VECTOR ASSIGNMENT

1. The perimeter of the triangle whose vertices have the position vectors $(\mathbf{i}+\mathbf{j}+\mathbf{k})$, $(5\mathbf{i}+3\mathbf{j}-3\mathbf{k})$ and $(2\mathbf{i}+5\mathbf{j}+9\mathbf{k})$ is given by

(a) $15+\sqrt{157}$ (b) $15-\sqrt{157}$ (c) $\sqrt{15}-\sqrt{157}$ (d) $\sqrt{15}+\sqrt{157}$

2. If the vectors $6\mathbf{i}-2\mathbf{j}+3\mathbf{k}$, $2\mathbf{i}+3\mathbf{j}-6\mathbf{k}$ and $3\mathbf{i}+6\mathbf{j}-2\mathbf{k}$ form a triangle, then it is

(a) Right angled (b) Obtuse angled (c) Equilateral (d) Isosceles

3. The vectors $\overrightarrow{AB}=3\mathbf{i}+4\mathbf{k}$ and $\overrightarrow{AC}=5\mathbf{i}-2\mathbf{j}+4\mathbf{k}$ are the sides of a triangle *ABC*. The length of the median through *A* is

(a) $\sqrt{18}$ (b) $\sqrt{72}$ (c) $\sqrt{33}$ (d) $\sqrt{288}$

4. If **a** and **b** are two unit vectors inclined at an angle 2θ to each other, then $|\mathbf{a}+\mathbf{b}|<1$, if

(a) $\frac{\pi}{3}<\theta<\frac{2\pi}{3}$ (b) $\theta<\frac{\pi}{3}$ (c) $\theta>\frac{2\pi}{3}$ (d) $\theta=\frac{\pi}{2}$

5. If the position vectors of *A* and *B* are $\mathbf{i}+3\mathbf{j}-7\mathbf{k}$ and $5\mathbf{i}-2\mathbf{j}+4\mathbf{k}$, then the direction cosine of $\overrightarrow{AB}$ along *y*- axis is

(a) $\frac{4}{\sqrt{162}}$ (b) $-\frac{5}{\sqrt{162}}$ (c) –5 (d) 11

6. The position vectors of four points *A, B, C, D* lying in plane are **a, b, c, d** respectively. They satisfy the relation $|\mathbf{a}-\mathbf{d}|=|\mathbf{b}-\mathbf{d}|=|\mathbf{c}-\mathbf{d}|$, then the point *D* is

(a) Centroid of ΔABC (b) Circumcentre of ΔABC (c) Orthocentre of ΔABC (d) Incentre of ΔABC

7. In a parallelopiped the ratio of the sum of the squares on the four diagonals to the sum of the squares on the three coterminous edges is

(a) 2 (b) 3 (c) 4 (d) 1

8. A vector of magnitude 2 along a bisector of the angle between the two vectors $2\mathbf{i}-2\mathbf{j}+\mathbf{k}$ and $\mathbf{i}+2\mathbf{j}-2\mathbf{k}$ is

(a) $\frac{2}{\sqrt{10}}(3\mathbf{i}-\mathbf{k})$ (b) $\frac{1}{\sqrt{26}}(\mathbf{i}-4\mathbf{j}+3\mathbf{k})$ (c) $\frac{2}{\sqrt{26}}(\mathbf{i}-4\mathbf{j}+3\mathbf{k})$ (d) None of these

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

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

10. If *I* is the centre of a circle inscribed in a triangle *ABC,* then $|\overrightarrow{BC}|\overrightarrow{IA}+|\overrightarrow{CA}|\overrightarrow{IB}+|\overrightarrow{AB}|\overrightarrow{IC}$ is

(a) 0 (b) $\overrightarrow{IA}+\overrightarrow{IB}+\overrightarrow{IC}$ (c) $\frac{\overrightarrow{IA}+\overrightarrow{IB}+\overrightarrow{IC}}{3}$ (d) None of these

11. If the vector $-\mathbf{i}+\mathbf{j}-\mathbf{k}$ bisects the angle between the vector $\mathbf{e}$ and the vector $3\mathbf{i}+4\mathbf{j}$, then the unit vector in the direction of **e** is

