Model Question Paper

Vector Algebra - Part IV

12th Standard

Maths

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

I.Answer all the Questions.

II.Use blue pen only.

Time : 02:00:00 Hrs

Total Marks : 80

Section-A

4 x 1 = 4

1) If $\left[\vec{a}+\vec{b}, \vec{b}+\vec{c}, \vec{c}+\vec{a}\right] = 8$ then $\left[\vec{a}, \vec{b}\ ,\ \vec{c}\right]$ is

(a) 4 (b) 16 (c) 32 (d) -4

2) The value of $\left[\vec{i}+\vec{j}, \vec{j}+\vec{k}, \vec{k}+\vec{i}\right]$ is equal to

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

3) The shortest distance of the point $(2\ ,\ 10\ ,\ 1)$ from the plane $\vec{r}\ .\ (3\vec{i}-\vec{j}+4\vec{k}) = 2\sqrt{26}$ is

(a) $2\sqrt{26}$ (b) $\sqrt{26}$ (c) 2 (d) $\frac{1}{\sqrt{26}}$

4) The vector $(\vec{a}\times\vec{b})\times(\vec{c}\times\vec{d})$ is

(a) perpendicular to $\vec{a}, \vec{b}, \vec{c}\ and\ \vec{d}$ (b) parallel to the vectors $(\vec{a}\times\vec{b})\ and (\vec{c}\times\vec{d})$

(c) parallel to the line of intersection of the plane containing $\vec{a}\ and\ \vec{b}$ and the plane containing $\vec{c}\ and\ \vec{d}$

(d) perpendicular to the line of intersection of the plane containing $\vec{a}\ and\ \vec{b}$ and the plane containing $\vec{c}\ and\ \vec{d}$

Section-B

4 x 3 = 12

5) Find the area of the triangle whose vertices are $(3, -1, 2), (1, -1, -3)\ and\ (4, -3, 1)$

6) Show that torque about the point $A\ (3, -1, 3)$ of a force $4\vec{i}+2\vec{j}+\vec{k}$ through the point $B\ (5, 2, 4)$ is $\vec{i}+2\vec{j}-8\vec{k}$

7) Show that vectors $\vec{a}, \vec{b}, \vec{c}$ are coplanar if $\vec{a}+\vec{b}, \vec{b}+\vec{c}, \vec{c}+\vec{a}$ and only if are coplanar.

8) The volume of a parallelopiped whose edges are represented by $-12\vec{i}+\lambda\vec{k}, 3\vec{j}-\vec{k}, 2\vec{i}+\vec{j}-15\vec{k}$ is 546. Find the value of λ.

Section-C

4 x 6 = 24

9) Find the shortest distance between the parallel lines $\vec{r} = \left(2\vec{i}-\vec{j}-\vec{k}\right)+t\left(\vec{i}-2\vec{j}+3\vec{k}\right)\ \ and\ \ \vec{r} = \left(\vec{i}-2\vec{j}+\vec{k}\right)+s\left(\vec{i}-2\vec{j}+3\vec{k}\right)$

10) Show that the following two lines are skew lines: $\vec{r} = \left(3\vec{i}+5\vec{j}+7\vec{k}\right)+t\left(\vec{i}-2\vec{j}+\vec{k}\right)\ \ and\ \ \vec{r} = \left(\vec{i}+\vec{j}+\vec{k}\right)+s\left(7\vec{i}+6\vec{j}+7\vec{k}\right)$

11) Find the shortest distance between the skew lines $\frac{x-6}{3} = \frac{y-7}{-1} = \frac{z-4}{1}\quad and\quad \frac{x}{-3} = \frac{y+9}{2} = \frac{z-2}{4}$

12) Show that $(2, -1, 3), (1, -1, 0)\ and\ (3, -1, 6)$ are collinear.

Section-D

4 x 10 = 40

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

14) Find the vector and Cartesian equations of the plane passing through the points $(-1, 1, 1)$ and $(1, -1, 1)$ and perpendicular to the plane $x+2y+2z = 5$

15) Find the vector and Cartesian equations of the plane passing through the points $(2, 2, -1)$, $(3, 4, 2)$ and $(7, 0, 6)$

16) a) Find the vector and Cartesian equations of a plane which is at a distance of 18 units from the origin and which is normal to the vector $2\vec{i}+7\vec{j}+8\vec{k}$

b) The foot of the perpendicular drawn from the origin to a plane is $(8, -4, 3)$. Find the equation of the plane.

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