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Chapter: - Vectors and three –Dimensional Geometry

1 marks question

Q1. For what value of p, the vectors $2\hat{i}-3\hat{j}$ and $p\hat{i}-6\hat{j}$ are parallel. **Ans. 4,**

Q2. Find the angle between the vectors $\hat{i}-\hat{j}$ and $\hat{i}+\hat{j}$. **Ans. 90^0**

Q3. Find a unit vector perpendicular to $2\hat{i}-\hat{j}+\hat{k}$, and $3\hat{i}-4\hat{j}-\hat{k}$. **Ans.** $\frac{1}{\sqrt{3}}(\hat{i}+\hat{j}-\hat{k})$,

Q4. If P(1, 5, 4) and Q (4, 1,-2) Find direction ratio and direction cosines of $\vec{PQ}$, **Ans.** (3,-4,-6), $\frac{3}{\sqrt{61}},\frac{-4}{\sqrt{61}},\frac{-6}{\sqrt{61}}$

Q5. $|\vec{a}|$ =10, $|\vec{b}|$ =2, and $\vec{a}\cdot\vec{b}$ =12, Find $|\vec{a}\times\vec{b}|$ **Ans.** 16

Q6. $|\vec{a}|$ =2, $|\vec{b}|$ =5, and $|\vec{a}\times\vec{b}|$ =8, Find $\vec{a}\cdot\vec{b}$, **Ans.** ±6

Q7. Find the value of $\hat{i}.(\hat{j}\times\hat{k})+\hat{j}.(\hat{i}\times\hat{k})+\hat{k}.(\hat{i}\times\hat{j})$ **Ans.** 1

Q8. If α is the angle between any two vector $\vec{a}$ and $\vec{b}$ such that $|\vec{a}\times\vec{b}|$ = $|\vec{a}.\vec{b}|$. Find the value of α **Ans.** π/4

Q9. Find the projection of the vector $\hat{i}+\hat{j}+\hat{k}$ on the vector $\hat{i}$, **Ans.** 1

Q10. For what value of λ the vectors $2\hat{i}+\lambda\hat{j}+\hat{k}$ and $\hat{i}-2\hat{j}+3\hat{k}$ are perpendicular to each other. **Ans.**5/2

Q11. The x-coordinate of a point on the line joining the points Q (2, 2, 1) and R (5, 1,-2) is 4 Find its z-coordinate. **Ans.** -1

Q12. Find distance of the point (-2, 4,-5) from the line $\frac{x+3}{3}=\frac{y-4}{5}=\frac{z+8}{6}$, **Ans.** $\sqrt{\frac{37}{10}}$

4/6 marks question

Q13. Express the vector $\vec{a}=5\hat{i}-2\hat{j}+5\hat{k}$ as sum of two vectors such that one is parallel to the vector $\vec{b}=3\hat{i}+\hat{k}$ and the other is perpendicular to $\vec{b}$. **Ans.** $6\hat{i}+2\hat{k},\ -\hat{i}-2\hat{j}+3\hat{k}$

Q14. If the vectors $\vec{a}=2\hat{i}-\hat{j}+\hat{k}$, $\vec{b}=\hat{i}+2\hat{j}+3\hat{k}$, and $\vec{c}=3\hat{i}+\lambda\hat{j}+5\hat{k}$ are coplanar. Find the value of λ. **Ans.** 2

Q15. Given that $\vec{a}=\hat{i}+\hat{j}$, $\vec{b}=\hat{j}-3\hat{k}$, and $\vec{c}=\hat{i}+4\hat{k}$ verify that $\vec{a}\times(\vec{b}\times\vec{c})=(\vec{a}.\vec{c})\vec{b}-(\vec{a}.\vec{b})\vec{c}$

Q16. If the vectors $\vec{a}=\hat{i}+\hat{j}+\hat{k}$` and $\vec{b}=\hat{j}-\hat{k}$ find a vector $\vec{c}$ such that $\vec{a}\times\vec{c}=\vec{b}$ and $\vec{a}.\vec{c}=3$

Ans. $\frac{5}{3}\hat{i}+\frac{2}{3}\hat{j}+\frac{2}{3}\hat{k}$

Q17. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are three vectors such that $\vec{a}+\vec{b}+\vec{c}=\vec{0}$ then prove that $\vec{a}\times\vec{b}=\vec{b}\times\vec{c}=\vec{c}\times\vec{a}$