(a) $\frac{1}{15}(11\mathbf{i}+10\mathbf{j}+2\mathbf{k})$ (b) $-\frac{1}{15}(11\mathbf{i}-10\mathbf{j}+2\mathbf{k})$ (c) $-\frac{1}{15}(11\mathbf{i}+10\mathbf{j}-2\mathbf{k})$ (d) $-\frac{1}{15}(11\mathbf{i}+10\mathbf{j}+2\mathbf{k})$

12. The sides of a parallelogram are $2\mathbf{i}+4\mathbf{j}-5\mathbf{k}$, $\mathbf{i}+2\mathbf{j}+3\mathbf{k}$,then the unit vector parallel to one of the diagonals

(a) $\frac{1}{7}(3\mathbf{i}+6\mathbf{j}-2\mathbf{k})$ (b) $\frac{1}{7}(3\mathbf{i}-6\mathbf{j}-2\mathbf{k})$ (c) $\frac{1}{7}(-3\mathbf{i}+6\mathbf{j}-2\mathbf{k})$ (d) $\frac{1}{7}(3\mathbf{i}+6\mathbf{j}+2\mathbf{k})$

13. A point *O* is the centre of a cricle circumscribed about a triangle *ABC*. Then $\overrightarrow{OA}\ \sin 2A+\overrightarrow{OB}\ \sin 2B+\overrightarrow{OC}\ \sin 2C$ is equal to

(a) $(\overrightarrow{OA}+\overrightarrow{OB}+\overrightarrow{OC})\sin 2A$ (b) $3.\ \overrightarrow{OG}$, where *G* is the centroid of triangle *ABC*

(c) $\vec{O}$ (d) None of these

14. If $\mathbf{a}+\mathbf{b}+\mathbf{c}=\alpha\mathbf{d}$, $\mathbf{b}+\mathbf{c}+\mathbf{d}=\beta\,\mathbf{a}$ and **a, b, c** are non-coplanar, then the sum of $\mathbf{a}+\mathbf{b}+\mathbf{c}+\mathbf{d}=$

(a) 0 (b) $(\beta-1)\mathbf{d}+(\alpha-1)\mathbf{a}$ (c) $(\alpha-1)\mathbf{d}-(\beta-1)\mathbf{a}$ (d) $(\alpha-1)\mathbf{d}+(\beta-1)\mathbf{a}$

15. Let **a** and **b** be two non-parallel unit vectors in a plane. If the vectors $(\alpha\mathbf{a}+\mathbf{b})$ bisects the internal angle between **a** and **b,** then α is

(a) $\frac{1}{2}$ (b) 1 (c) 2 (d) 4

16. If **a** and **b** are the position vectors of *A* and *B* respectively, then the position vector of a point *C* on *AB* produced such that $\overrightarrow{AC}=3\overrightarrow{AB}$ is

(a) 3**a** – **b** (b) 3**b** – **a** (c) 3**a** – 2**b** (d) 3**b** – 2**a**

17. If the position vectors of the points *A, B, C, D* be $2\mathbf{i}+3\mathbf{j}+5\mathbf{k}$, $\mathbf{i}+2\mathbf{j}+3\mathbf{k}$, $-5\mathbf{i}+4\mathbf{j}-2\mathbf{k}$ and $\mathbf{i}+10\mathbf{j}+10\mathbf{k}$ respectively, then

(a) $\overrightarrow{AB}=\overrightarrow{CD}$ (b) $\overrightarrow{AB}\parallel\overrightarrow{CD}$ (c) $\overrightarrow{AB}\perp\overrightarrow{CD}$ (d) None of these

18. The position vector of a point *C* with respect to *B* is $\mathbf{i}+\mathbf{j}$ and that of *B* with respect to *A* is $\mathbf{i}-\mathbf{j}$. The position vector of *C* with respect to *A* is

(a) 2**i** (b) 2**j** (c) –2**j** (d) –2**i**

19. *A* and *B* are two points. The position vector of *A* is 6**b** – 2**a.** A point *P* divides the line *AB* in the ratio 1 : 2. If **a** – **b** is the position vector of *P* , then the position vector of *B* is given by

