COM S 331
Homework 1

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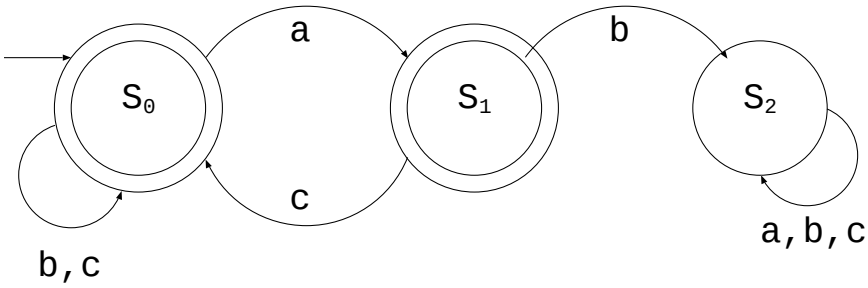
1. $L = \{((a^*c^+)^*b^*(a^*c^+)^*)^* + ((a+c)^*(c^+b^*)^*(a+c)^*)^*\}$
2. $L = \{((a+c)^*b(a+c)^*b))^* + (a+c)^*\}$
3. $(a+b+c)^*(a+b)^*$ can be simplified to $(a+b+c)^*$ because any string that can be created using $(a+b)^*$ can also be created using $(a+b+c)^*$ because $(a+b)^* \subseteq (a+b+c)^*$.
   In plain English, this expression describes any permutation of any length of the three characters a, b, and c.
4. $(a+b)^*c^*(a+b)^*$ cannot be simplified because the ordering of the concatenation doesn't allow for either $(a+b)^*$ to be rearranged in a way that would allow for simplification.
   In plain English, this expression describes string with any permutation of any length of the two characters a and b, followed by a string of any length made of just c's, followed again by permutation of any length of the two characters a and b.
5. The following diagram is a DFA:



   S_2 is a trap state that prevents the DFA from leaving that state because as soon as a single a is followed by a single b, it is impossible for the DFA to accept the string, so it must reject it.

6. The following DFA models $L = w \in a, b^* : |w|_a \ mod \ 3 = 0$: