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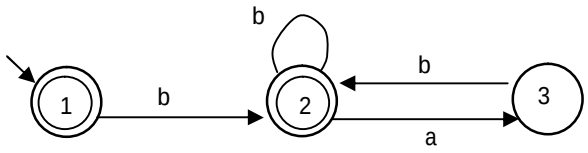
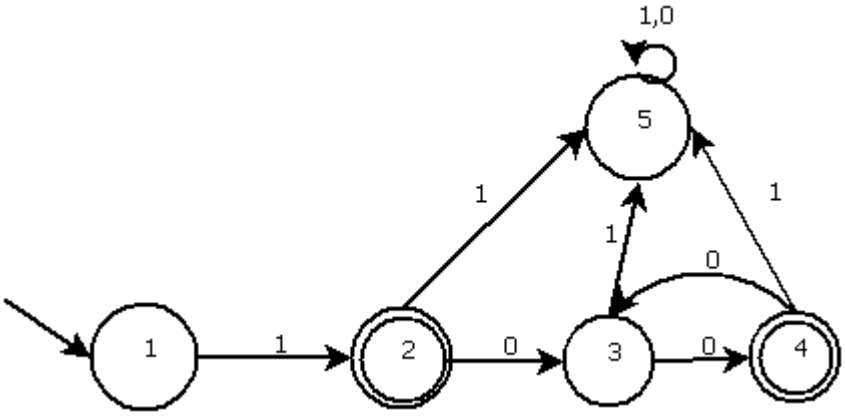
Theory of Automata
Homework #3
Oct. 12th, 2009

1. The FSM accepts any strings that start with 0 or more ‘b’s, then contain an odd number of ‘a’s (at least 1), followed by any combination of 0 or more ‘a’s and 0 or more ‘b’s.

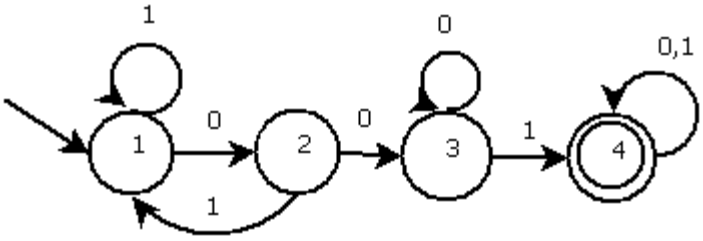
2. a.



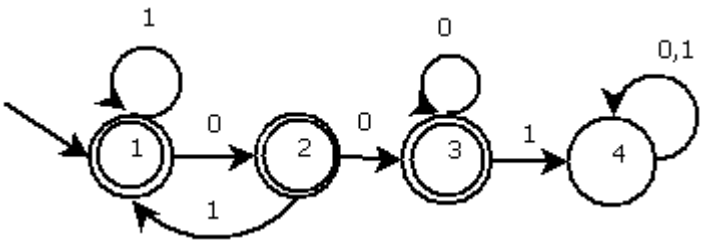
2. b.



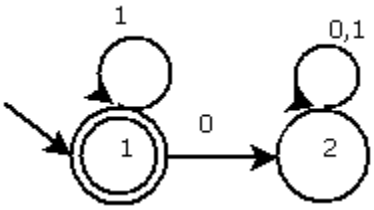
2.c.



2.d.



2.e.



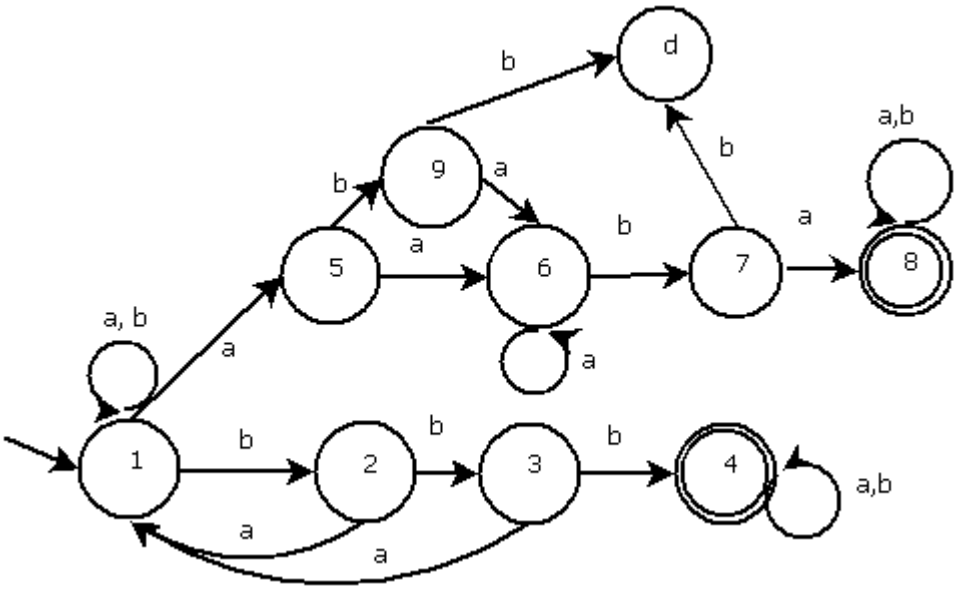
3. Assume states are numbered 1 for top-left, 2 for top-right, 3 for bottom-left and 4 for bottom-right.