(a) $7\mathbf{a}-15\mathbf{b}$ (b) $7\mathbf{a}+15\mathbf{b}$ (c) $15\mathbf{a}-7\mathbf{b}$ (d) $15\mathbf{a}+7\mathbf{b}$

20. The points *D, E, F* divide *BC, CA* and *AB* of the triangle *ABC* in the ratio 1 : 4, 3 : 2 and 3 : 7 respectively and the point *K* divides *AB* in the ratio 1 : 3, then $(\overrightarrow{AD}+\overrightarrow{BE}+\overrightarrow{CF}):\overrightarrow{CK}$ is equal to

(a) 1 : 1 (b) 2 : 5 (c) 5 : 2 (d) None of these

21. The point *B* divides the arc *AC* of a quadrant of a circle in the ratio 1 : 2. If *O* is the centre and $\overrightarrow{OA}=\mathbf{a}$ and $\overrightarrow{OB}=\mathbf{b}$, then the vector $\overrightarrow{OC}$ is

(a) **b** – 2**a** (b) 2**a** – **b** (c) 3**b** – 2**a** (d) None of these

22. The point having position vectors $2\mathbf{i}+3\mathbf{j}+4\mathbf{k}$, $3\mathbf{i}+4\mathbf{j}+2\mathbf{k}$, $4\mathbf{i}+2\mathbf{j}+3\mathbf{k}$ are the vectices of

(a) Right angled triangle (b) Isosceles triangle (c) Equilateral triangle (d) Collinear

23. Let *p* and *q* be the position vectors of *P* and *Q* respectively with respect to *O* and $|\mathbf{p}|=p$, $|\mathbf{q}|=q$. The points *R* and *S* divide *PQ* internally and externally in the ratio 2 : 3 respectively. If $\overrightarrow{OR}$ and $\overrightarrow{OS}$ are perpendicular,then

(a) $9p^2=4q^2$ (b) $4p^2=9q^2$ (c) $9p=4q$ (d) $4p=9q$

24. The position vectors of the points *A, B, C* are $(2\mathbf{i}+\mathbf{j}-\mathbf{k})$, $(3\mathbf{i}-2\mathbf{j}+\mathbf{k})$ and $(\mathbf{i}+4\mathbf{j}-3\mathbf{k})$ respectively. These points

(a) Form an isosceles triangle (b) Form a right-angled triangle (c) Are collinear (d)Form a scalene triangle

25. *ABCDEF* is a regular hexagon where centre *O* is the origin. If the position vectors of *A* and *B* are $\mathbf{i}-\mathbf{j}+2\mathbf{k}$ and $2\mathbf{i}+\mathbf{j}-\mathbf{k}$ respectively, then $\overrightarrow{BC}$ is equal to

(a) $\mathbf{i}-\mathbf{j}+2\mathbf{k}$ (b) $-\mathbf{i}+\mathbf{j}-2\mathbf{k}$ (c) $3\mathbf{i}+3\mathbf{j}-4\mathbf{k}$ (d) None of these

26. Let $\overrightarrow{AB}=3\mathbf{i}+\mathbf{j}-\mathbf{k}$ and $\overrightarrow{AC}=\mathbf{i}-\mathbf{j}+3\mathbf{k}$. If the point *P* on the line segment *BC* is equidistant from *AB* and *AC*, then $\overrightarrow{AP}$ is

(a) $2\mathbf{i}-\mathbf{k}$ (b) $\mathbf{i}-2\mathbf{k}$ (c) $2\mathbf{i}+\mathbf{k}$ (d) None of these

27. If $4\mathbf{i}+7\mathbf{j}+8\mathbf{k}$, $2\mathbf{i}+3\mathbf{j}+4\mathbf{k}$, and $2\mathbf{i}+5\mathbf{j}+7\mathbf{k}$ are the position vectors of the vertices *A, B* and *C* respectively of triangle *ABC.* The position vector of the point where the bisector of angle *A* meets *BC,* is

