vectors : $7\hat{i} - 4\hat{j} + 7\hat{k}$, $\hat{i} - 6\hat{j} + 10\hat{k}$, $-\hat{i} - 3\widehat{+} 4\hat{k}$ and $5\hat{i} - \hat{j} + 5\hat{k}$

respectively. Then ABCD is a:

A. rhombus

B. rectangle

C. parallelogram but not a rhombus

D. None of these

Answer: D

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57. If the vectors $\overrightarrow{AB} = 3\hat{i} + 4\hat{k}$ and $\overrightarrow{AC} = 5\hat{i} - 2\hat{j} + 4\hat{k}$ are the side of the triangle ABC, then the length of the median through A is :

A. $\sqrt{72}$

B. $\sqrt{33}$

C. $\sqrt{288}$

D. $\sqrt{18}$.

Answer: B

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58. $\vec{a}, \vec{b}, \vec{c}$ are three vectors such that $\vec{a}+\vec{b}+\vec{c}=\vec{0}, \left|\vec{a}\right|=1, \left|\vec{b}\right|=2, \left|\vec{c}\right|=3,$ then : $\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}$ is equal to :

A. -7

B. 7

C. 1

D. $0.$

Answer: A

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59. The valur of a so that the volume of parallelopiped formed by vectors $\hat{i}+a\hat{j}+\hat{k}, \hat{j}+a\hat{k}, a\hat{i}+\hat{k}$ becomes minimum is :

A. $\sqrt{3}$

B. 2

C. $\frac{1}{\sqrt{3}}$

D. $3.$

Answer: C

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60. A particle acted by constant forces $4\hat{i}+\hat{j}-3\hat{k}$ and $3\hat{i}+\hat{j}-ahtk$ is displaced from the point $\hat{i}+2\hat{j}+3\hat{k}$ to the point $5\hat{i}+4\hat{j}+\hat{k}$. The total work done by the forces is :

A. 30 units

B. 40 units

C. 50 units

D. 20 units.

Answer: B

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61. If $\vec{a}, \vec{b}, \vec{c}$ are non-coplanar vectors and λ is a real number, then the vectors $\vec{a} + 2\vec{b} + 3\vec{c}, \lambda\vec{b} + \mu\vec{c}$ and $(2\lambda - 1)\vec{c}$ ar non-coplanar for:

A. all values of λ

B. all expect one value of λ

C. all except two values of λ

D. no value of λ.

Answer: C

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62. If C is the mid-point of AB and P is an7y pont outside AB, then :

A. $\overrightarrow{PA} + \overrightarrow{PB} = \overrightarrow{PC}$

B. $\overrightarrow{PA} + \overrightarrow{PB} = 2\overrightarrow{PC}$

C. $\overrightarrow{PA} + \overrightarrow{PB} + \overrightarrow{PC} = \overrightarrow{0}$.

D. $\overrightarrow{PA} + \overrightarrow{PB} + 2\overrightarrow{PC} = \overrightarrow{0}$.

Answer: B

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63. For any vector $\overrightarrow{a}$, the value of

$\left(\overrightarrow{a} \times \hat{i}\right) + \left(\overrightarrow{a} \times \hat{j}\right)^2 \left(\overrightarrow{a} \times \hat{k}\right)^2$ is equal to :

A. $\overrightarrow{a}^2$

B. $2\overrightarrow{a}^2$

C. $4\overrightarrow{a}^2$

D. $2\vec{a}^2$.

Answer: D

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64. 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 $\left[\vec{a}\,\vec{b}\,\vec{c}\right]$ depends on:

A. only x

B. only y

C. neither x or y

D. both x or y.

Answer: C

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65. Let a,b and c be distinct non-negative numbers. If the vectors $a\hat{i} + a\hat{j} + c\hat{k}$, $\hat{i} + \hat{k}$ and $c\hat{i} + c\hat{j} + b\hat{k}$ lie in a plane, then c is :

A. the Arithmetic Mean of a and b

B. the Geometric Mean of a and b

C. the Harmonic Mean of a and b

D. equal to zero.

Answer: B

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Multiple Choice Question Level Ii

1. If $\vec{a}, \vec{b}$ and $\vec{c}$ are three non-coplanar vectors and $\vec{p}, \vec{q}$ and $\vec{r}$ are vectors defined by $\vec{p} = \frac{\vec{b} \times \vec{c}}{\left[\vec{a}\,\vec{b}\,\vec{c}\right]}, \vec{q} = \frac{\vec{c} \times \vec{a}}{\left[\vec{a}\,\vec{b}\,\vec{c}\right]}$ and

$\vec{r} = \dfrac{\vec{a} \times \vec{b}}{\left[\vec{a}\,\vec{b}\,\vec{c}\right]}$, then the value of $\left(\vec{a} + \vec{b}\right) \cdot \left(\vec{b} + \vec{c}\right) \cdot \vec{q} + \left(\vec{c} + \vec{a}\right) \cdot \vec{r}$ =

A. 0

B. 1

C. 2

D. 3

Answer: D

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2. For non zero vectors $\vec{a}, \vec{b}, \vec{c}$ $\left(\vec{a} \times \vec{b}\right). Ve = \left|\vec{a}\right|\left|\vec{b}\right|\left|\vec{c}\right|$ holds iff:

