

# CS 373 Fall 2010

## Quiz 5 Solutions

### Lecture 1 - Mahesh

1. C. The language of  $G_*$  is  $\{a^i b^j c^k \mid i \neq j \text{ or } j \neq k\}$ . Choices (a) and (b) violate this format, while (c) can be derived. Note that derivations can have nonterminals in them.
2. A.  $A$  can make any number of a's.
3. B. A grammar is ambiguous if some string (in this case,  $abbccc$ ) has two parse trees. In CFGs, you can often find strings that have multiple derivations but only one parse tree. Such strings do not make the grammar ambiguous.
4. C. The machine is in state  $q_1$ , so it is reading braces and popping stack symbols. When it sees the  $]$  of the input, it pops another  $A$  from the stack and stays in  $q_1$ . Eventually this computation will crash, but not within one step.
5. B. For some string of  $A$ s put on the stack, the machine will pop some of them and then accept. Since pushing an  $A$  corresponds to input  $[$  and popping an  $A$  corresponds to input  $]$ , the machine accepts (c).
6. C. LBAs accept context sensitive languages (CSLs). While all CSLs are decidable, it does not mean that every LBA must terminate on all inputs, so (a) is wrong. CSLs are a proper subset of Decidable languages, so (b) is wrong. CSLs are a proper superset of CFGs, so (c) is correct.

### Lecture 2 - Gul

1. C. The language of  $G_*$  is  $\{a^i b^j c^k \mid i = j \text{ or } j = k\}$ . Choices (a) and (b) violate this format, while (c) can be derived. Note that derivations can have nonterminals in them.
2. A.  $C$  can make any number of c's.
3. B. A grammar is ambiguous if some string (in this case,  $abc$ ) has two parse trees. In CFGs, you can often find strings that have multiple derivations but only one parse tree. Such strings do not make the grammar ambiguous.
4. C. The machine is in state  $q_1$ , so it is reading braces and popping stack symbols. When it sees the  $[$  of the input, it pops another  $A$  from the stack and stays in  $q_1$ . Eventually this computation will crash, but not within one step.

5. C. For some string of  $A$ s and  $B$ s put on the stack, the machine will pop some of them and then accept. Since  $A$ s and  $B$ s correspond to input  $[$ s and  $]$ s respectively, the machine accepts (c).
6. C. LBAs accept context sensitive languages (CSLs). While all CSLs are decidable, it does not mean that every LBA must terminate on all inputs, so (a) is wrong. CSLs are a proper subset of Decidable languages, so (b) is wrong. CSLs are a proper superset of CFGs, so (c) is correct.