

## Q2

Saturday, June 6, 2020

1:17 PM

$$L_1 = \{a^n b^m c^h \mid n, m, h \in \mathbb{Z}^+, 2h = n - 3m\}$$

$$L_2 = \{a^n b^m c^h \mid n, m, h \in \mathbb{Z}^+, 2h \geq n - 3m\}$$

Q1 solution

Prove  $L_1$  is regular with pumping lemma

$$L_1 = \{a^n b^m c^h \mid n, m, h \in \mathbb{Z}^+, 2h = n - 3m\}$$

$$p = 20 + 3l$$

$$w = a^p b^l c^0 \mid 20 = p - 3l, w \in L_1, |w| > p$$

$$y = a^k, p \geq k \geq 1, |xy| \leq p, |y| \geq 1$$

$$xz = a^{p-k} b^l c^0, p-k < 20 + 3l$$

$$\Rightarrow xz \notin L_1$$

$\therefore L_1$  is non regular

$L_2 \cup L_1$

where  $L_2 (2h \geq n - 3m)$  includes  $L_1 (2h = n - 3m)$

$L_2$  is also non-regular

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