Ans to the ques no:- C

Given that, $L_3 = \{w \in \{0,1,2\}^* : 0^n 1^n 2^n \text{ where } n \geq 0\}$
Say L_3 is regular. P is the pumping length.
Assume, $w = 0^{p} 1^p 2^p$

Here, $|w| \geq p$

$w = xyz$

$|xy| \leq p$

$y \neq \varepsilon$

$xy^iz \in L_3$, where $i \geq 0$

So, after decomposing w into xyz,

$x = 0^d$

$y = 0^f \quad [f \geq 1]$

$z = 0^{p-d-f} 1^p 2^p \quad [d+f \leq p]$

Lets say, $i = 2$

$\therefore xy^iz = 0^d (0^f)^2 0^{p-d-f} 1^p 2^p$

$= 0^{d}\ 0^{2f}\ 0^{p-d-f}\ 1^{p}\ 2^{p}$

$= 0^{d+2f+p-d-f}\ 1^{p}\ 2^{p}$

$= 0^{c+f}\ 1^{p}\ 2^{p}$

If, $0^{p+f}\ 1^{p}\ 2^{p} \in L_3$,

then, $p+f = p$

$\Rightarrow f = 0$

However, the precondition was $f \geq 1$.

So, this is a contradiction.

Therefore, L_3 is not regular.