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sec : 11

Ans no 1

a) $L = \{ w \in \{0,1\}^* : ww^R$ and w^R means w in reverse$\}$

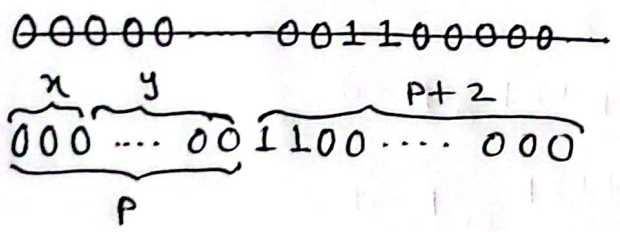
Let, L is a regular language.

pumping length = p

$S = ww^R$

$= 0^p 1 1 0^p$

length = 2p + 2



x consists of some 0's

y consists of some 0's

$i = 1$, $S = xyz \in L$

$i = 2$, $s' = xyyz = 0^p 0^{|y|} 1 1 0^p$

$= 0^{p+|y|} 1 1 0^p \notin L$

∴ L is not regular.

b) $L = \{ w \in \{a, b\}^* : w = b^n a^m$ where $n > m, m \geq 0 \}$

Let, L in a regular language

pumping length = p

$s = b^{p+d} a^p$

x consists of some b's

y " of " b's

$i = 1, s = xyz \in L$

$i = 2, s' = xyyz$

$= b^p b^{|y|} b^d a^p$

$= b^{p+|y|} b^d a^p \notin L$

∴ L in not regular.

e) $L = \{ w \in \{0, 1, 2, 3\}^* : w = 1^n 0^m 3^n 2^m, n, m \geq 0 \}$

Let, L in a regular language

pumping length = p

Assume $n = m$

$s = 1^p 0^p 3^p 2^p$

length $= 4p > p$

$i = 1, s = xyz \notin L$

$i = 2, s' = xyyz = 1^p 1^{|y|} 0^p 3^p 2^p$

$= 1^{p+|y|} 0^p 3^p 2^p \notin L$

L in not regular.

d) $L = \{ w \in \{0,1\}^* : w = 1^n : n \text{ is a power of three} \}$

Let L is a regular language.

pumping length $= p$

$s = 1^n$

$= 1^{3^p}$ $[n = 3^p]$

length $= 3^p > p$

$i = 1, s = xyz \in L$

$j = 2, s' = xyyz = 1^{3^p + |y|}$

So, $3^p + |y| \geq 3^{p+1}$

$\Rightarrow |y| \geq 3^{p+1} - 3^p = 2 \cdot 3^p$

$p \geq |y| \geq 2 \cdot 3^p$, but $3^p > p$

So, L is not a regular language.