

Step-1

Given that the cyclic transformation T is defined by $T(v_1, v_2, v_3) = (v_2, v_3, v_1)$.

We have to find $T(T(T(v)))$ and $T^{100}(v)$.

Step-2

Now

$$\begin{aligned} T(T(T(v))) &= T(T(v_2, v_3, v_1)) \quad (\text{Since by (1)}) \\ &= T(v_3, v_1, v_2) \\ &= (v_1, v_2, v_3) \\ &= v \end{aligned}$$

Hence $\boxed{T(T(T(v))) = v}$

Step-3

We have $T(T(T(v))) = T^3(v) = v$

Now

$$\begin{aligned} T^{100}(v) &= T\left((T^3)^{33}(v)\right) \\ &= T(v) \quad (\text{Since } T^3(v) = v) \\ &= (v_2, v_3, v_1) \end{aligned}$$

Hence $\boxed{T^{100}(v) = T(v)}$