

## Quiz 1 - 230125

● Graded

Student

Abhinav Shripad

Total Points

15 / 15 pts

Question 1

Q1

15 / 15 pts

Regularity of  $L_1$

✓ + 1 pt Claiming that  $L_1$  is regular

✓ + 4 pts Constructing the DFA for  $L_1$

+ 1 pt correct regex without correctness proof

+ 4 pts correct regex with proof

Regularity of  $L_2$

✓ + 1 pt Claiming that  $L_2$  is regular

✓ + 4 pts Constructing the DFA for  $L_2$

+ 3 pts correct regex without correctness proof

+ 4 pts correct regex with proof

✓ + 2.5 pts Claiming that  $L' = L \cap L_1 \cap L_2$

✓ + 2.5 pts Showing that  $L'$  is regular by closure properties

+ 0 pts Totally Incorrect / Unattempted

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COL352: Introduction to Automata & Theory of Computation

QUIZ

Date:

15 minutes

Maximum marks: 15

Let  $L_1 = \{ w \in \Sigma^* \mid w \text{ contain odd "b"} \}$   
and  $L_2 = \{ w \in \Sigma^* \mid w \text{ contain "aa"} \}$

Claim:-  $L_1$  and  $L_2$  are regular.

Proof:- DFA for  $L_1 = (\{q_0, q_1\}, \Sigma, \delta, q_0, \{q_1\})$

where  $\delta(q_0, b) = q_1$ ,  $\delta(q_1, b) = q_0$

and  $\delta(q_i, x) = q_i$  where  $x \in \Sigma$ ,  $x \neq b$ .

This recognize  $L_1$

Consider NFA for  $L_2$  as ~~follows~~ follows:-



(closed under difference)

$\Rightarrow L_1, L_2$  are regular  $\Rightarrow L_1 \setminus L_2$  is regular (tutorial)

Let  $(Q_1, \Sigma, \delta_1, q_0^1, F_1)$  and  $(Q_2, \Sigma, \delta_2, q_0^2, F_2)$  be the DFA, ~~construct~~ construct DFA for  $L'$  as  $(Q, \Sigma, \delta, q_0, F)$  as

$Q = Q_1 \times Q_2$ ,  $q_0 = (q_0^1, q_0^2)$ ,

$\delta(q_1, q_2, a) = (\delta_1(q_1, a), \delta_2(q_2, a))$

$F = \{ (q_1, q_2) \mid q_1 \in F_1, q_2 \in Q_2 \setminus F_2 \}$ .

This clearly recognizes  $L'$  as it is  $L_1 \setminus L_2$

$\Rightarrow (L_1 \setminus L_2) \cap L = L'$  is regular (closed under intersection and difference)