Step-1

We have $\det A = 6$ and

$$\det A = \begin{vmatrix} \text{row } 1 \\ \text{row } 2 \\ \text{row } 3 \end{vmatrix} = \begin{vmatrix} \text{row } 1 + \text{row } 2 \\ \text{row } 2 + \text{row } 3 \\ \text{row } 3 \end{vmatrix}$$

Step-2

$$\det B = \begin{vmatrix} \text{row } 1 + \text{row } 2 \\ \text{row } 2 + \text{row } 3 \\ \text{row } 3 + \text{row } 1 \end{vmatrix}$$

Therefore

$$= \det A + \begin{vmatrix} \text{row } 1 + \text{row } 2 \\ \text{row2+row } 3 \\ \text{row } 1 \end{vmatrix}$$

Step-3

$$\det B = \det A + \begin{vmatrix} \text{row } 2 \\ \text{row } 2 + \text{row } 3 \\ \text{row } 1 \end{vmatrix}$$

$$= \det A + \begin{vmatrix} \text{row } 2 \\ \text{row } 3 \\ \text{row } 1 \end{vmatrix}$$

Step-4

$$\det B = \det A - \begin{vmatrix} \text{row } 2 \\ \text{row } 1 \\ \text{row } 3 \end{vmatrix}$$

$$= \det A + \begin{vmatrix} \text{row } 1 \\ \text{row } 2 \\ \text{row } 3 \end{vmatrix}$$

$$= \det A + \det A$$

$= 6 + 6$

$= \boxed{12}$