A. $\vec{a}\,.\,Vecb = 0,\ \vec{b}\,.\,Ve = 0,\ \vec{c}\,.\,\vec{a} \neq 0$

B. $\vec{b}\,.\,\vec{c} = 0,\ \vec{c}\,\vec{a} = 0,\ \vec{a}, \vec{b} \neq 0$

C. $\overrightarrow{c}.\overrightarrow{a}=0, \overrightarrow{a}.\overrightarrow{b}=0, \overrightarrow{b}.\overrightarrow{c}\neq 0$

D. $\overrightarrow{a}.\overrightarrow{b}=\overrightarrow{b}.\overrightarrow{c}=\overrightarrow{c}.\overrightarrow{a}=0.$

Answer: D

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3. If $\overrightarrow{a}=\hat{i}+\hat{j}-\hat{k}, \overrightarrow{b}=\hat{i}-\hat{j}+\hat{k}$ and $\overrightarrow{c}$ is unit vector perpendicular to the vector $\overrightarrow{a}$ and coplanar with $\overrightarrow{a}$ and $\overrightarrow{b}$, then a unit vector $\overrightarrow{d}$ perpendicular to both $\overrightarrow{a}$ and $\overrightarrow{c}$ is :

A. $\frac{1}{\sqrt{6}}\left(2\hat{i}-ahtj+\hat{k}\right)$

B. $\frac{\hat{i}+\hat{j}}{\sqrt{2}}$

C. $\frac{\hat{j}+\hat{k}}{\sqrt{2}}$

D. $\frac{\hat{i}+\hat{k}}{\sqrt{2}}.$

Answer: C

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4. If $\vec{\alpha} = 2\hat{i} + 3\hat{j} - \hat{k}, \vec{\beta} = -\hat{i} + 2\hat{j} - 4\hat{k}, \vec{\lambda} = \hat{i} + \hat{j} + \hat{k},$ then $\left(\vec{\alpha} \times \vec{\beta}\right).\left(\vec{\alpha} \times \vec{\gamma}\right)$ is :

A. 60

B. 64

C. 74

D. $-74.$

Answer: D

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5. The scalar $\vec{A}.\left(\vec{B} + \vec{C}\right) \times \left(\vec{A} + \vec{B} + \vec{C}\right)$ is :

A. 0

B. $\left[\vec{A}\vec{B}\vec{C}\right] + \left[\vec{B}\vec{C}\vec{A}\right]$

C. $2\left[\vec{A}\vec{B}\vec{C}\right]$

D. $\left[\vec{A}\,\vec{B}\,\vec{C}\right]$.

Answer: A

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6. If $\vec{a}, \vec{b}, \vec{c}$ are three non-coplanar vectors, then $\left[\vec{a}+\vec{b}+\vec{c}\;\vec{a}-\vec{c}\;\vec{a}-\vec{b}\right]$ is equal to :

A. 0

B. $\left[\vec{a}\,\vec{b}\,\vec{c}\right]$

C. $-3\left[\vec{a}\,\vec{b}\,\vec{c}\right]$

D. $2\left[\vec{a}\,\vec{b}\,\vec{c}\right]$.

Answer: C

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7. The position vectors of the points A and B are $\vec{a}$ and $\vec{b}$ respectively. P divided [AB] in the ratio $3:1$, Q is mid-point of [AP]. The positin vector of Q is :

A. $\dfrac{5\vec{a}+3\vec{b}}{8}$

B. $\dfrac{\vec{a}+3\vec{b}}{4}$

C. $\dfrac{3\vec{a}+5\vec{b}}{4}$

D. $\dfrac{3\vec{a}+\vec{b}}{4}$.

Answer: A

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8. If the non-zero vectors $\vec{a}$ and $\vec{b}$ are perpendicular to each other, then the solution of the equation $\vec{r}\times\vec{a}=\vec{b}$ is :

A. $\vec{r}=\vec{xa}+\dfrac{1}{\vec{a}\,.\,\vec{a}}\left(\vec{a}\times\vec{c}\right)$

B. $\vec{r} = \vec{x} a + \frac{1}{\vec{a} . \vec{b}}\left(\vec{a} \times \vec{b}\right)$

C. $\vec{r} = \overrightarrow{xr} \times \vec{b}$

D. $\vec{r} = \overrightarrow{xb} \times \vec{a}$.

Answer: B

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9. If the veactors $\vec{a}, \vec{b}$ and $\vec{c}$ form the sides BC,CA and AB respectively of triangle ABC, then :

A. $\vec{a} . \vec{b} + \vec{b} . \vec{c} + \vec{c} . \vec{a} = 0$

B. $\vec{a} \times \vec{b} = \vec{b} \times \vec{c} = \vec{c} \times \vec{a}$

C. $\vec{a} . \vec{b} = \vec{b} . \vec{c} = \vec{c} . \vec{a}$

D. $\vec{a} \times \vec{b} + \vec{b} \times \vec{b} \times \vec{c} \times \vec{a} = \vec{0}$.

Answer: B

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10. If $\vec{a}, \vec{b}$ and $\vec{c}$ are unit coplanar vectors, then the scalar triple product :

$$\left[2\vec{a} - \vec{b}, 2\vec{b} - \vec{c}, 2\vec{c} - \vec{a}\right] =$$

A. 0

B. 1

C. $-\sqrt{53}$

D. $\sqrt{3},$

Answer: A

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11. If $\vec{a} = \hat{i} + \hat{j} - \hat{k}, \vec{b} = -\hat{i} + 2\hat{j} + 2\hat{k}$ and $\vec{c} = -\hat{i} + 2\hat{j} - \hat{k},$ then a unit vector normal to the vectors $\vec{a} + \vec{b}$ and $\vec{b} - \vec{c}$ is :

