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 $l:m$ 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) $AB+BC=AC$ (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 tetrahedran 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

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