(a) $\frac{2}{3}(-6\mathbf{i}-8\mathbf{j}-6\mathbf{k})$ (b) $\frac{2}{3}(6\mathbf{i}+8\mathbf{j}+6\mathbf{k})$ (c) $\frac{1}{3}(6\mathbf{i}+13\mathbf{j}+18\mathbf{k})$ (d) $\frac{1}{3}(5\mathbf{j}+12\mathbf{k})$

28. Three points whose position vectors are $\mathbf{a}+\mathbf{b}$, $\mathbf{a}-\mathbf{b}$ and $\mathbf{a}+k\mathbf{b}$ will be collinear, if the value of *k* is

(a) Zero (b) Only negative real number (c) Only positive real number (d) Every real number

29. The points with position vectors $10\mathbf{i}+3\mathbf{j}$, $12\mathbf{i}-5\mathbf{j}$ and $a\mathbf{i}+11\mathbf{j}$ are collinear, If *a* =

(a) – 8 (b) 4 (c) 8 (d) 12

30. Let the value of $\mathbf{p}=(x+4y)\mathbf{a}+(2x+y+1)\mathbf{b}$ and $\mathbf{q}=(y-2x+2)\mathbf{a}+(2x-3y-1)\mathbf{b}$, where **a** and **b** are non-collinear vectors. If $3\mathbf{p}=2\mathbf{q}$, then the value of *x* and *y* will be

(a) – 1, 2 (b) 2, –1 (c) 1, 2 (d) 2, 1

31. If $(x, y, z)\neq(0, 0, 0)$ and $(\mathbf{i}+\mathbf{j}+3\mathbf{k})x+(3\mathbf{i}-3\mathbf{j}+\mathbf{k})y+(-4\mathbf{i}+5\mathbf{j})z=\lambda(x\mathbf{i}+y\mathbf{j}+z\mathbf{k})$, then the value of λ will be

(a) – 2, 0 (b) 0, – 2 (c) – 1, 0 (d) 0, – 1

32. The vectors $\mathbf{i}+2\mathbf{j}+3\mathbf{k}$, $\lambda\mathbf{i}+4\mathbf{j}+7\mathbf{k}$, $-3\mathbf{i}-2\mathbf{j}-5\mathbf{k}$ are collinear, if λ equals

(a) 3 (b) 4 (c) 5 (d) 6

33. If three points *A, B* and *C* have position vectors (1, *x*, 3), (3, 4, 7) and (*y*, – 2, – 5) respectively and if they are collinear, then (*x*, *y*) =

(a) (2, – 3) (b) (– 2, 3) (c) (2, 3) (d) (– 2, – 3)

34. The position vectors of three points are $2\mathbf{a}-\mathbf{b}+3\mathbf{c}$, $\mathbf{a}-2\mathbf{b}+\lambda\mathbf{c}$ and $\mu\mathbf{a}-5\mathbf{b}$ where **a**, **b**, **c** are non-coplanar vectors. The points are collinear when

(a) $\lambda=-2,\ \mu=\frac{9}{4}$ (b) $\lambda=-\frac{9}{4},\ \mu=2$ (c) $\lambda=\frac{9}{4},\ \mu=-2$ (d) None of these

35. Three points whose position vectors are **a, b, c** will be collinear if

(a) $\lambda\mathbf{a}+\mu\mathbf{b}=(\lambda+\mu)\mathbf{c}$ (b) $\mathbf{a}\times\mathbf{b}+\mathbf{b}\times\mathbf{c}+\mathbf{c}\times\mathbf{a}=0$ (c) $[\mathbf{a}\ \mathbf{b}\ \mathbf{c}]=0$ (d) None of these

36. If $\mathbf{p}=\mathbf{i}-2\mathbf{j}+3\mathbf{k}$ and $\mathbf{q}=3\mathbf{i}+\mathbf{j}+2\mathbf{k}$, then a vector along **r** which is linear combination of **p** and **q** and also perpendicular to **q** is

(a) $\mathbf{i}+5\mathbf{j}-4\mathbf{k}$ (b) $\mathbf{i}-5\mathbf{j}+4\mathbf{k}$ (c) $-\frac{1}{2}(\mathbf{i}+5\mathbf{j}-4\mathbf{k})$ (d) None of these