A. $\hat{i}$

B. $\hat{j}$

C. $\hat{k}$

D. None of these.

Answer: A

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12. If $\vec{a}, \vec{b}, \vec{c}$ are unit vectors, then :

$\left|\vec{a}-\vec{b}\right|^2+\left|\vec{b}-\vec{c}\right|^2+\left|\vec{c}-\vec{a}\right|^2$ does not exceed :

A. 4

B. 9

C. 8

D. 6

Answer: B

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13. If $\overrightarrow{a} = ahti - ahtk, \overrightarrow{b} = x\hat{i} + \hat{j} + (1-x)\hat{k}$ and $\overrightarrow{c} = y\hat{i} + x\hat{j} + 1(+ x -$

then $\left[\overrightarrow{a}\overrightarrow{b}\overrightarrow{c}\right]$ depends on :

A. only x

B. only y

C. neither x or y

D. both x or y.

Answer: C

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14. Given two vectors $\hat{i} + \hat{j}$ and $\hat{i} + 2\hat{j}$, the unit vector coplanar with the two vectors and perpendicular to first is :

A. $\frac{1}{\sqrt{2}}\left(\hat{i} + \hat{j}\right)$

B. $\frac{1}{\sqrt{5}}\left(2\hat{i}+\hat{j}\right)$

C. $\pm\frac{1}{\sqrt{2}}\left(\hat{i}+\hat{k}\right)$

D. None of these.

Answer: C

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15. If $\vec{a}=3\hat{i}-5\hat{j}$ and $\vec{b}=6\hat{i}+3\hat{j}$ are two vectors and $\vec{c}$ a vector such that $\vec{c}=\vec{a}\times\vec{b}$, then $\left|\vec{a}\right|:\left|\vec{b}\right|:\left|\vec{c}\right|=$

A. $\sqrt{34}:\sqrt{45}:\sqrt{39}$

B. $\sqrt{34}:\sqrt{45}:39$

C. $34:39:45$

D. $39:35:34.$

Answer: B

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16. Let $\overrightarrow{v} = 2\hat{i} + 2\hat{j} - \hat{k}$ and $\overrightarrow{w} = \hat{i} + 3\hat{k}. If \overrightarrow{u}$ is a unit vector, then the maximum value of the scalar triple product $\left[\overrightarrow{u}\overrightarrow{v}\overrightarrow{w}\right]$ is :

A. -1

B. $\sqrt{10} + \sqrt{6}$

C. $\sqrt{59}$

D. $\sqrt{6}$.

Answer: C

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17. If $\overrightarrow{a}$ and $\overrightarrow{b}$ are two unit vectors such that $\overrightarrow{a} + 2\overrightarrow{b}$ and $5\overrightarrow{a} - 4\overrightarrow{b}$ are perpendicular to each other, then the angle between $\overrightarrow{a}$ and $\overrightarrow{b}$ is :

A. 45°

B. 60°

C. $\cos^{-1}\left(\frac{1}{3}\right)$

D. $\cos^{-1}\left(\frac{2}{7}\right)$.

Answer: B

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18. If $\vec{u}, \vec{v}$ and $\vec{w}$ are three non-coplanar vectors, then :

$\left(\vec{u} + \vec{c} - \vec{w}\right) . \left(\vec{u} - \vec{v}\right) \times \left(\vec{v} - \vec{w}\right)$ equals :

A. $\vec{u} . \vec{v} \times \vec{w}$

B. $\vec{u} . \vec{w} \times \vec{v}$

C. $3\vec{u} . \vec{u} \times \vec{w}$

D. 0

Answer: A

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19. Let $\overrightarrow{u}=\hat{i}+\hat{j}, \overrightarrow{v}=\hat{i}-\hat{j}$ and $\overrightarrow{w}=\hat{i}+2\hat{j}+3\hat{k}. If \widehat{n}$ is a unit vector such that $\overrightarrow{u}.\widehat{n}=0$ and $\overrightarrow{c}.\widehat{n}=0,$ then $\left|\overrightarrow{w}.\widehat{n}\right|$ is equal to :

A. 1

B. 2

C. 3

D. 0

Answer: C

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20. Let $\overrightarrow{a}, \overrightarrow{b}$ and $\overrightarrow{c}$ be three non-zero vectors such that no two of these are collinear.If the vector $\overrightarrow{a}+2\overrightarrow{b}$ is collinear with $\overrightarrow{c}$ and $\overrightarrow{b}+3\overrightarrow{c}$ is collinear with $\overrightarrow{a}$(λ being some non-zero scalar), then $\overrightarrow{a}+2\overrightarrow{b}+6\overrightarrow{c}$ equals:

