

5) 3-D CO-ORDINATES

1 x 2 = 2 Marks

 IMP FORMULAS, KEY CONCEPTS 

1.1) If $P(x, y, z)$ is a point in space then $|x|$ denotes the perpendicular distance of P from the $y z$ plane and $|y|, |z|$ denote the perpendicular distances of P from zx plane, xy plane respectively.

1.2) The distance of $P(x, y, z)$ from the xy plane is $|z|$

1.3) The distance of $P(x, y, z)$ from the X -axis is $\sqrt{y^2 + z^2}$

2.1) The distance between the two points $A(x_1, y_1, z_1), B(x_2, y_2, z_2)$ is

$$AB = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

2.2) The distance between $O(0, 0, 0)$ and $P(x, y, z)$ is $OP = \sqrt{x^2 + y^2 + z^2}$

3) If a point P collinear with $A(x_1, y_1, z_1), B(x_2, y_2, z_2)$ divides the line segment $\overline{AB}$ in the ratio

$$l : m \text{ internally then } P = \left(\frac{lx_2 + mx_1}{l + m}, \frac{ly_2 + my_1}{l + m}, \frac{lz_2 + mz_1}{l + m} \right)$$

4.1) The ratio in which the point $P(x, y, z)$ collinear with $A(x_1, y_1, z_1), B(x_2, y_2, z_2)$ divides the line segment $\overline{AB}$ is $(x_1 - x) : (x - x_2)$ or $(y_1 - y) : (y - y_2)$ or $(z_1 - z) : (z - z_2)$

4.2) The ratio in which the line segment joining $A(x_1, y_1, z_1), B(x_2, y_2, z_2)$ divided by

(i) yz plane is $-x_1 : x_2$ (ii) zx plane is $-y_1 : y_2$ (iii) xy plane is $-z_1 : z_2$

5) If the points $A(x_1, y_1, z_1), B(x_2, y_2, z_2), C(x_3, y_3, z_3)$ are collinear, in this order then

$$(i) AB + BC = AC \quad (ii) \frac{x_1 - x_2}{x_2 - x_3} = \frac{y_1 - y_2}{y_2 - y_3} = \frac{z_1 - z_2}{z_2 - z_3}$$

6.1) The centroid of the triangle formed by the points $A(x_1, y_1, z_1), B(x_2, y_2, z_2)$ & $C(x_3, y_3, z_3)$ is

$$G = \left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3}, \frac{z_1 + z_2 + z_3}{3} \right)$$

6.2) The centroid of the tetrahedron formed by $(x_1, y_1, z_1), (x_2, y_2, z_2), (x_3, y_3, z_3)$ & (x_4, y_4, z_4) is

$$G = \left(\frac{x_1 + x_2 + x_3 + x_4}{4}, \frac{y_1 + y_2 + y_3 + y_4}{4}, \frac{z_1 + z_2 + z_3 + z_4}{4} \right)$$