37. If **a** and **b** are two non zero and non-collinear vectors, then **a** + **b** and **a** – **b** are

(a) Linearly dependent vectors (b) Linearly independent vectors
(c) Linearly dependent and independent vectors (d) None of these

38. If **p, q** are two non-collinear and non-zero vectors such that $(\mathbf{b}-\mathbf{c})\mathbf{p}\times\mathbf{q}+(\mathbf{c}-\mathbf{a})\mathbf{p}+(\mathbf{a}-\mathbf{b})\mathbf{q}=0$, where **a, b, c** are the lengths of the sides of a triangle, then the triangle is

(a) Right angled (b) Obtuse angled (c) Equilateral (d) Isosceles

39. If $\mathbf{r}=3\mathbf{i}+2\mathbf{j}-5\mathbf{k}$, $\mathbf{a}=2\mathbf{i}-\mathbf{j}+\mathbf{k}$, $\mathbf{b}=\mathbf{i}+3\mathbf{j}-2\mathbf{k}$ and $\mathbf{c}=-2\mathbf{i}+\mathbf{j}-3\mathbf{k}$ such that $r=\lambda\,\mathbf{a}+\mu\,\mathbf{b}+\nu\,\mathbf{c}$ then

(a) $\mu,\ \frac{\lambda}{2},\ \nu$ are in A.P. (b) $\lambda,\ \mu,\ \nu$ are in A.P. (c) $\lambda,\ \mu,\ \nu$ are in H.P. (d) $\mu,\ \lambda,\ \nu$ are in G.P.

40. If **a** is any vector in space, then

(a) $\mathbf{a}=(\mathbf{a}.\mathbf{i})\mathbf{i}+(\mathbf{a}.\mathbf{j})\mathbf{j}+(\mathbf{a}.\mathbf{k})\mathbf{k}$ (b) $\mathbf{a}=(\mathbf{a}\times\mathbf{i})+(\mathbf{a}\times\mathbf{j})+(\mathbf{a}\times\mathbf{k})$
(c) $\mathbf{a}=\mathbf{j}(\mathbf{a}.\mathbf{i})+\mathbf{k}(\mathbf{a}.\mathbf{j})+\mathbf{i}(\mathbf{a}.\mathbf{k})$ (d) $\mathbf{a}=(\mathbf{a}\times\mathbf{i})\times\mathbf{i}+(\mathbf{a}\times\mathbf{j})\times\mathbf{j}+(\mathbf{a}\times\mathbf{k})\times\mathbf{k}$

41. If **a, b** and **c** are unit vectors, then $|\mathbf{a}-\mathbf{b}|^2+|\mathbf{b}-\mathbf{c}|^2+|\mathbf{c}-\mathbf{a}|^2$ does not exceed

(a) 4 (b) 9 (c) 8 (d) 6

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

(a) 45° (b) 60° (c) $\cos^{-1}\left(\frac{1}{3}\right)$ (d) $\cos^{-1}\left(\frac{2}{7}\right)$

43. If $\mathbf{a}=\mathbf{i}+2\mathbf{j}+2\mathbf{k}$ and $\mathbf{b}=3\mathbf{i}+6\mathbf{j}+2\mathbf{k}$, then a vector in the direction of **a** and having magnitude as $|\mathbf{b}|$ is

(a) $7(\mathbf{i}+\mathbf{j}+\mathbf{k})$ (b) $\frac{7}{3}(\mathbf{i}+2\mathbf{j}+2\mathbf{k})$ (c) $\frac{7}{9}(\mathbf{i}+2\mathbf{j}+2\mathbf{k})$ (d) None of these

44. The vector $\mathbf{b}=3\mathbf{j}+4\mathbf{k}$ is to be written as the sum of a vector $\mathbf{b}_1$ parallel to $\mathbf{a}=\mathbf{i}+\mathbf{j}$ and a vector $\mathbf{b}_2$ perpendicular to **a**. Then $\mathbf{b}_1=$