A. $\lambda\overrightarrow{a}$

B. $\lambda \vec{b}$

C. $\lambda \vec{c}$

D. $\vec{0}$.

Answer: D

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21. Let $\vec{a}$, $\vec{b}$, and $\vec{c}$ be three non-zero vectors such that no two of them are colinear and

$$\left(\vec{a} \times \vec{b}\right) \times \vec{c} = \frac{1}{3}\left|\vec{b}\right|\left|\vec{c}\right|\vec{a}.$$

If θ is the angle between the vectors $\vec{b}$ and $\vec{c}$, then a value of $\sin\theta$ is :

A. $\frac{1}{3}$

B. $\frac{\sqrt{2}}{3}$

C. $\frac{2}{3}$

D. $\frac{2\sqrt{2}}{3}$.

Answer: D

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22. If $\vec{a} = \left(\hat{i} + \hat{j} + \hat{k}\right), \vec{a} . \vec{b} = 1$ and $\vec{a} \times \vec{b} = \hat{j} - \hat{k}$ then $\vec{b}$ is :

A. $\hat{i} - ahtj + \hat{k}$

B. $2\hat{j} - \hat{k}$

C. $\hat{i}$

D. $2\hat{i}$.

Answer: C

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23. If $\vec{a}, \vec{b}, ce$ are non-coplanar vectors and λ is a real number, then $\left[\lambda\left(\vec{a} + \vec{b}\right)\lambda^2 \vec{b} \lambda \vec{c}\right] = \left[\vec{a} \vec{b} + \vec{c} \vec{b}\right]$ for :

A. no value of λ

B. eactly one value of λ

C. ecactly two values of λ

D. exactly three values of λ.

Answer: A

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24. If $\widehat{u}$ and $\hat{v}$ are unit vactors and θ is the angle between them, the $2\widehat{u} \times 3\hat{v}$ is unit veactor for :

A. More than two values of θ.

B. No value of θ.

C. Exactly one value of θ.

D. Exactly two values of θ.

Answer: C

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25. Let $\overrightarrow{a} = \hat{i} + \hat{j} + \hat{k}, \overrightarrow{b} = \hat{i} + 2\hat{k}$ and $\overrightarrow{c} = x\hat{i} + (x-2)\hat{j} + \hat{k}$. If the vector $\overrightarrow{c}$ lies in the plane of $\overrightarrow{a}$ and $\overrightarrow{b}$, then x equals :

A. 1

B. -4

C. -2

D. 0

Answer: C

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26. The vector $\overrightarrow{a} = \alpha\hat{i} + 2\hat{j} + \beta\hat{k}$ lies in the plance of the vectors $\overrightarrow{b} = \hat{i} + \hat{j}$ and $\overrightarrow{c} = ahtj + \hat{k}$ and bisects the angle between $\overrightarrow{b} g$ and $\overrightarrow{c}$. Then which one of the following gives possible values of α and β ?

A. $\alpha = 1, \beta = 1$

B. $\alpha = 2, \beta = 2$

C. $\alpha = 1, \beta = 2$

D. $\alpha = 2, \beta = 1.$

Answer: A

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27. The non-zero vectors $\vec{a}, \vec{b}$ and $\vec{c}$ are related by $\vec{a} = 8\vec{b}$ and $\vec{c} = -7\vec{b}$. Then the angle between $\vec{a}$ and $\vec{c}$ is :

A. π

B. 0

C. $\frac{\pi}{4}$

D. $\frac{\pi}{2}.$

Answer: A

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28. Let the vectors $\vec{a}, \vec{b}, \vec{c}$ and $\vec{d}$ be such that $\left(\vec{a} \times \vec{b}\right) \times \left(\vec{c} \times \vec{d}\right) = \vec{0}$. Let P_1, P_2 be planes determined by the pairs of vectors $\vec{a}, \vec{b}$ and $\vec{c}, \vec{d}$ respectively. Then the between P_1 and P_2 is :

A. 0

B. $\pi / 4$

C. $\pi / 3$

D. $\pi / 2.$

Answer: A

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29. The unit vector which is orthgonal to the vector $\vec{a} = 3\hat{i} + 2\hat{j} + 6\hat{k}$ and is coplanar with the vectors $\vec{b} = 2\hat{i} + \hat{j} + \hat{k}$ and $\vec{c} = \hat{i} - \hat{j} + \hat{k}$

is :

A. $\dfrac{2\hat{i}-6\hat{j}+\hat{k}}{\sqrt{41}}$

B. $\dfrac{2\hat{i}-3\hat{j}}{\sqrt{13}}$

C. $\dfrac{3\hat{j}-\hat{k}}{\sqrt{10}}$

D. $\dfrac{4\hat{i}-3\hat{j}-3\hat{k}}{\sqrt{34}}$.

Answer: C

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30. If $\vec{a}, \vec{b}, \vec{c}$ are three non-zero, non-coplanar vectors and

$$\vec{b}_1=\vec{b}-\frac{\vec{b}.\vec{a}}{\left|\vec{a}\right|_2}\vec{a},\ \vec{b}_2=\vec{b}+\frac{\vec{b}.\vec{a}}{\left|\vec{a}\right|^2}\vec{a},\ \vec{c}_1=\vec{c}-\frac{\vec{c}.\vec{a}}{\left|\vec{a}\right|^2}\vec{a}+\frac{\vec{b}.}{\left|\vec{c}\right|}$$

$$+\frac{\vec{b}.\vec{c}}{\left|\vec{b}\right|^2}\vec{b}_1,$$

then the set of orthogonal vectors is :

