诚信保证(Integrity commitment)

本人知晓我校考场规则和违纪处分条例的有关规定，保证遵守考场规则，诚实做人。   本人签字(Signature)：

编号：

西北工业大学考试试题（B 卷）

2021 － 2022 学年第 2 学期

开课学院 **School of Computer Science**
课程 **Compiler Principles/编译原理(英) (U10M12008.01)**
学时 **48 hours**
考试日期 **2022.7.2** 考试时间 **2 hours** 小时   考试形式（ 闭 ）卷

Question	Q1(12)	Q2(8)	Q3(8)	Q4(8)	Q5(10)	Q6(15)	Q7(14)	Q8(15)	Q9(10)	Sum of Scores
Scores										

考生班级（Class ID）		学号（Student ID）			姓名（Name）	

【Q1】 (12 scores: 3+3+3+3)

For grammar G[S]:

S→SaS | A，A→ε | aB，B→(B) | b

Answer the following questions:

(1) Is this grammar a recursive grammar? Give the answer and the reason for your answer.

(2) What are the terminals and non-terminals of this grammar?

(3) G[S] is an ambiguous grammar. Find one example string and give two different left-most derivation sequences to prove the ambiguity of G[S].

(4) Given a string "aaa(b)", is it a legal sentence defined by this grammar? Please draw the parsing tree for the input?

【Q2】 (8 scores: 4+4)

Given grammar G[E]:

①E→RTa {printf("1");}   ②R→b {printf("2");}
③T→ε {printf("3");}   ④T→xyT {printf("4");}

Given "bxyxya" as the input string, and supposed that we use LR similar parsing algorithm (reduction based analysis), please present the left-most reduction sequences. Then give the output of printf functions defined in the question.

Notation: here we suppose to execute the printf when we use the rule to do derivation.

注：1. 答题请写在该试卷上相应位置。
    2. 命题教师和审题教师姓名应在试卷存档时填写。
教务处印制

【Q3】(8 scores: 4+4)

　　Given grammar G[S]: S→Sa | b

(1) Please rewrite G[S] into G[A] so that G[A] could recognize the same language as G[S] while G[A] is not a left-recursive grammar.

(2) Prove that G[A] is equivalent to G[S] (recognize the same language).

Notation: You could utilize basic BNF or EBNF to represent G[A].

【Q4】Please answer the following questions: (8 scores)

　(1) Given regular expression ((a|b) | (0|1)*)*, please draw the NFA. (2scores)

　(2) Write down the regular expression or NFA or DFA for the following language:

　　　Hex integer such as 0x01AF or 0X01af.　 (2 scores)

　　　Octal integer such as 01 or 07　　　　　(2 scores)

　　　Decimal integer such as 1 or 19　　　　　(2 scores)

【Q5】 (10 scores) Given the following C program:

```
int i, x, y;
for (i=1+x; i<=x+y; i++)
{
    if (x>y+1)   break;
    else
    {
        x = x*2;
    };
}
x=9;
```

　　Please present the Quadruple (three-address code) or if-goto forms with equivalent logic to above program. (10 scores)

【Q6】 (15 scores)

　　Given G[S] as following:

　　　S → aA | d | ε

　　　A → bAS| ε

　　(1) Present the First set for each production rule. (3 scores)

　　(2) Present the Follow Set for each non-terminal symbol. (3 scores)

	First	Follow
S → aA		
S → d		
S → ε		
A → bAS		
A → ε		

(3) Present the LL(1) table.   Is this grammar LL(1)? (5 +2 scores)

	a	b	d	#
S				
A				

(4) Given input string "abd", present the derivation sequences according to the LL(1) table: (2 scores)

【Q7】 (14 scores)
Given the following NFA:
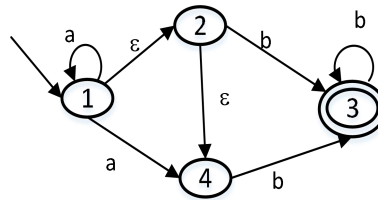
(1) Present the equivalent Matrix representation of this NFA. (7 scores)

	a	b	ε
1			
2			
3			
4			

(2) Transform the NFA to DFA. (7 scores)

【Q8】 (15 scores)
Given the following grammar G[Z]:

Z→ABa   A→bB | ε

B→ ε   B→xyB

bxyxya=>bB

(1) Please write down the LR(0) automata. (6 scores)
(2) Please present the LR(0) parsing table. (7 scores)

	a	b	x	y	Z	A	B
I0							
I1							
...	...	...	...	...	...	...	

【Q9】For the following three addresses IR code, write down the basic blocks and draw the control flow graph of it. (10 scores).
(1) X := X*3
(2) if X!=10 goto (6)
(3) goto (4)
(4) X := X*X
(5) goto (2)
(6) if X>0 goto (7)
(7) X := X-2
(8) Y := X+5
(9) goto (2)