Quiz 2

● Graded

Student

PALLAV GOYAL

Total Points

15 / 15 pts

Question 1

Question 1

3 / 3 pts

✔ **+ 3 pts** Correct

Question 2

Question 2

4 / 4 pts

✔ **+ 4 pts** Correct answer :

$1^* + (10)^* + (100)^*$ **or**

$1^* + 10(10)^* + 100(100)^*$

Question 3

Question 3

4 / 4 pts

✔ **+ 4 pts** Correct

Question 4

Question 4

4 / 4 pts

✔ **+ 4 pts** Correct

CS340 (2024) – Quiz 2

Duration: 40 minutes, Total marks: 15, Pages: 4.

- **Important note.** Answers without clear and concise explanations will not be graded.

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Problems

1. **(3 marks)** Let $\Sigma = \{0, 1\}$. Consider the regular expressions γ_1 and γ_2 given below.

   - $\gamma_1 = (0(0+1)^*0) + (1(0+1)^*1) + 0 + 1$.
   - $\gamma_2 = 0^*(10^*)^*001$.

   Question. Is $L(\gamma_1) \cap L(\gamma_2) = \emptyset$? If "Yes", give a precise justification. If "No", give a string $x \in \Sigma^*$ such that $x \in L(\gamma_1) \cap L(\gamma_2)$ and explain.

No, $x = 1001$ lies in both $L(\gamma_1)$ and $L(\gamma_2)$

In γ_1 looking at $(1(0+1)^*1)$, 00 lies in $(0+1)^*$

Hence 1001 lies in $(1(0+1)^*1)$ and hence in γ_1

In γ_2 looking at $0^*(10^*)^*001$

$$\underbrace{\epsilon}_{0^*}\ \underbrace{(1\epsilon)}_{1 \text{ times}}\ 001 = 1001$$ lies in $L(\gamma_2$

PALLAV GOYAL 220747

2. **(4 marks)** Let $\Sigma = \{0, 1\}$ and let N be the automaton given in Figure 1. Write a regular expression γ with **at most two occurrences** of "+" such that $L(\gamma) = L(N)$. Give a brief and precise justification for your answer.

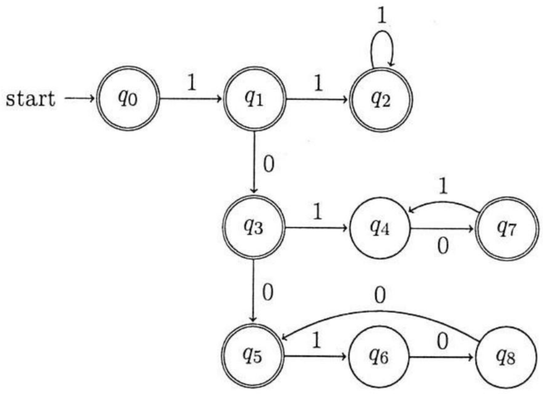


Figure 1: Automaton N

$\gamma = 1^* + (10)^* + (100)^*$

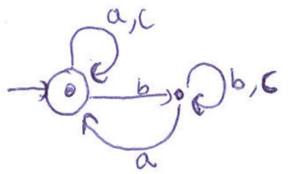
The accepting states q_0, q_1, q_2 are captured by 1^*

The accepting states q_0, q_3, q_7 are captured by $(10)^*$

The accepting states q_0, q_5 are captured by $(100)^*$

PALLAV GOYAL 220747

3. **(4 marks)** Let $\Sigma = \{a, b, c\}$ and let $\gamma = (a+c)^*(b(b+c)^*a(a+c)^*)^*$ be a regular expression. Construct a DFA M with at most 2 states such that $L(\gamma) = L(M)$. Give a brief and precise justification for your answer.



We can ~~som~~ consider the initial state q_1 which is accepting state and the other state as q_2.

We move to q_2 from q_1 at the first sight of b and move back to q_1 at first sight of a

$$\underbrace{(a+c)^*}_{q_1}\ (b\ \underbrace{(b+c)^*}_{q_2}\ \underbrace{a\,(a+c)^*}_{q_1})^*$$

$(a+c)^*$ means any arbitrary string without b
$(b+c)^*$ means any arbitrary string without a
The intution is if we arrive at a b then we must get ~~atl~~ atleast one a after that b

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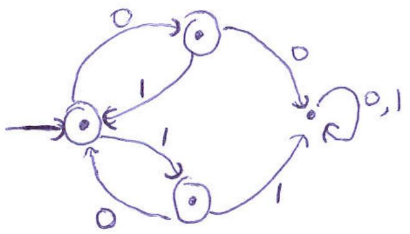
4. **(4 marks)** Let $\Sigma = \{0, 1\}$ and $\gamma = (01 + 10)^*(0 + 1 + \epsilon)$. Construct a DFA M with at most 4 states such that $L(M) = L(\gamma)$. Give a brief and precise justification for your answer.



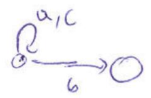
$(01 + 10)^* \; (0 + 1 + \varepsilon)$

The ~~f~~ starting state represents all accepting strings of even length.

The middle 2 states represent ~~that~~ accepting strings of odd length.

The last state is rejecting state from which we cannot get out. which occurs when ~~we~~ a 0 at odd position is. followed by one more 0 or 1 at odd position is ~~follow~~ followed by one more 1


0
1
1
0


a,c
b