

**Question 10:** If  $S$  is the set of distinct values of 'b' for which the following system of linear equations  $x + y + z = 1$   
 $x + ay + z = 1$   $ax + by + z = 0$  has no solution, then  $S$  is :

- (a) an empty set
- (b) an infinite set
- (c) a finite set containing two or more elements
- (d) a singleton

**Answer: (d)**

**Solution:**

$$D = \begin{vmatrix} 1 & 1 & 1 \\ 1 & a & 1 \\ a & b & 1 \end{vmatrix}$$

$$= -(a - 1)^2 = 0$$

$$\Rightarrow a = 1$$

We get first two planes co-incident for  $a = 1$ .

$$x + y + z = 1$$

$$x + y + z = 1$$

$$x + by + z = 0$$

If  $b = 1$ , the system will be inconsistent and hence no solution.

If  $b \neq 1$ , the system will produce infinite solutions.

Hence, for no solution,  $S$  has to be a singleton set  $\{1\}$ .