If a, b, c are all different and $\begin{vmatrix} a & a^3 & a^4-1 \\ b & b^3 & b^4-1 \\ c & c^3 & c^4-1 \end{vmatrix} = 0$, then the value of $abc(ab+bc+ca)$ is equal to:

Solution:

$$\Rightarrow abc \begin{vmatrix} b+a & b^2+a^2+ab \\ c+a & c^2+a^2+ac \end{vmatrix} = \begin{vmatrix} 1 & b^2+a^2+ab \\ 1 & c^2+a^2+ac \end{vmatrix}$$

Applying $R_2 \to R_2 - R_1$ and then cancelling $c - b$ on both sides, we get

$$\Rightarrow abc \begin{vmatrix} b+a & b^2+a^2+ab \\ 1 & a+b+c \end{vmatrix} = \begin{vmatrix} 1 & b^2+a^2+ab \\ 0 & a+b+c \end{vmatrix}$$

$$\therefore abc(ab+b^2+bc+a^2+ab+ac-b^2-c^2-ab) = a+b+c$$

$$\Rightarrow abc(ab+bc+ca) = a+b+c$$

A $a-b-c$

B $a-b+c$

C $a+b+c$

D 0

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