Quiz 4

1. Recall the language $L_2 \subseteq \{0,1\}^*$ defined as

$$L_2 = \{u10 \mid u \in \{0,1\}^*\} \cup \{u11 \mid u \in \{0,1\}^*\}$$

That is, L_2 contains all strings that have a 1 as the second last symbol. Consider the following proof that any DFA recognizing L_2 must have at least 4 states: Any DFA recognizing L_2 has to remember the last two symbols of the input string. Since there are 4 strings of length 2, it must have 4 states.

(A) The proof is correct.

(B) The proof is incorrect because there is a DFA with 3 states that recognizes L_2.

(C) The proof is incorrect because there is no basis for assuming that a DFA recognizing L_2 has to remember that last two symbols of the input string.

(D) The proof is incorrect because this statement has to be proved by induction.

2. Let L be recognized by a DFA M and an NFA N. Which of the following statements is necessarily true?

(A) M and N are the exact same machines.

(B) M and N have the same number of states.

(C) N has transitions on ϵ.

(D) There is an NFA N' that recognizes L which has the same number of states as M.

3. Which of the following statements is true?

(A) There are languages that can be recognized by an NFA which cannot be recognized by a DFA.

(B) Languages recognized by NFAs cannot be recognized by DFAs because they can have infinitely many active threads at any given time.

(C) If L is a language recognized by an NFA then there is a DFA that can recognize L.

(D) Every language is recognized by an NFA because they are subsets of Σ^*.

4. Let M be a DFA with m states, and N be an NFA with n states such that $\mathbf{L}(M) = \mathbf{L}(N)$. Which of the following statements is necessarily true?

(A) $2^n \leq m$

(B) $m < 2^n$

(C) $n \leq m$

(D) None of the above