4.4.2

AI25BTECH11006

Question: If the equation of a line is

$$x = ay + b, \quad z = cy + d,$$

then find its parametric form.

Solution:
The given equations are

$$x = ay + b, \quad z = cy + d.$$

Step 1: Choose a parameter. Let

$$y = t, \quad t \in \mathbb{R}.$$

Step 2: Express x, y, z in terms of t. Substituting $y = t$, we get

$$x = at + b, \quad y = t, \quad z = ct + d.$$

Step 3: Parametric form of the line. Thus, the parametric equations of the line are

$$x = at + b, \quad y = t, \quad z = ct + d.$$

the parametric vector form of the line is $\mathbf{r}(t) = \begin{pmatrix} b \\ 0 \\ d \end{pmatrix} + t \begin{pmatrix} a \\ 1 \\ c \end{pmatrix}$