Model Question Paper

Vector Algebra - Part V

12th Standard

Maths

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

I.Answer all the Questions.

II.Use blue pen only.

Time : 02:00:00 Hrs

Total Marks : 58

Section-A

4 x 1 = 4

1) The work done by the force $\vec{F} = \vec{i} + \vec{j} + \vec{k}$acting on a particle, if the particle is displaced from $A\ (3, 3, 3)$ to the point $B\ (4, 4, 4)$ is,

(a) 2 units (b) 3 units (c) 4 units (d) 7 units

2) If $\vec{a} = \vec{i} - 2\vec{j} + 3\vec{k}$and $\vec{b} = 3\vec{i} + \vec{j} + 2\vec{k}$then a unit vector perpendicular to $\vec{a}\ and\ \vec{b}$is,

(a) $\frac{\vec{i}+\vec{j}+\vec{k}}{\sqrt{3}}$ (b) $\frac{\vec{i}-\vec{j}+\vec{k}}{\sqrt{3}}$ (c) $\frac{-\vec{i}+\vec{j}+\overrightarrow{2k}}{\sqrt{3}}$ (d) $\frac{\vec{i}-\vec{j}-\vec{k}}{\sqrt{3}}$

3) The point of intersection of the lines $\frac{x-6}{-6} = \frac{y+4}{+4} = \frac{z-4}{-8}$and $\frac{x+1}{2} = \frac{y+2}{4} = \frac{z+3}{-2}$is

(a) (0, 0, -4) (b) (1, 0, 0) (c) (0, 2, 0) (d) (1, 2, 0)

4) The point of intersection of the lines $\vec{r} = (\overrightarrow{-i} + \overrightarrow{2j} + \overrightarrow{3k}) + t(\overrightarrow{-2i} + \vec{j} + \vec{k})$and $\vec{r} = (\overrightarrow{2i} + \overrightarrow{3j} + \overrightarrow{5k}) + s(\vec{i} + \overrightarrow{2j} + \overrightarrow{3k})$is,

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

Section-B

8 x 3 = 24

5) Show that the following planes are at right angles.$\vec{r}.\left(2\vec{i} - \vec{j} + \vec{k}\right) = 15\ \ and\ \ \vec{r}.\left(-\vec{i} - \vec{j} - 3\vec{k}\right) = 3$

6) The planes $\vec{r}.\left(2\vec{i} + \lambda\vec{j} - 3\vec{k}\right) = 10\ \ and\ \vec{r}.\left(\lambda\vec{i} + 3\vec{j} + \vec{k}\right) = 5$ are perpendicular. Find λ.

7) Find the angle between the line $\frac{x-2}{3} = \frac{y+1}{-1} = \frac{z-3}{-2}$and the plane $3x + 4y + z + 5 = 0$

8) Find the angle between the line$\vec{r} = \vec{i} + \vec{j} + 3\vec{k} + \lambda\left(2\vec{i} + \vec{j} - \vec{k}\right)$ and the plane $\vec{r}.\left(\vec{i} + \vec{j}\right) = 1$

9) Find the angle between the following planes: $2x + y - z = 9\ and\ x + 2y + z = 7$

10) Find the angle between the following planes: $2x - 3y + 4z = 1\ \ and\ \ -x + y = 4$

11) Find the centre and radius of each of the following spheres.

$\vec{r}^2 - \vec{r}.\left(4\vec{i} + 2\vec{j} - 6\vec{k}\right) - 11 = 0$

12) Find the angle between the vectors $2\vec{i} + \vec{j} - \vec{k}$ and $\vec{i} + 2\vec{j} + \vec{k}$ by using cross product.

Section-C

3 x 10 = 30

13) Find the vector and Cartesian equations of the plane, through the point (1,2,-2) and parallel to the line $\frac{x+2}{3} = \frac{y+1}{-2} = \frac{z-4}{-4}$ and perpendicular to the plane 2x+3y+3z=8.

14) Prove that $\cos(A + B) = \cos A \cos B - \sin A \sin B$

15) a) Find the vector and Cartesian equation of the plane passing through the point (-1,-2,1) and perpendicular to two planes x+2y+4z+7=0 and 2x-y+3z+3=0

(OR)

b) Find the vector and Cartesian equations of the plane which contains the line $\frac{x-2}{-1} = \frac{-y}{3} = \frac{z+1}{1}$ and perpendicular to the plane x-2y+3z-2=0

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