Ministry of Higher Education
El-Shorouk Academy
Higher Institute for Computer &
Information Technology

Department	:	Computer Science	Acad. Year	:	2017 / 2018
Instructor	:	Dr. Ahmed elabbassy	Term	:	Second
Reviewer1	:	Dr. Khaled Menshawy	Year	:	4th
Reviewer2	:	Dr. M. El-Hennawy	No. Questions	:	4
			Date	:	24/05/2018
			Time Allowed	:	2 Hours
			Max. Marks	:	80 Marks
			No. of pages	:	2

4203 Compiler Theory (Final Exam)

Answer all of the following questions:

Question 1 (20 Marks)

1.1 Consider the following grammar for Boolean expressions (where id stands for the terminal identifier"):

Bexp* → *Bexp* or *Bterm* | *Bterm
Bterm* →*Bterm* and *Bfact* | *Bfact
Bfact →not *Bfact* | (*Bexp*) | id

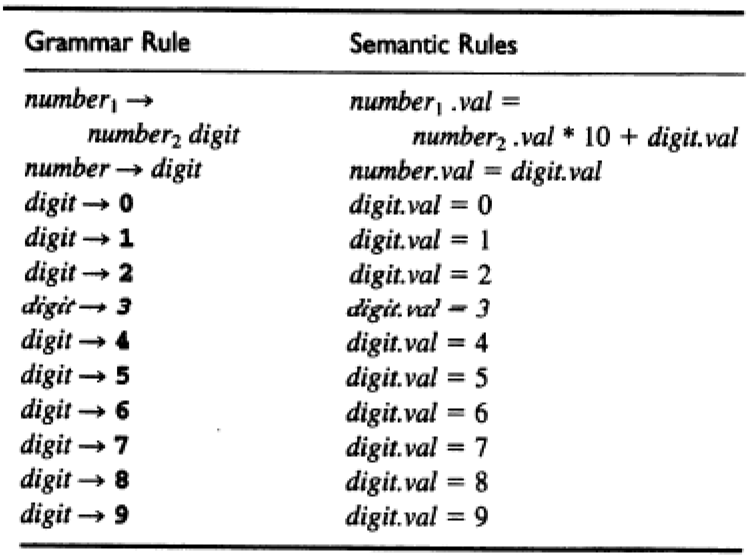
a) What is the start symbol in the above grammar?
b) What are the terminal and the non-terminal symbols in the above grammar?
c) Construct a leftmost derivation for the following sentence: not id and id
d) Eliminate the Left-Recursion from the above grammar.

1.2 What do we mean when we say that a grammar is "ambiguous"? Mention two techniques for eliminating ambiguity from a grammar

1.3 Explain why Top Down parsers cannot handle Left Recursive Grammars.

Question 2 (20 Marks)

2.1 Given the following BNF grammar and associated semantic rules:



Grammar Rule	Semantic Rules
number$_1$ → *number*$_2$ *digit*	*number*$_1$.*val* = *number*$_2$.*val* * 10 + *digit*.*val*
number → *digit*	*number*.*val* = *digit*.*val*
digit → **0**	*digit*.*val* = 0
digit → **1**	*digit*.*val* = 1
digit → **2**	*digit*.*val* = 2
digit → **3**	*digit*.*val* = 3
digit → **4**	*digit*.*val* = 4
digit → **5**	*digit*.*val* = 5
digit → **6**	*digit*.*val* = 6
digit → **7**	*digit*.*val* = 7
digit → **8**	*digit*.*val* = 8
digit → **9**	*digit*.*val* = 9

a) Draw the dependency graph for the semantic rules
b) Draw the parse tree and dependency graph for the string 785

2.2 Draw DFA's that accept the following:
a) All strings that represent numeric constants in scientific notation
b) All strings that contain exactly one b over the alphabet {a, b, c}
c) The regular expression a(ab)*aa, given the alphabet { a, b }.

2.3 What is the role of the following sections in a procedure activation record?

a) Space for bookkeeping information
b) Space for local temporaries

Question 3 (20 Marks)

3.1 Given the grammar rule for an if-statement:

If-stmt **→ if (** ***exp*** **)** ***statement***
| if (***exp*** **)** ***statement*** **else** ***statement***

a) Translate this rule into EBNF

b) Draw the syntax diagram of EBNF of part (a).

c) Write pseudo-code to parse this grammar by recursive descent

3.2 Mention a situation where the First set computation is required.

3.3 Given the following arithmetic Expression:

a * b + a * b * c

a) Write down the corresponding three-address code.

b) Show the triple representation for this code.

Question 4 (20 Marks)

4.1 Consider the following grammar

Stmt-sequence → stmt; stmt-sequence | stmt
Stmt→ **s**

a) Left factor this grammar

b) Construct First and Follow sets for the non terminal of the resulting grammar. You are asked to show the computation process.

c) Construct the LL(1) parsing table for the resulting grammar

d) Show the action of corresponding LL(1) parser given the input string s; s ; s

4.2 What is meant by regular expression?

4.3 Write regular expressions for the following:

a) All strings of digits such that all 2's occur before all 9's

b) Strings of a's and b's that contain an even number of a's and an even number of b's

c) All strings that contain at most one b over the alphabet {a, b, c}

(End of Questions-Good Luck)