Q18. For any vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ evaluate $\vec{a}\times(\vec{b}+\vec{c})+\vec{b}\times(\vec{c}+\vec{a})+\vec{c}\times(\vec{a}+\vec{b})$ **Ans.** 0 **P.T.O.**

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Q19. Find the unit vector perpendicular to the plane ABC , where the position vectors of A,B, and C are $2\hat{i}-\hat{j}+\hat{k}$, $\hat{i}+\hat{j}+2\hat{k}$, and $2\hat{i}+3\hat{k}$ respectively. **Ans**. $\frac{3}{\sqrt{14}}\hat{i}+\frac{2}{\sqrt{14}}\hat{j}-\frac{1}{\sqrt{14}}\hat{k}$

Q20. Show that the area of parallelogram having diagonals $3\hat{i}+\hat{j}-2\hat{k}$` and $2\hat{i}-6\hat{j}+8\hat{k}$ is $10\sqrt{3}$ sq units.

Q21. If $\vec{b}\times\vec{c}=\vec{c}\times\vec{a}\neq 0$ then prove that $\vec{a}+\vec{b}=\lambda\vec{c}$ where λ is a scalar.

Q22. . If $\vec{a}\times\vec{b}=\vec{c}\times\vec{d}$ and $\vec{a}\times\vec{c}=\vec{b}\times\vec{d}$ then prove that $\vec{a}-\vec{d}$ is parallel to $\vec{b}-\vec{c}$,

Q23. . If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are three vectors such that $\vec{a}\times\vec{b}=\vec{c}$ and $\vec{b}\times\vec{c}=\vec{a}$ prove that $\vec{a}$, $\vec{b}$, $\vec{c}$ are mutually at right angles and $|\vec{b}|$ =1, $|\vec{c}|=|\vec{a}|$

Q24. Find the distance between the planes 4x-2y +4z+5=0 and 2x-y +2z +3 =0, **Ans**. 1/6

Q25. Find the equation of the plane through (3,4,-1) which is parallel to the plane $\vec{r}.(2\hat{i}-3\hat{j}+5\hat{k})+2=0$ **,Ans.** $\vec{r}.(2\hat{i}-3\hat{j}+5\hat{k})+11=0$ **,**

Q26. Find the equation of the plane passing through the point (1,-1, 2) and (2, -2, 2) and which is perpendicular to the plane 6x-2y +2z =9, **Ans**. x+y -2z+4=0,

Q27 Find the equation of the plane passing through the point(-1,-1,2) and perpendicular to each of the following planes;2x+3y-3z=2,and 5x-4y+z=6, **Ans**. 9x+17y+23z-20=0,

Q28. Find the equation of the plane which meets the axes in A, B, C given that the centroid of the triangle ABC is the point (α,β,γ), **Ans**. $\frac{x}{\alpha}+\frac{y}{\beta}+\frac{z}{\gamma}=3$,

Q29.Find the length and the foot of the perpendicular from the point (7,14,5) to the plane 2x+4y-z=2, **Ans**.$3\sqrt{21}$ and (1, 2, 8)

Q30. Find the length and the foot of the perpendicular drawn from the point (2,-1,5) to the line $\frac{x-11}{10}=\frac{y+2}{-4}=\frac{z+8}{-11}$ **Ans**. $\sqrt{14}$ and (1, 2, 3)

Q31. Find the image of the point (1, 2, 3) on the line $\frac{x-6}{3}=\frac{y-7}{2}=\frac{z-7}{-2}$ **Ans**. (5, 8, 15)

Q32 Find the equation of the plane passing through the line of intersection of the planes $\vec{r}.(\hat{i}+\hat{j}+\hat{k})=1$ and 2x +3y-z+4=0,and parallel to x-axis, **Ans**. y-3z+6=0,

Q33. Find the S.D between the lines whose vector equation are:- $\vec{r}=(\hat{i}+2\hat{j}+3\hat{k})+\lambda(2\hat{i}+3\hat{j}+4\hat{k})$ and $\vec{r}=(2\hat{i}+4\hat{j}+5\hat{k})+\mu(4\hat{i}+6\hat{j}+8\hat{k})$ **Ans.** $\frac{\sqrt{5}}{\sqrt{29}}$

Q34. If the lines $\frac{x-1}{-3}=\frac{y-2}{2\lambda}=\frac{z-3}{2}$ and $\frac{x-1}{3\lambda}=\frac{y-1}{1}=\frac{z-6}{-5}$ are perpendicular then find the value of λ.

Ans. -10/7

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