A. $\left(\vec{a}, \vec{b}_1, \vec{c}_3\right)$

B. $\left(\vec{a}, \vec{b}_1, \vec{c}_2\right)$

C. $\left(\vec{a}, \vec{b}_1, \vec{c}_1\right)$

D. $\left(\vec{a}, \vec{b}_2, \vec{c}_2\right)$.

Answer: B

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31. Let $\vec{a} = \hat{i} + \hat{j} + \hat{k}, \vec{b} = \hat{i} - ahtj + \hat{k}$ and $\hat{i} - \hat{j} - \hat{k}$ be three vectors. A vector $\vec{v}$ in the plane of $\vec{a}$ and $\vec{b}$, whose projection on $\vec{c}$ is $\frac{1}{\sqrt{3}}$, is given by :

A. $-2\hat{i} + 5\hat{j} - 2\hat{k}$

B. $3\hat{i} + \hat{j} - 3\hat{k}$

C. $2\hat{i} + \hat{j} - 2\hat{k}$

D. $4\hat{i} + \hat{j} - 4\hat{k}$.

Answer: A

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32. The number of distinct real values of λ, for which the vectors :

$-\lambda^2\hat{i}+\hat{j}+\hat{k}, \hat{i}-\lambda^2\hat{j}+\hat{k}$ and $\hat{i}+\hat{j}-\lambda^2\hat{k}$ are coplanar, is :

A. zero

B. one

C. two

D. three.

Answer: C

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33. Let $\overrightarrow{a}, \overrightarrow{b}, \overrightarrow{c}$ be unit vectors such that $\overrightarrow{a}+\overrightarrow{b}+\overrightarrow{c}=\overrightarrow{0}$. Which one of the following is correct ?

A. $vca \times \vec{b} = \vec{b} \times \vec{c} = \vec{c} \times \vec{a} = \vec{0}$

B. $\vec{a} \times \vec{b} = \vec{b} \times \vec{c} = \vec{c} \times \vec{a} \neq \vec{0}$

C. $\vec{a} \times \vec{b} = \vec{b} \times \vec{c} = \vec{a} \times \vec{c} \neq \vec{0}$

D. $\vec{a} \times \vec{b}, \vec{b} \times \vec{c}, \vec{c} \times \vec{a}$ are mutually perpendicular.

Answer: B

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34. The edges of a parallelopiped are of unit length and are parallel to non-coplanar unit vectors $\hat{a}, \hat{b}, \hat{c}$ such that $\hat{a}.\hat{b} = \hat{b}.\hat{c} = \hat{c}.\hat{a} = 1/2$. Then the volume of the parallelopiped is :

A. $\frac{1}{\sqrt{2}}$

B. $\frac{1}{2\sqrt{2}}$

C. $\frac{\sqrt{3}}{2}$

D. $\frac{1}{\sqrt{3}}$.

Answer: A

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35. Let two non-collinear unit vectors $\widehat{a}$ and $\hat{b}$ form an acute angle. A point P moves so that at any time t the position vector $\overrightarrow{OP}$ (where O is the origin) is given by $\widehat{a}\cos t+\hat{b}\sin t$. When P is farthest from origin I, let M be the length of $\overrightarrow{OP}$ and $\widehat{u}$ be teh unit vector along $\overrightarrow{OP}$. Then P:

A. $\widehat{u}=\dfrac{\widehat{a}+\hat{b}}{\left|\widehat{a}+\hat{b}\right|}$ and $M=\left(1+\widehat{a}.\,\hat{b}\right)^{1/2}$

B. $\widehat{u}=\dfrac{\widehat{a}-\hat{b}}{\left|\widehat{a}-\hat{b}\right|}$ and $M=(1+\widehat{a}.\,Hatb)^{1/2}$

C. $\widehat{u}=\dfrac{\widehat{a}+\hat{b}}{\left|\widehat{a}+\hat{b}\right|}$ and $M=\left(1+2\widehat{a}.\,\hat{b}\right)^{1/2}$

D. $\widehat{u}=\dfrac{\widehat{a}-\hat{b}}{\left|\widehat{a}-\hat{b}\right|}$ and $M=\left(1+2\widehat{a}.\,\hat{b}\right)^{1/2}$.

Answer: A

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36. If $\vec{u}$, $\vec{\nu}$, and $\vec{w}$ are non coplanar vectors and p,q are real numbers, then the equality $\left[3\vec{u}\,p\vec{\nu}\,p\vec{w}\right]-\left[p\vec{\nu}\,\vec{w}\,q\vec{u}\right]-\left[2\vec{w}\,q\vec{\nu}\,q\vec{u}\right]=0$ holds for

A. exactly one value of (p,q)

B. exactly two values of (p,q)

C. more than two but not all values of (p,q)

D. all values of (p,q).

Answer: A

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37. If $\vec{a}, \vec{b}, \vec{c}$ and $\vec{d}$ are unit vectors such that $\left(\vec{a}\times\vec{b}\right).\left(\vec{c}\times\vec{d}\right)=1$ and $\vec{a}.Ve=\frac{1}{2}$ then :

