Sample Quiz from last year

1. [3 marks] Define two languages $A = \{0, 01\}$ and $B = \{\varepsilon, 1, 00\}$.

    (a) What is $A \times B$?

    (b) What is $A \cup B$?

    (c) How many strings are in the language AB?

2. [2 marks] Prove that there exist languages A and B for which $A^* \cup B^* \neq (A \cup B)^*$.

3. [3 marks] Let L be the set of binary strings that contain at least three 0's. For example, 01100 and 0000 are in L, but 1001 and ε are not in L. Draw the transition diagram of a deterministic finite automaton that accepts L.

4. [4 marks] Let $\Sigma = \{0, 1\}$. Give a careful proof that every string $x \in \Sigma^*$ of even length is accepted by the finite automaton M with the following transition diagram.