King Fahd University of Petroleum and Minerals

Department of Information and Computer Science

ICS 313-02
(031)

Fundamentals of Programming Languages

EXAM I
(70 Minutes)

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Student ID :_____

Name : _____

Question No	Maximum points	Student points
1	10	
2	6	
3	16	
4	8	
5	8	
6	12	
Total	60	

Oct. 18, 2003

Question 1: **Complete the following statements:** **(10 points)**

1._____: The ease with which programs can be read and understood.

2._____: How easily a language can be used to create programs for a chosen problem domain.

3. A program is said to be _____ if it performs to its specifications under all conditions.

4._____: The ease with which programs can be moved from one implementation to another.

5._____: The applicability to a wide range of applications

6._____: The completeness and precision of the language's official defining document.

7._____: is the ability of a program to intercept run-time errors, take corrective measures, and continue to execute.

8._____: is having two distinct referencing methods, or names, for the same memory cell.

9._____: gathers characters of the source program into lexical units.

10._____: takes the lexical units from the lexical analyzer and uses them to construct a parse tree.

Question 2: **(6 points)**

The programming language evaluation criteria provide a framework for language design. Unfortunately, that framework is self-contradictory. Explain by listing language design trade-offs.

Question 3: **(16 points)**

3.1 Complete the following statements.

- _____ is the form or structure of the expressions, statements, and program units.
- _____is the meaning of the expressions, statements, and program units.
- A _____ is a string of characters over some alphabet.
- A _____ is the lowest level syntactic unit of a language.
- A _____ is a category of lexemes.
- A _____ is a language used to describe another language.
- A _____ is a finite non-empty set of rules.
- A _____ is a repeated application of rules, starting with the start symbol and ending with a sentence.

3.2 What is the primary use of attribute grammars?

3.3 Consider the following grammar:

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

Which of the following sentences are in the language generated by this grammar?

a. abcd
b. acccbd
c. acccbcc
d. acd
e. accc

Question 4: **(8 points)**

4.1 What are the two distinct goals of syntax analysis?

4.2 Describe the parsing problem for a top-down parser.

Question 5 **(8 points)**

For the following grammar rule, perform the ***pairwise disjointness test***. Then write a recursive-decent parsing subprogram that parses the language generated by the rule. Assume you have a lexical analyzer named **`lex`** and an error-handling subprogram named **`error`**, which is called whenever a syntax error is detected.

A → aB | b | BB

Question 6: **(12 points)**

6.1 Define:

Binding:

Binding time:

Static binding:

Dynamic binding:

6.2 List the categories of variables by lifetimes.

6.3 What are the advantages and disadvantages of dynamic type binding?