A. $\vec{a}, \vec{b}, \vec{c}$ are non - coplanar

B. $\vec{a}, \vec{b}, \vec{d}$ are non-coplanar

C. $\vec{b}, \vec{d}$ are non-parallel

D. $\vec{a}, \vec{d}$ are parallel and $\vec{b}, \vec{c}$ are parallel.

Answer: C

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38. Let $(P(3, 2, 6)$ be a point in space and Q be point on the line $\vec{r} = (\hat{i} - \hat{j} + 2\hat{k}) + \mu(-3\hat{i} + \hat{j} + 5\hat{k})$. Then the value of μ for which the vector $\overrightarrow{PQ}$ is parallel to the plane $x - 4y + 3z = 1$ is :

A. $\frac{1}{4}$

B. $-\frac{1}{4}$

C. $\frac{1}{8}$

D. $-\frac{1}{8}$.

Answer: A

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1. Let $\overrightarrow{a} = \hat{j} - \hat{k}$ and $\overrightarrow{c} = \hat{i} - \hat{j} - \hat{k}$. Then the vector $\overrightarrow{b}$ satisfying $\overrightarrow{a} \times \overrightarrow{b} + \overrightarrow{c} = \overrightarrow{0}$ and $\overrightarrow{a} . Vecb = 3$ is :

A. $-\hat{i} + \hat{j} - 2\hat{k}$

B. $2\hat{i} - \hat{j} + 2\hat{k}$

C. $\hat{i} - \hat{j} - 2\hat{k}$

D. $\hat{i} + \hat{j} - 2\hat{k}.$

Answer: A

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2. If the vectors $\overrightarrow{a} = \hat{i} - \hat{j} + 2\hat{k}, \overrightarrow{b} = 2\hat{i} + 4\hat{j} + \hat{k}$ and $\overrightarrow{c} = \lambda\hat{i} + \hat{j} + \mu\hat{k}$ aer mutually orthogonal, then $(\lambda, \mu) =$

A. $(-3, 2)$

B. $(2, -3)$

C. $(-2, 3)$

D. $(3, -2)$.

Answer: A

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3. Let P,Q,R and S be the points on the plane with position vectors $-2\hat{i}-\hat{j}, 4\hat{i}, 3\hat{i}+3\hat{j}$ and $-3\hat{i}+2\hat{j}$ respectively. The quadrilateral PQRS must be a:

A. parallelogram, which is neither a rhombus nor a rectangle

B. square

C. reactangle, but not a square

D. rhombus, but not a square

Answer: A

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4. Two adjacent sides of a parallelogram ABCD are given by : $\overrightarrow{AB} = 2\hat{i} + 10\hat{j} + 11\hat{k}$ and $\overrightarrow{AD} = -\hat{i} + 2\hat{j} + 2\hat{k}$. The side AD is rotated by an acute angle α in the plane of the parallelogram so that AD becomes AD'. If AD' makes a right angle with the side AB, then the cosine of the angle α is given by

A. $\frac{8}{9}$

B. $\frac{\sqrt{17}}{9}$

C. $\frac{1}{9}$

D. $\frac{4\sqrt{5}}{9}$.

Answer: B

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5. If $\vec{a} = \frac{1}{\sqrt{10}}\left(3\hat{i} + \hat{k}\right)$ and $\vec{b} = \frac{1}{7}\left(2\hat{i} + 3\hat{j} - 6\hat{k}\right)$, then the value of $\left(2\vec{a} - \vec{b}\right).\left[\left(\vec{a} \times \vec{b}\right) \times \left(\vec{a} + 2\vec{b}\right]\right.$ is :

A. -5

B. -3

C. 5

D. $3.$

Answer: A

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6. The vectors $\vec{a}$ and $\vec{b}$ are not perpendicular and $\vec{c}$ and $\vec{d}$ are two vectors satisfying $\vec{b} \times \vec{c} = \vec{b} \times \vec{d}$ and $\vec{a}.\vec{d} = 0$. Then the vector $\vec{d}$ is equal to :

A. $\vec{b} - \left(\frac{\vec{b}.\vec{c}}{\vec{a}.\vec{b}}\right)\vec{c}$

B. $\vec{c} + \left(\frac{\vec{a}.\vec{c}}{\vec{a}.\vec{b}}\right)\vec{b}$

C. $\vec{b} + \left(\frac{\vec{b} \cdot \vec{c}}{\vec{a} \cdot \vec{b}}\right)\vec{c}$

D. $\vec{c} - \left(\frac{\vec{a} \cdot \vec{c}}{\vec{a} \cdot \vec{b}}\right)\vec{b}.$

Answer: D

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7. Let $\vec{a} = \hat{i} + \hat{j} + \hat{k}, \vec{b} = \hat{i} - ahtj + \hat{k}$ and $\hat{i} - \hat{j} - \hat{k}$ be three vectors. A vector $\vec{v}$ in the plane of $\vec{a}$ and $\vec{b}$, whose projection on $\vec{c}$ is $\frac{1}{\sqrt{3}}$, is given by :

A. $\hat{i} - 3\hat{j} + 3\hat{k}$

B. $-3\hat{i} - 3\hat{j} - \hat{k}$

C. $3\hat{i} - \hat{j} + 3\hat{k}$

D. $\hat{i} + 3\hat{j} - 3\hat{k}.$

Answer: C

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8. If the vectors $p\hat{i}+\hat{j}+\hat{k}, \hat{i}i+q\hat{j}+\hat{k}$ and $\hat{i}+\hat{j}+r\hat{k}(p\neq q\neq r\neq 1)$ are coplanar, then the value of pqr-$(p+q+r)$ is :

