weekly-Exercise - 03

## ICS 365-51 Metropolitan State University/MN

## Week 3 Due 11:59pm, Sunday, Sept. 11, 2022 Fall 2022

## Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

## Please complete both Parts I and II and then upload the results to D2L under the dropbox for Weekly Exercise 03 before the deadline (total 20 points).

## Part I: Based on the discussion in Lecture 3, please either bold or highlight your answers below, only one answer per question. (1 point each, total 10 points)

1. Based on the discussion in Chapter 3 of the textbook, which of the following statements is NOT true?

A) “Context-free grammar,” proposed by Noam Chomsky, is useful for describing the syntax of programming languages;

B) A metalanguage is a language that is used to describe another language;

C) BNF was proposed before Context-free grammars were introduced;

D) BNF stands for Backus-Naur Form.

2. Based on the discussion in Chapter 3 of the textbook, which of the following is not a primary method of semantics description?

A) Functional semantics

B) Denotational semantics

C) Operational semantics

D) Axiomatic semantics

3. Which of the following is NOT true to BNF fundamentals?

A) Grammar is defined as a finite non-empty set of rules

B) RHS can only be a string of terminals

C) Nonterminals are often enclosed in angle brackets

D) A start symbol is a special element of the nonterminals of a grammar

4. Consider the following grammar

<S> → <A>a<B>b

<A> → <A>b | b

<B> → a<B> | a

Which of the following sentences/strings is not acceptable by this grammar?

A) baab

B) baaab

C) bbaab

D) abaab

5. A lexeme is defined as \_\_\_\_\_

A) a category of identifiers

B) a string of characters over some alphabet

C) the lowest level syntactic unit of a language

D) a set of sentences

6. Based on the discussion in Chapter 3, which of the following statements is NOT true?

A) In a well-designed programming language, semantics should follow directly from syntax;

B) The syntax of a programming language is the form of its expressions, statements, and program units while its semantics refers to the meaning of those expressions, statements, and program units;

C) The strings of a language are called sentences or statements.

D) Describing semantics is as easy as describing syntax

7. The meaning of the expressions, statements, and program units in a programming language refers to

A) grammar

B) semantics

C) syntax

D) BNF

8. Consider the following grammar

<S> → a<S>c<B> | <A> | b

<A> → c<A> | c

<B> → d | <A>

Which of the following sentences/strings is not acceptable by this grammar?

A) b

B) cc

C) ccd

D) abcd

9. Based on the discussion on attribute grammars in Chapter 3, which of the following statements is NOT true?

A) Attribute grammars can only be used to describe the syntax of a programming language;B) An attribute grammar is defined by a grammar, a set of attributes, a set of attribute computation functions, and a set of predicates;

C) Attribute grammars are extensions to context-free grammars; D) Attribute grammars are a formal approach both to describing and checking the correctness of the static semantic rules of a program.

10. Suppose test and flag are defined as boolean variables. Then, which of the following boolean expressions is equivalent to (!test || flag)?

A) (test && flag)

B) !(!test || flag)

C) !(test && !flag)

D) (!test && flag)

**Part II: Please study the discussion in class as well as covered in Chapter 3 of the textbook to complete the following tasks: (Total 10 points)**

1 Please consider the following grammar

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| <S> → a<A>b<B>  <A> → b<A> | b  <B> → <B>a | a |

and determine (either check, bold, or highlight) whether each of the following strings is acceptable or not by this grammar (1 point each, total 5 points)

1.1) abbbaa Yes \_\_ No \_\_

1.2) ababab Yes \_\_ No \_\_

1.3) abbbba Yes \_\_ No \_\_

1.4) bababa Yes \_\_ No \_\_

1.5) abbaaa Yes \_\_ No \_\_

2 Write a grammar for the language consisting of strings that have *n* copies of the letter *a* followed by the same number of copies of the letter *b*, where *n > 0*. For examples, the strings *ab*, *aaaabbbb*, and *aaaaaaaabbbbbbbb* are in the language but *a*, *abb*, *ba*, and *aaabb* are not. (Problem 13 on page 159 of your textbook, 5 points)

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