3.a. aabbba is part of the language, it goes state 1, 1, 1, 2, 3, 2, 4 (which is an accepting state.)

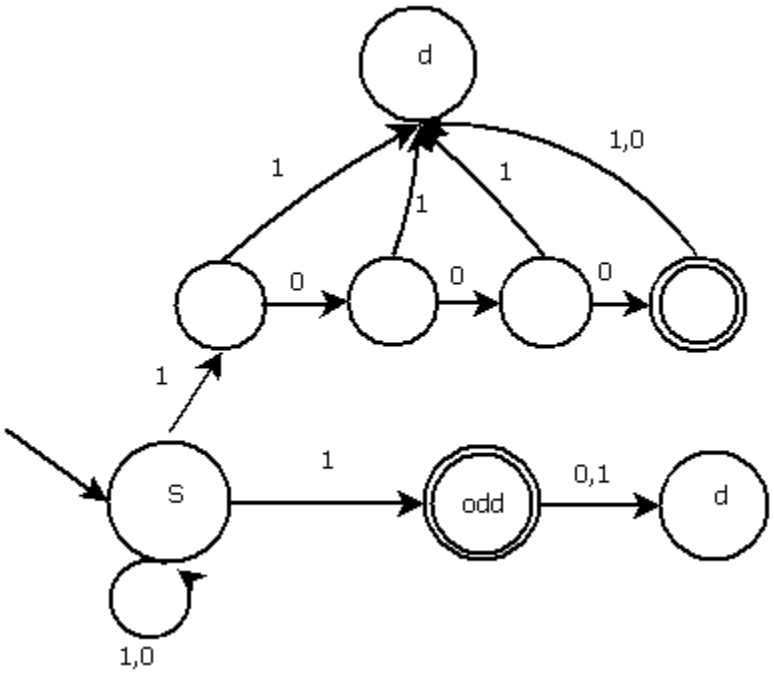
3.b. bab is not part of the language.

3.c. baba is part of the language, it goes 1, 3, 3, 2, 4.

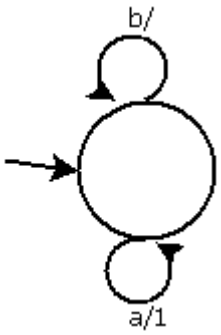
4.a.



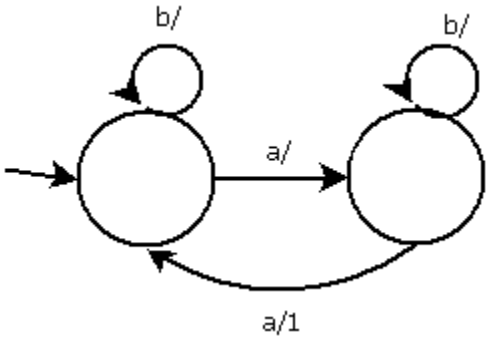
4.b.



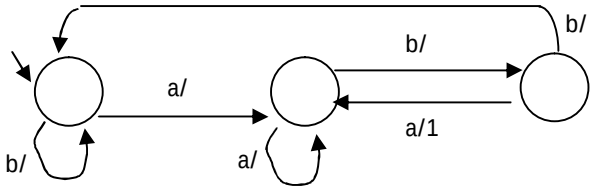
5.a.



5.b.



5.c.



6. I am assuming the weather/passport HMM is the same as the one in the slides (slide #83 for Chapter 5) because I do not have the text book.

6.a. ###L is 4 items long.

