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4

MID-SEM

CS-305

Ans 1) To Show $L = \{ ww : w \in \{0,1\}^* \}$ is not regular.

Assume that L is regular. Let p be the pumping Length guaranteed by the pumping Lemma.

Take $w = 0^p 1 0^p 1$.

here, clearly $w \in L$, and $|w| \geq p$.

Now we need to show that for any partition $w = xyz$, with $|xy| \leq p$ and $y \neq \epsilon$,

$\exists\, i \geq 0$ s.t. $xy^i z \notin L$.

0

Let us take $k = |y|$.

Now note that $0 < k \leq p$, then $xy^n z = 0^{pk}$ $1 0^p 1 \in L$, because if it were in L, then for some string, we must have $0^{p \cdot k} 1 0^p 1 = 0u$

which implies that u ends with 1, and so $p \cdot k = p$, which is impossible because $k \neq 0$

Hence proved

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Ans2 b) Lets say L is regular then its complement. L_1 would be also regular.

L_1 will contain all strings in (a,b) which. are not in L.

lets say L_2 be.

$$L_2 = L_1 \cap a^* b^*$$

thus, L_2 contains only those elements. of L_1 in which the a's & b's are in right order; that.

$$L_2 = \{a^n b^n : n \geq 0\}$$

1.5

So, if L was regular then L_1 would. regular & since L_2 is $\cap$ of these 2 language would also be regular.

but here $a^n b^n$ is not regular.

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Ans4 :> Look at size of q of L. If there is a cycle, then |L| >= 6. otherwise, check the no. of all possible paths ordering with a final states.

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Incomplete!

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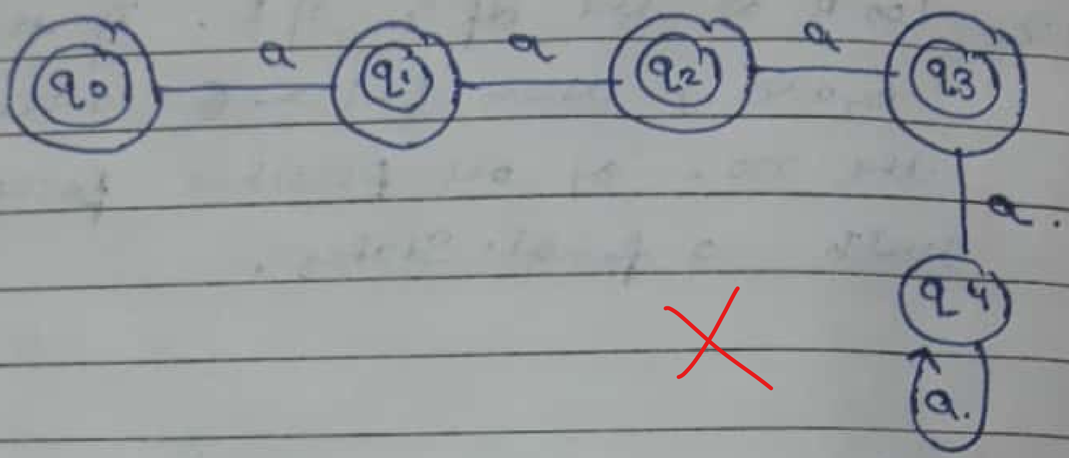
Ans 8(b).



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Here, $L = a^n \quad n \geq 0 \; ; \; n \neq 4$.

So, if we take any power of a, that is $1, a, a^2, a^3, a^5$ but not 4 and its multiple because a^8 can be write as $(aa)^4$ which is to be so should not be in this language.

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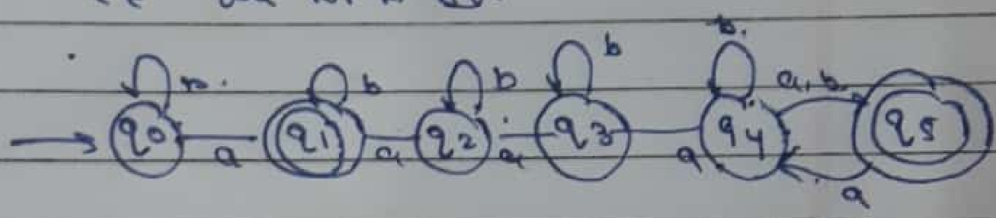
Ans 7 8/c. Given .

$a : R = b^* ab^* ab^* ab^* + bb^* ab^+ ab^* ab$

$= b^* ab^* ab^* ab^+ (b + ab) \rightarrow$ Identity for union.

$= b^* ab^* ab^* ab^* ab^*$

To = $\epsilon\epsilon^+$ the NFA be.



Equation is at each stage ..

$q_0 = \lambda + q_0 . b$ — ①

$q_1 = q_0 a + q_1 . b$ — ②

$q_3 = q_1 a + q_2 . b$ — ③.

0.5

other eqns?

we need to add q_1 & q_5 to get final answers .

$q_0 = \lambda + q_0 b.$

— Arden's theorem.

$q_0 = \lambda . b^*.$ — By identity for con catination

$\boxed{q_1 = (b^* . a) . b^*}$ → Arden theorem