Tutorial Week 8

1. The formal description of a DFA M is $(\{q_1, q_2, q_3, q_4, q_5\}, \{\text{u,d}\}, \delta, q3, \{q3\})$ where δ is given by the following table. Give the state diagram of this machine.

	u	d
q_1	q_1	q_2
q_2	q_1	q_3
q_3	q_2	q_4
q_4	q_3	q_5
q_5	q_4	q_5

2. Give state diagrams of DFAs that recognize the following languages. In all parts the alphabet is 0, 1

   a. $\{w | w$ begins with a 1 and ends with a 0$\}$

   b. $\{w | w$ contains the substring 0101, i.e., $w = x0101y$ for some strings $x, y\}$

   c. $\{w | w$ is every string except 11 and 111$\}$

   d. $\{w | w$ contains an even number of 0s, or contains exactly two 1s$\}$

   e. {The empty set}

3. Convert question c. into a circuit

4. Dave has been telling everyone he has a great teaching job, but his friend Brian suspects he actually works in retail. Brian knows Dave used to work as a baker, but he thinks by looking at the day of the week Dave starts to work, then looking at the day Dave ends, he can determine what job he has based on the break.
   Teachers have weekends off, Bakers have Sunday & Monday off, and Retail workers could have any day of the week off.
   Design a DFA that will start in an "unknown" state, then take in two consecutive inputs, first the day of the week Dave starts on, then the day Dave ends on. Based on the day Dave starts your DFA should have an initial guess as to his profession. The DFA accepts Brian's guess, i.e. if Dave is a retail worker.

5. Now design the outline for a circuit for the last DFA. Complete everything but the boxes for the state transitions:

6. Now generate regular expressions based on the previous DFAs in Question 2