A. 2

B. 0

C. -1

D. $-2.$

Answer: D

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9. Let $\vec{a}, \vec{b}, \vec{c}$ be three non-zero vectors, which are pair-wise non-collinear. If $\vec{a}+3\vec{b}$ is collinear with c and $\vec{b}+2\vec{c}$ is collinear with $\vec{a}$, then $\vec{a}+3\vec{b}+6\vec{c}$ is :

A. $\vec{a}$ is parallel to $\vec{b}$

B. $\vec{b}$

C. $\vec{0}$

D. $\vec{a} + \vec{c}$.

Answer: C

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10. Let $\vec{a}$ and $\vec{b}$ be two unit vectors. If the vecctors $\vec{c} = \hat{a} + 2\hat{b}$ and $\vec{d} = 5\hat{a} - 4\hat{b}$ are perpendicular to each other, then the angle between $\vec{a}$ and $\vec{b}$ is :

A. $\frac{\pi}{6}$

B. $\frac{\pi}{2}$

C. $\frac{\pi}{3}$

D. $\frac{\pi}{4}$.

Answer: C

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11. Let ABCD be a parallelogram such that $\overrightarrow{AB} = \overrightarrow{q}, \overrightarrow{AD} = \overrightarrow{p}$ and $\angle BAD$ be an acute angle. If $\overrightarrow{r}$ is the vector that coincides with the altitude direacted from the vertex B to the side AD, then $\overrightarrow{r}$ is given by :

A. $\overrightarrow{r} = 3\overrightarrow{q} - \frac{3\left(\overrightarrow{p}\,.\,\overrightarrow{q}\right)}{\left(\overrightarrow{p}\,.\,\overrightarrow{p}\right)}\overrightarrow{p}$

B. $\overrightarrow{r} = -\overrightarrow{q} + \frac{\overrightarrow{p}\,.\,\overrightarrow{q}}{\overrightarrow{p}\overrightarrow{p}}\Bigg)\overrightarrow{p}$

C. $\overrightarrow{r} = \overrightarrow{q} - \left(\frac{\overrightarrow{p}\,.\,\overrightarrow{q}}{\overrightarrow{p}\,.\,\overrightarrow{p}}\right)\overrightarrow{p}$

D. $\overrightarrow{r} = -3\overrightarrow{q} + \frac{3\left(\overrightarrow{p}\,.\,\overrightarrow{q}\right)}{\left(\overrightarrow{p}\,.\,\overrightarrow{p}\right)}\overrightarrow{p}$

Answer: B

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12. If $\overrightarrow{a}$ and $\overrightarrow{b}$ are vectors such that $\left|\overrightarrow{a}+\overrightarrow{b}\right|=\sqrt{29}$ and $\overrightarrow{a}\times\left(2\hat{i}+3\hat{j}+4\hat{k}\right)=\left(2\hat{i}+3\hat{j}+4\hat{k}\right)\times\overrightarrow{b}$, then a possible value of $\left(\overrightarrow{a}+\overrightarrow{b}\right).\left(-7\hat{i}+2\hat{j}+3\hat{k}\right)$ is:

A. 0

B. 3

C. 4

D. 8

Answer: C

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13. If the vectors $\overrightarrow{AB}=3\hat{i}+4\hat{k}$ and $\overrightarrow{AC}=5\hat{i}-2\hat{j}+4\hat{k}$ are the side of the triangle ABC, then the length of the median through A is :

A. $\sqrt{72}$

B. $\sqrt{33}$

C. $\sqrt{45}$

D. $\sqrt{18}$.

Answer: B

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14. Let $\overrightarrow{PR} = 3\hat{i} + \hat{j} - 2\hat{k}$ and $\overrightarrow{SQ} = \hat{i} - 3\hat{j} - 4\hat{k}$. Determine diagonals of a parallelogram PQRS and PT $= \hat{i} + 2\hat{j} + 3\hat{k}$ be another vector. The volume of the parallelopiped determined by the vector $\overrightarrow{PT}, \overrightarrow{PQ}$ and $\overrightarrow{PS}$ is :

A. 5

B. 20

C. 10

D. 30

Answer: C

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15. If $\left[\vec{a}\times\vec{b}\;\vec{b}\times\vec{c}\;\vec{c}\times\vec{a}\right]=\lambda\left[\vec{a}\;\vec{b}\;\vec{c}\right]^2$, then λ is equal to :

A. 3

B. 0

C. 1

D. 2

Answer: C

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16. Let $\vec{a}$, $\vec{b}$, and $\vec{c}$ be three non-zero vectors such that no two of them are colinear and

$$\left(\vec{a}\times\vec{b}\right)\times\vec{c}=\frac{1}{3}\left|\vec{b}\right|\left|\vec{c}\right|\vec{a}.$$

If θ is the angle between the vectors $\vec{b}$ and $\vec{c}$, then a value of $\sin\theta$ is :

A. $\frac{2\sqrt{2}}{3}$

B. $\frac{-\sqrt{2}}{3}$

C. $\frac{2}{3}$

D. $\frac{-2\sqrt{3}}{3}$.

Answer: A

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Recent Competitive Question

1. A space vector makes the angle 150° and 60° with the positive direction of x and y-axes. The angle made by the vector with the positive direction of z-axis is :

