Quiz 13

1. Consider the grammar $G = (V = \{S, A, C, X, Y\}, \Sigma = \{a, b, c\}, R, S)$ where the set of rules R is as follows:

$$\begin{array}{ll} S & \rightarrow AX|YC \\ A & \rightarrow aA|\epsilon \\ C & \rightarrow cC|\epsilon \\ X & \rightarrow bXc|\epsilon \\ Y & \rightarrow aYb|\epsilon \end{array}$$

   Which of the following statements is true about G?

   (A) G is ambiguous because there are at least two derivations from S producing abc.

   (B) G is ambiguous because there are at least two parse trees with root labelled S and yield abc.

   (C) G is not ambiguous because multiple derivations of abc from S does not imply ambiguity.

   (D) G may not be ambiguous because derivations and parse trees for a single string abc do not determine ambiguity.

   Correct answer is (B).

2. Consider the proof of Proposition 10 (lecture 12, pages 7 and 8) showing that if there is a parse tree T with root A and yield α then there is a derivation $A \stackrel{*}{\Rightarrow} \alpha$. If T has n internal nodes then based on the proof the *best* answer that upper bounds the number of steps in the derivation $A \stackrel{*}{\Rightarrow} \alpha$ is

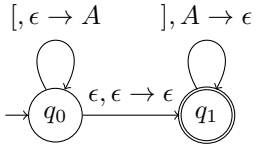
   (A) $O(\log n)$

   (B) $O(n)$

   (C) $O(n^2)$

   (D) $O(2^n)$

   Correct answer is (B).



3. Consider the PDA $P = (Q = \{q_0, q_1\}, \Sigma = \{[,]\}, \Gamma = \{A\}, q_0, F = \{q_1\}, \delta)$ shown above. Suppose the current instantaneous description is $\langle q_1, AAAAA\rangle$ and the unread portion of input is]][. The instantaneous description after *one* step is

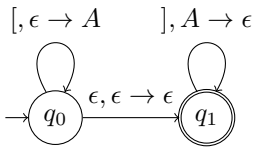
   (A) The machine crashes.

   (B) $\langle q_1, AAAAAA\rangle$

   (C) $\langle q_1, AAAA\rangle$

   (D) $\langle q_0, AAAA\rangle$

   Correct answer is (C).



4. Consider the PDA $P = (Q = \{q_0, q_1\}, \Sigma = \{[,]\}, \Gamma = \{A\}, q_0, F = \{q_1\}, \delta)$ shown above. Which of the following strings is accepted by P?

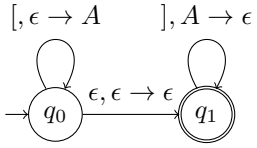
   (A) [[][]]

   (B) [[[]]]

   (C) [[]][]

   (D) None, because P does not push a symbol onto the stack *before* processing any input symbols.

   Correct answer is (B).



5. Consider the PDA $P = (Q = \{q_0, q_1\}, \Sigma = \{[,]\}, \Gamma = \{A\}, q_0, F = \{q_1\}, \delta)$ shown above. $\mathbf{L}(P)$ is

   (A) $\{[^n]^n \mid n \geq 0\}$

   (B) $\{w \in \{[,]\}^* \mid w \text{ is a string of well-matched parenthesis}\}$

   (C) $\{[^i]^j \mid i \geq j \geq 0\}$

   (D) $\emptyset$

   Correct answer is (C).