COSC 445/ 542 Compiler February 2016 Name:_____

Open book

1. Consider the regular expression (a | b* c)
Note (,) and | are meta-symbols.
Reminder: The precedence of regular expression operators, highest to lowest, is closure (*) > concatenate > alternate (|)

1A. Give three strings recognized by the regular expression.

1B. Write the NFA that recognizes the tokens defined by the regular expression.
This question is testing your knowledge of RE → NFA; it is not testing your knowledge of RE → DFA.

2. Write the state transition table for the following state transition diagram.

3. Write the DFA that corresponds to the following NFA.
Any correct DFA is a correct answer to this question.

4. Minimize this DFA
Any correct DFA that has the minimal number of states is a correct answer.

5. Remove direct left recursion from this grammar (Give the complete new set of productions and of non-terminal symbols)

S → A B **c**
A → A C | C
B → **w**
C → **x**

T = { **c, w, x**} NT = {S, A, B, C}

6. Give a set of productions for an expression grammar with the following four operators: **<-** , **->** , **(-** , **-)**

high precedence: **<-** , **->** right associative
low precedence: **(-** , **-)** left associative

T = { **<-** , **->** , **(-** , **-)** , **num** , **id** }

Note: **(** and **)** are not symbols in this grammar.

7. Consider this set of productions in a grammar

S →	**a** S'	// (1)
S →	S'	// (2)
S' →	T T'	// (3)
T →	**a**	// (4)
T' →	T T'	// (5)
T' →	ε	// (6)

T = { **a, b** } NT = { S, S', T, T' }
A label for each production is given to the right ((1) – (6))

7A. Give the FIRST sets for all symbols

7B. Give the FOLLOW sets for the non-terminals

7C. Give the FIRST+ sets for all productions.

7D. Is the grammar backtrack free? Why or why not?