Quiz 8

1. Recall that regular languages are closed under union. Based on this observation which of the following is necessarily true?

   (A) If L_1 and L_2 are regular then $L_1 \cup L_2$ is regular.

   (B) If $L_1 \cup L_2$ is regular then L_1 and L_2 is regular.

   (C) $L_1 \cup L_2$ is regular.

   (D) All of the above.

   Correct answer is (A).

2. Recall that regular languages are closed under complementation. Based on this observation, which of the following is necessarily true?

   (A) If L is regular then $\overline{L}$ is regular.

   (B) If $\overline{L}$ is regular then L is regular.

   (C) $L \cup \overline{L}$ is regular.

   (D) All of the above.

   Correct answer is (D).

3. Let $h : \{0,1\}^* \to \{a,b\}$ where $h(0) = a$ and $h(1) = ba$. Let L be the language described by the regular expression $(0 \cup 1)^*1(0 \cup 1)^*$. Then $h(L)$ is

   (A) $\{w \in \{a,b\}^* \mid w \text{ has at least one } b\}$

   (B) described by the regular expression $(a \cup b)^*$

   (C) described by the regular expression $(a \cup b)^*ba(a \cup b)^*$

   (D) $\{w \in \{a,b\}^* \mid w \text{ has at least one } b, \text{ has no consecutive } bs, \text{ and ends with an } a\}$

   Correct answer is (D).

4. Recall that a homomorphism is a function $h : \Sigma^* \to \Delta^*$ that maps strings over (some alphabet) Σ to strings over (some alphabet) Δ. If $L \subseteq \Sigma^*$, which of the following is the correct definition of $h(L)$?

   (A) $h(L) = \{w \mid h(w) \in L\}$

   (B) $h(L) = \cup_{w \in L} h(w)$

   (C) $h(L) = \cup_{w \in L} \{h(w)\}$

   (D) $h(L) = \cup_{h(w) \in L} \{h(w)\}$

   Correct answer is (C).