(a) $\frac{3}{2}(\mathbf{i}+\mathbf{j})$ (b) $\frac{2}{3}(\mathbf{i}+\mathbf{j})$ (c) $\frac{1}{2}(\mathbf{i}+\mathbf{j})$ (d) $\frac{1}{3}(\mathbf{i}+\mathbf{j})$

45. The components of a vector **a** along and perpendicular to the non-zero vector **b** are respectively

(a) $\frac{\mathbf{a}.\mathbf{b}}{|\mathbf{a}|},\frac{|\mathbf{a}\times\mathbf{b}|}{|\mathbf{a}|}$ (b) $\frac{\mathbf{a}.\mathbf{b}}{|\mathbf{b}|},\frac{|\mathbf{a}\times\mathbf{b}|}{|\mathbf{b}|}$ (c) $\frac{\mathbf{a}.\mathbf{b}}{|\mathbf{a}|},\frac{\mathbf{a}.\mathbf{b}}{|\mathbf{a}|}$ (d) $\frac{|\mathbf{a}\times\mathbf{b}|}{|\mathbf{a}|},\frac{|\mathbf{a}\times\mathbf{b}|}{|\mathbf{b}|}$

46. Let $\mathbf{b}=4\mathbf{i}+3\mathbf{j}$ and **c** be two vectors perpendicular to each other in the *xy*-plane. All vectors in the same plane having projections 1 and 2 along **b** and **c** respectively, are given by

(a) $2\mathbf{i}-\mathbf{j},\ \frac{2}{5}\mathbf{i}+\frac{11}{5}\mathbf{j}$ (b) $2\mathbf{i}+\mathbf{j},\ -\frac{2}{5}\mathbf{i}+\frac{11}{5}\mathbf{j}$ (c) $2\mathbf{i}+\mathbf{j},\ -\frac{2}{5}\mathbf{i}-\frac{11}{5}\mathbf{j}$ (d) $2\mathbf{i}-\mathbf{j},\ -\frac{2}{5}\mathbf{i}+\frac{11}{5}\mathbf{j}$

47. Let $\mathbf{a}=2\mathbf{i}-\mathbf{j}+\mathbf{k}$, $\mathbf{b}=\mathbf{i}+2\mathbf{j}-\mathbf{k}$ and $\mathbf{c}=\mathbf{i}+\mathbf{j}-2\mathbf{k}$ be three vectors. A vector in the plane of **b** and **c** whose projection on **a** is of magnitude $\sqrt{2/3}$ is

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

48. If **a** and **b** are two vectors, then $(\mathbf{a}\times\mathbf{b})^2$ equals

(a) $\begin{vmatrix}\mathbf{a}.\mathbf{b} & \mathbf{a}.\mathbf{a}\\ \mathbf{b}.\mathbf{b} & \mathbf{b}.\mathbf{a}\end{vmatrix}$ (b) $\begin{vmatrix}\mathbf{a}.\mathbf{a} & \mathbf{a}.\mathbf{b}\\ \mathbf{b}.\mathbf{a} & \mathbf{b}.\mathbf{b}\end{vmatrix}$ (c) $\begin{vmatrix}\mathbf{a}.\mathbf{b}\\ \mathbf{b}.\mathbf{a}\end{vmatrix}$ (d) None of these

49. Given $\mathbf{a}=\mathbf{i}+\mathbf{j}-\mathbf{k}$, $\mathbf{b}=-\mathbf{i}+2\mathbf{j}+\mathbf{k}$ and $\mathbf{c}=-\mathbf{i}+2\mathbf{j}-\mathbf{k}$. A unit vector perpendicular to both $\mathbf{a}+\mathbf{b}$ and $\mathbf{b}+\mathbf{c}$ is

(a) **i** (b) **j** (c) **k** (d) $\frac{\mathbf{i}+\mathbf{j}+\mathbf{k}}{\sqrt{3}}$

50. For any two vectors **a** and **b**, $(\mathbf{a}\times\mathbf{b})^2$ is equal to

(a) a^2-b^2 (b) a^2+b^2 (c) $a^2b^2-(\mathbf{a}.\mathbf{b})^2$ (d) None of these