Brain International School

Vikas Puri, New Delhi

ASSIGNMENT NO. 4

SUBJECT: MATHEMATICS **CLASS-XII** **OCTOBER,2025**

Ch Vectors and 3d

Ques1 Show that the points with position vectors $\vec{a} - 2\vec{b} + 3\overrightarrow{c} - 2\vec{a} + 3\vec{b} + 2\vec{c}$, and -8$\vec{a} + 13\vec{b}$ are Collinear

Ques2 if the position vector $\vec{a}$ of a point (12,n) is such that $|\vec{a}|$=13 find n

Ques3 find a vector of magnitude 5 units which is parallel to $2\hat{\imath} - \hat{\jmath}$

Ques4 if $\vec{a} = \hat{\imath} + \hat{\jmath} + 2\hat{k}$ and $\vec{b} = 3\hat{\imath} + 2\hat{\jmath} - \hat{k}\ find\ (\vec{a} + 3\vec{b}).(2\vec{a} - \vec{b})$

Ques5 for any vector $\vec{r}$, prove that $\vec{r}$= $(\vec{r}.\hat{\imath})\hat{\imath} + (\vec{r}.\hat{\jmath})\hat{\jmath} + (\vec{r}.\hat{k})\hat{k}$

Ques6 if $\hat{a}\ and\ \hat{b}\ are\ unit\ vectors$ inclined at an angle θ then prove that $sin\frac{\theta}{2} = \frac{1}{2}\left|\hat{a} - \hat{b}\right|$

Ques7 find $|\vec{a}|$ and $|\vec{b}|$ if $(\vec{a} - \overrightarrow{b}).(\vec{a} + \vec{b}) = 27\ and\ |\vec{a}| = 2|\vec{b}|$

Ques8 if two vectors $\vec{a}$ and $\vec{b}$ are such that $|\vec{a}| = 3$, $|\vec{b}| = 2\ and\ \vec{a}.\vec{b} = 6\ find\ |\vec{a} + \vec{b}|\ and\ |\vec{a} - \vec{b}|$

Ques9 if $\hat{a}\ and\ \hat{b}$ are unit vectors inclined to an angle θ then prove that cos$\frac{\theta}{2}$=$\frac{1}{2}\left|\hat{a} + \hat{b}\right|$

Ques10 if $\vec{a} = 5\hat{\imath} - \hat{\jmath} - 3\hat{k}$ and $\vec{b} = \hat{\imath} + 3\hat{\jmath} - 5\hat{k}$ then show that the vectors $\vec{a} + \vec{b}\ and\ \vec{a} - \vec{b}$ are orthogonal

Ques11 find a unit vector perpendicular to the plane ABC where A,B,C are A (3,-1,2) B(1,-1,-3) and C(4,-3,1) resp.
hint $\hat{n} = \frac{\overrightarrow{AB} \times \overrightarrow{AC}}{|\overrightarrow{AB} \times \overrightarrow{AC}|}$

Ques12 Given $|\vec{a}| = 10, |\vec{b}| = 2$ and $\vec{a}.\vec{b} = 12$ find $|\vec{a} \times \vec{b}|$

Ques13 show that $(\vec{a} \times \vec{b})^2$=$\begin{vmatrix} \vec{a}.\vec{a} & \vec{a}.\vec{b} \\ \overrightarrow{a.b} & \vec{b}.\vec{b} \end{vmatrix}$

Ques14 if $\vec{a}, \vec{b}, \vec{c}$ are position vectors of the verticesA, B, C of a ΔABC , show that area of ΔABC is
$\frac{1}{2}\left|\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a}\right|$ and deduce the condition for collinear

Ques15 for any three vectors $\vec{a}, \vec{b}\ and\ \vec{c}$ show that $\vec{a} \times (\vec{b} + \vec{c})$+$\vec{b} \times (\vec{c} + \vec{a}) + \vec{c} \times (\vec{a} + \vec{b}) = \vec{0}$

Ques16. determine the point in XY –plane which is equidistant from three points A(2,0,3) B(0,3,2) C(0,0,1)

Ques17. find the ratio in which the line joining the points (1,2,3) and (-3,4,-5) is divided by xy-plane .find the co-ordinate of point of division .

Ques18. A vector $\overrightarrow{OP}$ is inclined to ox at 45° and OY at 60° find the angle at which $\overrightarrow{OP}$ is inclined at OZ

Ques19. the Cartesian equations of a line are 6x-2=3y+1=2z-2 . find its direction ratios and also find vector equation of a line

Ques 20if the points A(-1,3,2) B(-4,2,-2) c(5,5,γ) are collinear . find the value of γ

Ques21 find the equation of the line passing through the points A(-1,3,-2) and perpendicular to

lines $\frac{x}{1}=\frac{y}{2}=\frac{z}{3}$ and $\frac{x+2}{-3}=\frac{y-1}{2}=\frac{z+1}{5}$

Ques22.find foot of perpendicular from the point(0,2,3) on the line $\frac{x+3}{5}=\frac{y-1}{2}=\frac{z+4}{3}$. also find the Length of perpendicular

Ch linear programmimg

Q 1 If the feasible region for a LPP is _____, then the optimal value of the objective function Z = ax + by may or may not exist.

Q 2 In a LPP if the objective function Z = ax + by has the same maximum value on two corner points of the feasible region, then every point on the line segment joining these two points give the same _____ value.

Q 3 The closed half plane represented by 5x + 2y – 10 ≥ 0 contains point (1, 0).

Q 4 In LPP, the objective function is always _____

Q 5 In a LPP if the objective unction Z = ax + by has the same minimum value on two corner points of the feasible region, then every point on the line segment joining these two points give the same minimum value.

Q 6 If the feasible region for a LPP is unbounded, then the optimal value of the objective function Z =ax + by may or may not exist.

Q 7 Corner points of the feasible region determined by the system f linear constraints are (0, 3), (1, 1) and (3, 0). Let Z = px + qy, where p, q > 0. Condition on p and q so that the minimum value of Z occurs at (3, 0) and (1, 1) is:

(a) p = 2q (b) p = q (c) p = 3q (d) q = 2p

Q 8 Corner points of the feasible region determined by the system of linear constraints are (0, 3), (1, 1) and (3, 0). Let Z = 4x + 5y be the objective function. The minimum value of Z occurs at:

(a) (0, 3) only

(b) (3, 0) only

(c) (1, 1) only

(d) any point of the line segment joining the points (1, 1) and (0, 3)

Q 9 Corner points of the feasible region determined by the system of linear constraints are (0, 3), (1, 1) and (3, 0). Let Z = px + qy, where p, q > 0. Condition on p and q so that the minimum value of Z occurs at (3, 0) and (0, 3) is

(a) p = 2q (b) p = q (c) p = 3q (d) q = 2p