THEORY OF COMPUTATION

SURPRISE TEST-2

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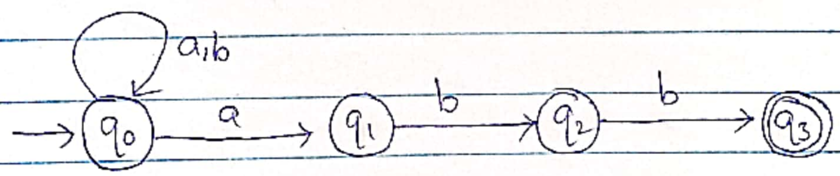
1. $(a+b)^* abab (a+b)^*$ has abab as a substring

2. $a(a+b)(a+b)(a+b)$ starts with a and has length 4.

3. (i) Every regular language over Σ is finite - False
   (ii) $aa^* + bb^*$ is the same as $(a+b)^*$ - False
   ($(a+b)^*$ can have $\wedge$ but aa^*+bb^* doesn't)
   (a^* over $\{a\}$ is a contradictory example for (i))

4. Finite automata for $(a+b)^* abb$

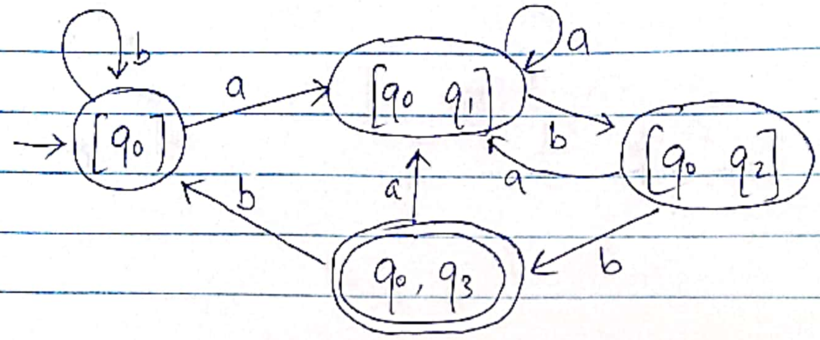


The transition table for the NFA is :

State	a	b
$\rightarrow q_0$	$\{q_0, q_1\}$	q_0
q_1	-	q_2
q_2	-	q_3
q_3	-	-

Converting the NFA to DFA.

State	a	b
→ [q_0]	[q_0, q_1]	[q_0]
[q_0, q_1]	[q_0, q_1]	[q_0, q_2]
[q_0, q_2]	[q_0, q_1]	[q_0, q_3]
[q_0, q_3]	[q_0, q_1]	[q_0]



5. Let $L = \{a^n b^{2n} \mid n > 0\}$

We can prove that L is not regular by contradiction

Let us suppose that L is regular.
Hence we can apply the PUMPING LEMMA.

Let n be the number of states. Let $w = a^n b^{2n}$.
By pumping lemma $w = xyz$ with $|xy| \le n$, $|y| > 0$ and $xy \in L$.
As $|xy| \le n$, $xy = a^m$ and $y = a^l$ where $0 \le l \le n$
So $xy = a^{n-1} b^{2n} \in L$.
This is a contradiction since $n-1 \neq n$
$\therefore$ L is NOT REGULAR.