CS 373 Fall 2010
Quiz 2 Solutions

Lecture 1 - Mahesh

1. C. B is clearly false. A need not be true because of epsilon transitions.
2. B. aa is in L(R), a is not in L(R), and the empty string is in L(R) (which violates C).
3. B. Intuitively, the number of b's is dependent on the number of a's, and the number of a's is unbounded.
4. C. $\{0^n1^n\}$ and 0^* are nonregular and regular, respectively, but both infinite. They are both subsets of all binary strings (which is regular and infinite).
5. B. Consider $L_1 = \Sigma^*$ and $L_2 = \{0^n1^n\}$. A and C do not hold.
6. C. $\Sigma^* \backslash L$ is the complement of L. If L was regular, this would be regular. Thus L must be nonregular.

Lecture 2 - Gul

1. C. There must be some final state, and there can be unreachable states that are not final.
2. A. a is in L(r), aa is not in L(r), and a does not contain any b's.
3. A. We can build a DFA for this. n is a fixed value, so our DFA verifies that there are at least n a's followed by at least one but less than n b's.
4. C. If L_1 and L_2 are Σ^*, then L_2 can be regular. If L_1 is $L(b^*c^*)$ and L_2 is the language from problem 2 on HW4, then L_2 can be nonregular.
5. A. We can build a DFA for $L_1 \backslash L_2$ (i.e. L_1 without the strings it shares with L_2) because this set is finite. Now build a machine for L_2 as follows: simulate the machine for $L_1 \cup L_2$ and the machine for $L_1 \backslash L_2$ in parallel, and accept when the first machine accepts and the second machine rejects.
6. C. If L was regular, L^R would be regular (as shown in the homework). Thus L must be nonregular.