Assignment 8

Due on 2019-06-25, 23:59 IST.

1. Consider a context-free grammar with a rule alphabet $\{S, A, B, C\}$, with the production rules $S \rightarrow AA$ and $S \rightarrow AB$, and the following rules regarding variables defined from the grammar:
   1. $A \rightarrow \text{True}$
   2. $B \rightarrow \text{False}$
   3. $C \rightarrow \text{Not}$

   a) Write the grammar in Backus-Naur Form (BNF).
   b) Derive a sentence in the language generated by the grammar.

2. Which of the following sets best describes the language generated by the given grammar?
   a) $\{a, b\}$
   b) $\{a^n b^n | n \geq 0\}$
   c) $\{a^n b^m | n, m \geq 0\}$
   d) $\{a^n b^n c^m | n, m, k \geq 0\}$

3. How many of the productions in the production rules $S \rightarrow AA$ and $S \rightarrow AB$ are ambiguous?

4. A context-free grammar is a formal grammar that defines a language.
   a) True
   b) False

5. A context-free grammar is a formal grammar that defines a language.
   a) True
   b) False

6. A context-free grammar is a formal grammar that defines a language.
   a) True
   b) False

7. A context-free grammar is a formal grammar that defines a language.
   a) True
   b) False

8. A context-free grammar is a formal grammar that defines a language.
   a) True
   b) False

9. A context-free grammar is a formal grammar that defines a language.
   a) True
   b) False

10. A context-free grammar is a formal grammar that defines a language.
    a) True
     b) False

11. A context-free grammar is a formal grammar that defines a language.
    a) True
     b) False

12. A context-free grammar is a formal grammar that defines a language.
    a) True
     b) False

13. A context-free grammar is a formal grammar that defines a language.
    a) True
     b) False

14. A context-free grammar is a formal grammar that defines a language.
    a) True
     b) False

15. A context-free grammar is a formal grammar that defines a language.
    a) True
     b) False

Consider the method `findMax` defined below.
```java
public int findMax(int[] arr) {
    int max = arr[0];
    for (int i = 1; i < arr.length; i++) {
        if (arr[i] > max) {
            max = arr[i];
        }
    }
    return max;
}
```

16. What is the time complexity of the `findMax` method?
   a) $O(n)$
   b) $O(1)$
   c) $O(n^2)$
   d) $O(n \log n)$

17. What is the space complexity of the `findMax` method?
   a) $O(1)$
   b) $O(n)$
   c) $O\left(\frac{n^2}{2}\right)$
   d) $O\left(\frac{n^3}{2}\right)$