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Lecture notes - 21
BCA I Year (II Sem)
Mathematics - II (Unit - 5)

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Topic - Straight line

* The equation of straight line in general form is $ax+by+cz+d=0$

* The equation of straight line in symmetrical form is

$$\frac{x-\alpha}{l} = \frac{y-\beta}{m} = \frac{z-\gamma}{n}$$

Case-I The equation of straight line passing through (α, β, γ) and having direction cosines proportional to a, b, c is

$$\frac{x-\alpha}{a} = \frac{y-\beta}{b} = \frac{z-\gamma}{c}$$

* Equation of straight line passing through two points (x_1, y_1, z_1) and (x_2, y_2, z_2) is

$$\frac{x-x_1}{x_2-x_1} = \frac{y-y_1}{y_2-y_1} = \frac{z-z_1}{z_2-z_1}$$

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Imp

Exp-1 Find where the line $\frac{x-1}{2} = \frac{y-2}{-3} = \frac{z+3}{4}$ meets the plane $2x+4y-z+1=0$

Solution Given $\frac{x-1}{2} = \frac{y-2}{-3} = \frac{z+3}{4} = r$ (Let) ——— (1)

and given plane $2x+4y-z+1=0$ ——— (2)

Then any point p on the line is

$(2r+1, -3r+2, 4r-3)$

If line intersect the given plane at point p then

$2(2r+1)+4(-3r+2)-(4r-3)+1=0$

$\Rightarrow \cancel{4r}+2-12r+8-\cancel{4r}+3+1=0$

$\Rightarrow 12r+14=0 \quad \Rightarrow r = \frac{14}{12} = \frac{7}{6}$

Hence $\left[2\left(\frac{7}{6}\right)+1, -3\left(\frac{7}{6}\right)+2, 4\left(\frac{7}{6}-3\right)\right]$

$\Rightarrow \left[\frac{10}{3}, -\frac{3}{2}, \frac{5}{3}\right]$ Ans

Imp

Exp-2 Find the Coordinates of the point where the line joining the points $(2,-3,1)$ and $(3,-4,-5)$ meets the plane $2x+y+z=7$

Solution: The equation of Straight line passing through two points is

$$\frac{x-x_1}{x_2-x_1} = \frac{y-y_1}{y_2-y_1} = \frac{z-z_1}{z_2-z_1} = r$$

$\because$ points are $(2,-3,1)$ and $(3,-4,-5)$

$$\Rightarrow \frac{x-2}{3-2} = \frac{y+3}{-4+3} = \frac{z-1}{-5-1} = r$$

$$\Rightarrow \frac{x-2}{1} = \frac{y+3}{-1} = \frac{z-1}{-6} = r$$

$$\Rightarrow x = r+2, \quad y = -r-3, \quad z = -6r+1$$

then $P(x,y,z) = (r+2, -r-3, -6r+1)$

If the point lies on the given plane

$$\Rightarrow 2(r+2) + (-r-3) + (-6r+1) = 7$$

$$\Rightarrow 2r+4-r-3-6r+1 = 7$$

$$\Rightarrow -5r+2 = 7$$

$$\Rightarrow -5r = 5 \Rightarrow \boxed{r=-1}$$

Then required points are

$$x = -1+2 = 1, \quad y = +1-3 = -2, \quad z = -6(-1)+1 = 7$$

$$P(x,y,z) = (1,-2,+7)$$ Ans