Homework #3

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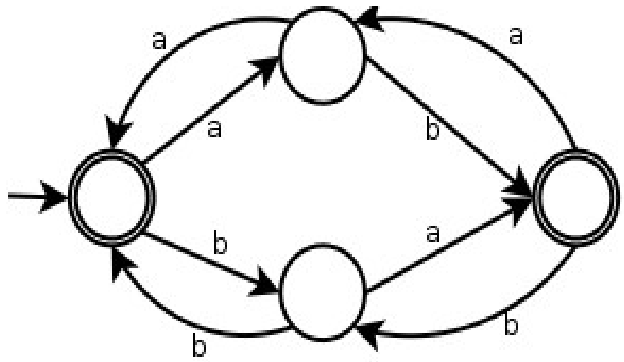
CS6110
MW 6:15-9:20p

1a.



1b. λ + $(aa+bb+(ab+ba)(ab+ba)^*(aa+bb))^*(ab+ba)(ab+ba)^*$

1c.

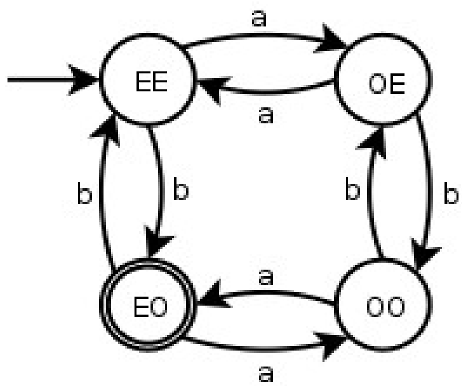
$$S_0 \to aS_1 \mid bS_2 \mid \lambda$$
$$S_1 \to aS_0 \mid bS_3$$
$$S_2 \to aS_3 \mid bS_0$$
$$S_3 \to aS_1 \mid bS_2 \mid \lambda$$

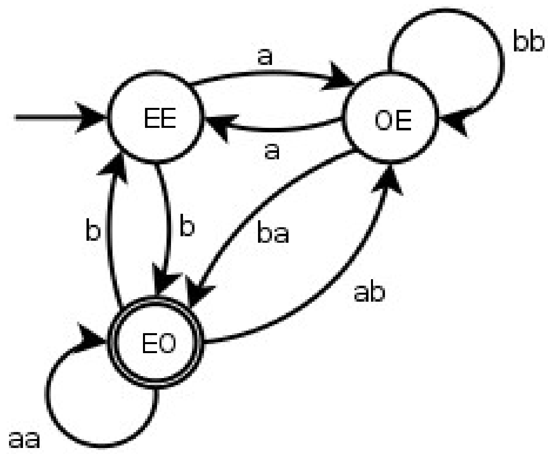
2a. $(a + b)^*ab$

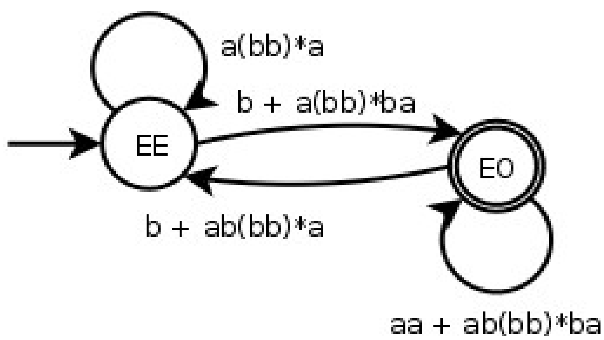
2b. $(a+b)^*(bb + a^*)$

2c. $((aa)^*(bb)^*)+(a(aa)^*b(bb)^*)$

3.







$(a(bb)^*a)^*(b+a(bb)^*ba) + ((a(bb)^*a)^*(b+a(bb)^*ba)(aa+ab(bb)^*ba)^*(b+ab(bb)^*a))^*$

4.

Proof:

(1) The opponent picks a number m.

(2) We chose a string *w* in *L* of *w* = $a^m b^m a^{m-1}$ which is in *L*.

(3) The opponent chooses a decompisiton of *xyz*, subject to

$$|xy| \leq m$$
$$|y| \geq 1 .$$

(4) because *xy* is bound by *m* it will contain all a. It doesn't matter what value we pick for *I* since it will invalidate the constrain *n* = *m* and the constraing $m \neq k$ will never be fufilled, thus we get a contradiction.

5.

Proof:

(1) The opponent picks a number m.

(2) We chose a string *w* in *L* of $w = a^{3^m}$ which is in *L*.

(3) The opponent chooses a decompisiton of *xyz*, subject to

$$|xy| \leq m$$
$$|y| \geq 1 .$$

(4) We can derive a contradiction in the string *w* by pumping down with $i=0$. This will never be equal to a power of 3 because it will always reduce the string by at most *m* letters which will always be less then the next lower power of three.

Bonus.