Possibilities:
Sun, Sun, Sun, Sun – (.87 *.8) * (.9 * .8) * (.9 * .8) * (.9 * .2) = 0.06495

Sun, Sun, Sun, Rain - (.87 *.8) * (.9 * .8) * (.9 * .8) * (.1 * .05) = 0.00180

Sun, Sun, Rain, Sun - (.87 *.8) * (.9 * .8) * (.1 * .05) * (.67 * .2) = 0.00034

Sun, Sun, Rain, Rain - (.87 *.8) * (.9 * .8) * (.1 * .05) * (.33 * .05) = 0.00004

Sun, Rain, Sun, Sun - (.87 *.8) * (.1 * .95) * (.67 * .8) * (.9 * .2) = 0.00638

Sun, Rain, Sun, Rain - (.87 *.8) * (.1 * .95) * (.67 * .8) * (.1 * .05) = 0.00018

Sun, Rain, Rain, Sun - (.87 *.8) * (.1 * .95) * (.33 * .95) * (.67 * .2) = 0.00278

Sun, Rain, Rain, Rain - (.87 *.8) * (.1 * .95) * (.33 * .95) * (.33 * .05) = 0.00034

Rain, Sun, Sun, Sun - (.13 *.95) * (.67 * .8) * (.9 * .8) * (.9 * .2) = 0.00858

Rain, Sun, Sun, Rain - (.13 *.95) * (.67 * .8) * (.9 * .8) * (.1 * .05) = 0.00024

Rain, Sun, Rain, Sun - (.13 *.95) * (.67 * .8) * (.1 * .95) * (.67 * .2) = 0.00084

Rain, Sun, Rain, Rain - (.13 *.95) * (.67 * .8) * (.1 * .95) * (.33 * .05) = 0.00010

Rain, Rain, Sun, Sun - (.13 *.95) * (.33 * .95) * (.67 * .8) * (.9 * .2) = 0.00374

Rain, Rain, Sun, Rain - (.13 *.95) * (.33 * .95) * (.67 * .8) * (.1 * .05) = 0.00010

Rain, Rain, Rain, Sun - (.13 *.95) * (.33 * .95) * (.33 * .95) * (.67 * .2) = 0.00163

Rain, Rain, Rain, Rain - (.13 *.95) * (.33 * .95) * (.33 * .95) * (.33 * .05) = 0.00020

The most likely possibility is Sun, Sun, Sun, Sun.

6.b.

Sun, Sun, Sun, Sun – (.55 * .3) * (.75 * .3) * (.75 * .3) * (.75 * .7) = 0.00439

Sun, Sun, Sun, Rain – (.55 * .3) * (.75 * .3) * (.75 * .3) * (.25 * .2) = 0.00042

Sun, Sun, Rain, Sun – (.55 * .3) * (.75 * .3) * (.25 * .8) * (.3 * .7) = 0.00156

Sun, Sun, Rain, Rain – (.55 * .3) * (.75 * .3) * (.25 * .8) * (.7 * .2) = 0.00104

Sun, Rain, Sun, Sun – (.55 * .3) * (.25 * .8) * (.3 * .3) * (.75 * .7) = 0.00156

Sun, Rain, Sun, Rain – (.55 * .3) * (.25 * .8) * (.3 * .3) * (.25 * .2) = 0.00015

Sun, Rain, Rain, Sun – (.55 * .3) * (.25 * .8) * (.7 * .8) * (.3 * .7) = 0.00388

Sun, Rain, Rain, Rain – (.55 * .3) * (.25 * .8) * (.7 * .8) * (.7 * .2) = 0.00259

Rain, Sun, Sun, Sun – (.45 * .8) * (.3 * .3) * (.75 * .3) * (.75 * .7) = 0.00383

Rain, Sun, Sun, Rain – (.45 * .8) * (.3 * .3) * (.75 * .3) * (.25 * .2) = 0.00036

Rain, Sun, Rain, Sun – (.45 * .8) * (.3 * .3) * (.25 * .8) * (.3 * .7) = 0.00136

Rain, Sun, Rain, Rain – (.45 * .8) * (.3 * .3) * (.25 * .8) * (.7 * .2) = 0.00091

Rain, Rain, Sun, Sun – (.45 * .8) * (.7 * .8) * (.3 * .3) * (.75 * .7) = 0.00953

Rain, Rain, Sun, Rain – (.45 * .8) * (.7 * .8) * (.3 * .3) * (.25 * .2) = 0.00091

Rain, Rain, Rain, Sun – (.45 * .8) * (.7 * .8) * (.7 * .8) * (.3 * .7) = 0.02371

Rain, Rain, Rain, Rain – (.45 * .8) * (.7 * .8) * (.7 * .8) * (.75 * .2) = 0.01693

The sum of probabilities for the Athens HMM is approximately 0.09224 .

The sum of probabilities for the London HMM is approximately 0.07313 .

Therefore, it is more likely this report originated in Athens.