A. 120°

B. 180°

C. 60°

D. 90°.

Answer: D

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2. If $\vec{a}, \vec{b}$, and $\vec{c}$ are unite vectors, such that $\vec{a} + \vec{b} + \vec{c} = \vec{0}$, then $2\vec{a}.\vec{b}.\vec{c} + 2\vec{c}.\vec{a} =$

A. 3

B. -3

C. 1

D. -1.

Answer: B

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3. If $\hat{i}, \hat{j}, \hat{k}$ are unit vectors along the positive direction of x^{-}, y^{-} and z-axes, then a false statement in the following is :

A. $\sum \hat{i}.\left(\hat{j}+\hat{k}\right)=0$

B. $\sum \hat{i}.\left(\hat{j}\times\hat{k}\right)=0$

C. $\sum \hat{i}\left(\hat{j}\times\hat{k}\right)=\vec{0}$

D. $\sum \hat{i}\left(\hat{j}+\hat{k}\right)=\vec{0}$.

Answer: B

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4. If $\vec{u}=\vec{a}-\vec{b}, \vec{v}=\vec{a}+\vec{b}$ and $\left|\vec{a}\right|=\left|\vec{b}\right|=2,$ then $\left|\vec{u}\times\vec{c}\right|$ is :

A. $2\sqrt{16-\left(\vec{a}.\vec{b}\right)^2}$

B. $2\sqrt{4-\left(\vec{a}.\vec{b}\right)^2}$

C. $\sqrt{16-\left(\vec{a} \cdot \vec{b}\right)^{2}}$

D. $\sqrt{4-\left(\vec{a} \cdot \vec{b}\right)^{2}}$

Answer: A

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5. The volume of the tetracedron formed by the points $(1, 1, 1)(2, 1, 3), (3, 2, 2)$ and $(3, 3, 4)$ in cubic units is :

A. $\frac{5}{6}$

B. $\frac{6}{5}$

C. 5

D. $\frac{2}{3}$

Answer: A

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6. Unit vector perpendicular to $\hat{i}-2\hat{j}+2\hat{k}$ and lying in the plance containing $\hat{i}+\hat{j}+2\hat{k}$ and $-\hat{i}+2\hat{j}+\hat{k}$ is :

A. $8\hat{i}-7\hat{j}+11\hat{k}$

B. $8\hat{i}+7\hat{j}-11\hat{k}$

C. $8\hat{i}-7\hat{j}-11\hat{k}$

D. $\frac{1}{\sqrt{234}}\left(8\hat{i}-7\hat{j}-11\hat{k}\right).$

Answer: D

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7. If $\vec{a}=\hat{i}+2\hat{j}+2\hat{k}, \left|\vec{b}\right|=5$ and angle between $\vec{a}$ and $\vec{b}$ is $\frac{\pi}{60,}$ then the area of the triangle formed by these two vectors as two side is :

A. $\frac{15}{2}$

B. 15

C. $\frac{15}{4}$

D. $\frac{15\sqrt{3}}{2}$

Answer: C

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8. If $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$ if $\vec{b}$ is a vector such that $\vec{a} \,.\, \vec{b} = \left|\vec{b}\right|$ and $\left|\vec{a} - \vec{b}\right| = \sqrt{7}$, then $\left|\vec{b}\right| =$

A. 7

B. 14

C. $\sqrt{7}$

D. $21.$

Answer: C

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9. If direction cosines of a vector of magnitude 3 are $\frac{2}{3}, -\frac{9}{3}, \frac{2}{3}$ and $a > 0$, then vector is ______

A. $2\hat{i} + \hat{j} + 2\hat{k}$

B. $2\hat{i} - \hat{j} + 2\hat{k}$

C. $\hat{i} - 2\hat{j} + 2\hat{k}$

D. $\hat{i} + 2\hat{j} + 2\hat{k}$

Answer: B

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10. Given two vectors $\hat{i} - \hat{j}$and $\hat{i} + 2\hat{j}$. The unit vector, coplanar with the two given vectors and perpendicular to $\left(\hat{i} - \hat{j}\right)$ is :

A. $\frac{1}{\sqrt{2}}\left(\hat{i} + \hat{j}\right)$

B. $\frac{1}{\sqrt{5}}\left(2\hat{i} + \hat{j}\right)$

C. $\pm\frac{1}{\sqrt{2}}\left(\hat{i} + \hat{k}\right)$

D. None of these.

Answer: A

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11. If $\vec{a}, \vec{b}, \vec{c}$ are three non-zero vector such that each one of then is perpendicular to the sum of the other two vectors, then the value of $\left|\vec{a}+\vec{b}+\vec{c}\right|^2$ is :

A. $\left|\vec{a}\right|+\left|\vec{b}\right|+\left|\vec{c}\right|$

B. $2\left(\left|\vec{a}\right|^2+\left|\vec{b}\right|^2\left|\vec{c}\right|^2\right)$

C. $\frac{1}{2}\left(\left|\vec{a}\right|^2+\left|\vec{b}\right|^2\left|\vec{c}\right|^2\right)$

D. $\left|\vec{a}\right|^2+\left|\vec{b}\right|^2+\left|\vec{c}\right|^2$

Answer: D

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