Model Question Paper

Vector Algebra - Part II

12th Standard

Maths

Reg.No. : | | | | | | |

I.Answer all the Questions.

II.Use blue pen only.

Time : 01:00:00 Hrs

Total Marks : 80

Section-A

4 x 1 = 4

1) The vectors $2\vec{i}+3\vec{j}+4\vec{k}$ and $a\vec{i}+b\vec{j}+c\vec{k}$ are perpendicular when

(a) $a=2\ ,\ b=3\ ,\ c=-4$ (b) $a=4\ ,\ b=4\ ,\ c=5$ (c) $a=4\ ,\ b=4\ ,\ c=-5$ (d) $a=-2\ ,\ b=3\ ,\ c=4$

2) The area of the parallelogram having a diagonal $3\vec{i}+\vec{j}-\vec{k}$ and a side $\vec{i}-3\vec{j}+4\vec{k}$ is ,

(a) $10\sqrt{3}$ (b) $6\sqrt{30}$ (c) $\frac{3}{2}\sqrt{30}$ (d) $3\sqrt{30}$

3) If $\left|\vec{a}+\vec{b}\right|=\left|\vec{a}-\vec{b}\right|$ then

(a) $\vec{a}$ is parallel to $\vec{b}$ (b) $\vec{a}$ is perpendicular to $\vec{b}$ (c) $|\vec{a}|=\left|\vec{b}\right|$ (d) $\vec{a}$ and $\vec{b}$ are unit vectors

4) If $\vec{p},\vec{q}$ and $\vec{p}+\vec{q}$ are vectors of magnitude λ then the magnitude of $|\vec{p}-\vec{q}|$ is

(a) 2λ (b) $\sqrt{3}\lambda$ (c) $\sqrt{2}\lambda$ (d) 1

Section-B

4 x 3 = 12

5) If the sum of two unit vectors is a unit vector prove that the magnitude of their difference is $\sqrt{3}$

6) Show that the vectors $3\vec{i}-2\vec{j}+\vec{k},\vec{i}-3\vec{j}+5\vec{k}\quad and\quad 2\vec{i}+\vec{j}-4\vec{k}$ form a right angled triangle.

7) Show that the points whose position vectors $4\vec{i}-3\vec{j}+\vec{k},2\vec{i}-4\vec{j}+5\vec{k},\vec{i}-\vec{j}$ form a right angle.

8) A force magnitude 5 units acting parallel to $2\vec{i}-2\vec{j}+\vec{k}$ displaces the point of application from $(1,2,3)\ to\ (5,3,7)$. Find the work done.

Section-C

4 x 6 = 24

9) Let $\vec{a},\vec{b},\vec{c}$ be unit vectors such that $\vec{a}.\vec{b}=\vec{a}.\vec{c}=0$ and the angle between $\vec{b}$ and $\vec{c}$ is $\frac{\pi}{6}$. Prove that $\vec{a}=\pm 2\left(\vec{b}\times\vec{c}\right)$.

10) Prove by vector method that the parallelogram on the same base and between the same parallel are equal in area.

11) Prove that twice the area of a parallelogram is equal to the area of another parallelogram formed by taking as its adjacent sides the diagonals of the former parallelogram.

12) a) The constant forces $2\vec{i}-5\vec{j}+6\vec{k},-\vec{i}+2\vec{j}-\vec{k},and\quad 2\vec{i}+7\vec{j}$ act on a particle which is displaced from position $4\vec{i}-3\vec{j}-2\vec{k}$ to position $6\vec{i}+\vec{j}-3\vec{k}$. Find the work done.

b) Find the unit vectors perpendicular to the plane containing the vectors $2\vec{i}+\vec{j}+\vec{k}\quad and\quad \vec{i}+2\vec{j}+\vec{k}$

Section-D

4 x 10 = 40

13) Show that the lines $\frac{x-1}{1}=\frac{y+1}{-1}=\frac{z}{3}$ and $\frac{x-2}{1}=\frac{y-1}{2}=\frac{-z-1}{1}$ intersect and find their point of intersection

14) Find the vector and Cartesian equations of the plane containing the line $\frac{x-2}{2}=\frac{y-2}{3}=\frac{z-1}{3}$ and parallel to the line $\frac{x+1}{3}=\frac{y-1}{2}=\frac{z+1}{1}$.

15) Find the vector and Cartesian equation of the plane through the point $(1,3,2)$ and parallel to the lines $\frac{x+1}{2}=\frac{y+2}{-1}=\frac{z+3}{3}$ and $\frac{x-2}{1}=\frac{y+1}{2}=\frac{z+2}{2}$

16) Find the vector and Cartesian equation to the plane through the point (-1,3,2) and perpendicular to the planes $x+2y+2z=5$ and $3x+y+2z=8$

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