

# King Fahd University of Petroleum and Minerals

Department of Information and Computer Science

ICS 410-01  
(071)

Programming Languages

Mid Term Exam  
(70 Minutes)

Dr. Mamdouh M. Najjar

Student ID : \_\_\_\_\_

Name : \_\_\_\_\_

Question No	Maximum points	Student points
1	8	
2	12	
3	14	
4	10	
5	10	
6	12	
7	14	
<b>Total</b>	<b>80</b>	

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**Question 1: Complete the following statements:**

**(8 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. \_\_\_\_\_: in a programming language means that a relatively small set of primitive constructs can be combined in relatively small number of ways to build the control and data structures of the language.
6. \_\_\_\_\_: is the ability of a program to intercept run-time errors, take corrective measures, and continue to execute.
7. \_\_\_\_\_: gathers characters of the source program into lexical units.
8. \_\_\_\_\_: takes the lexical units from the lexical analyzer and uses them to construct a parse tree.

**Question 2:**

**( 12 points)**

**2.1 List the five programming domains.**

**2.2 List the main four evaluation criteria for programming languages.**

**2.3 What are the three common parts between a compiler and an interpreter?**

**Question 3:**

**( 14 points )**

**3.1 Complete the following statements.**

- 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.

**3.2 Mark as True or False.**

- The syntax analysis part of a compiler is a recognizer for the language the compiler translates.
- A language recognizer is a device that can be used to generate the sentences of a language.
- Given a context-free grammar, a recognizer for the language generated by the grammar can be algorithmically constructed.
- An attribute grammar is a device used to describe more of the structure of a programming language than can be described with context-free grammar.
- Attribute grammars are context-free grammars to which have been added attributes, attribute computation functions, and predicate functions.

**3.3 Consider the following grammar:**

$\langle S \rangle \rightarrow a \langle S \rangle c \langle B \rangle \mid \langle A \rangle \mid b$

$\langle A \rangle \rightarrow c \langle A \rangle \mid c$

$\langle B \rangle \rightarrow d \mid \langle A \rangle$

**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:**

**(10 points)**

**4.1 There are three reasons why lexical analysis is separated from syntax analysis, list them.**

**4.2 What does a lexical analyzer do?**

**4.3 What does a parser do?**

**Question 5**

**( 10 points)**

**5.1 Briefly, describe the recursive-descent parsing process.**

**5.2 For the following grammar rule, perform the *pairwise disjointness test***

**$A \rightarrow aB \mid b \mid cBB$**

**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?**

**Question 7:**

**(14 points)**

- 7.1** A purely functional programming language does not use variables or assignment statements, thus freeing the programmer from concerns about the memory cells of the computer on which the program is executed. Without variables, iteration constructs are not possible, for they are controlled by variables.

Repetition is done in functional programming by \_\_\_\_\_.

- 7.2** The execution of a function always produces the same result when given the same parameters. This feature is called \_\_\_\_\_.

- 7.3** What is the output of the following Scheme program?

```
(define (y s lis)
  (cond
    ((null? lis) '())
    ((equal? s (car lis)) lis)
    (else (y s (cdr lis))))
  ))

(y 'x '(a b c d e e f f))
(y 'a '(b b c c c s s a a b c))
(y 'y '(y z y z y z))
```