Pick the correct alternative from among the choices (A), (B), and (C) provided for each question below. Each question is worth 1 point.

1. Let \( D = (Q, \{0, 1\}, \delta, q_0, F) \) be an DFA such that \( L(D) = \{0, 1\}^* \). Then,

   (A) Every state must be a final state, i.e., \( F = Q \).
   (B) No state is a final state, i.e., \( F = \emptyset \).
   (C) Neither of the above

2. Consider \( r = a(ab^*a \cup b^*)^* \). Which of the following is true about \( L(r) \)?

   (A) \( a \in L(r) \)
   (B) \( aa \in L(r) \)
   (C) There is at least one \( b \) in every string belonging to \( L(r) \)

3. For \( n \geq 0 \), let \( L_n = \{a^ib^k \mid i \geq n, \ 0 < k < n\} \).

   (A) \( L_n \) is regular, independent of the value of \( n \)
   (B) \( L_n \) is not regular, independent of the value of \( n \)
   (C) \( L_n \) is regular only for small values of \( n \)

4. Let \( L_1 \) be an infinite regular language. Let \( L_2 \) be an infinite set such that \( L_1 \subseteq L_2 \).

   (A) \( L_2 \) is definitely regular because \( L_1 \) is regular
   (B) \( L_2 \) is never regular because \( L_2 \) is infinite
   (C) \( L_2 \) may or may not be regular
5. Consider $L_1, L_2 \subseteq \Sigma^*$ such that $L_1$ is a finite language and $L_1 \cup L_2$ is regular.
   
   (A) $L_2$ is definitely regular
   (B) $L_2$ may not be regular
   (C) $L_2 = (L_1 \cup L_2) \setminus L_1$

6. Recall from homework 3, for a string $w$, $w^R$ denotes the reverse of $w$. For $L \subseteq \Sigma^*$, recall that $L^R = \{ w^R \mid w \in L \}$. Suppose $L^R$ is not regular. Then,
   
   (A) $L$ is definitely regular
   (B) $L$ may or may not be regular
   (C) $L$ is definitely not regular