

CMSC430 Spring 2014 Midterm 1

Name _____

Instructions

- You have 75 minutes for to take this exam.
- This exam has a total of 100 points. An average of 45 seconds per point.
- This is a closed book exam. No notes or other aids are allowed.
- If you have a question, please raise your hand and wait for the instructor.
- Answer essay questions concisely using 1-2 sentences. Longer answers are not necessary and a penalty may be applied.
- In order to be eligible for partial credit, show all of your work and clearly indicate your answers.
- Write neatly. Credit cannot be given for illegible answers.

	Problem	Score	Max Score
1	LL(1) parsing		20
2	Table-driven LL(1) parsing		6
3	Shift-reduce parsing		10
4	LR(1) parsing		22
5	LR(1) parse table construction		16
6	LR(1) conflicts		12
7	LALR(1) parsers		14
	Total		100

HONOR PLEDGE: I pledge on my honor that
I have not given or received any unauthorized
assistance on this assignment/ examination.

SIGNATURE: _____

$S \rightarrow A$
$A \rightarrow Aa \mid \epsilon$

1. (20 pts) LL(1) parsing
 - a. (8 pts) Compute FIRST and FOLLOW for S, A for the above grammar, where ϵ is the empty string:

	FIRST	FOLLOW
S		
A		

- b. (10 pts) Construct the LL(1) parse table for the grammar.

	a	\$
S		
A		

- c. (2 pts) Is the grammar LL(1)? Explain.

2. (6 pts) Table-driven LL(1) parsing

Using the following LL(1) parse table, parse the input “baa”. You only need to show the stack and remaining input at each stage of the parse.

	a	b	\$
S	$S \rightarrow ba$	$S \rightarrow AaC$	$S \rightarrow C$
A	$A \rightarrow ba$	$A \rightarrow bBa$	$A \rightarrow \varepsilon$
B	$B \rightarrow \varepsilon$	$B \rightarrow a$	$B \rightarrow \varepsilon$
C	$C \rightarrow ab$	$C \rightarrow ba$	$C \rightarrow \varepsilon$

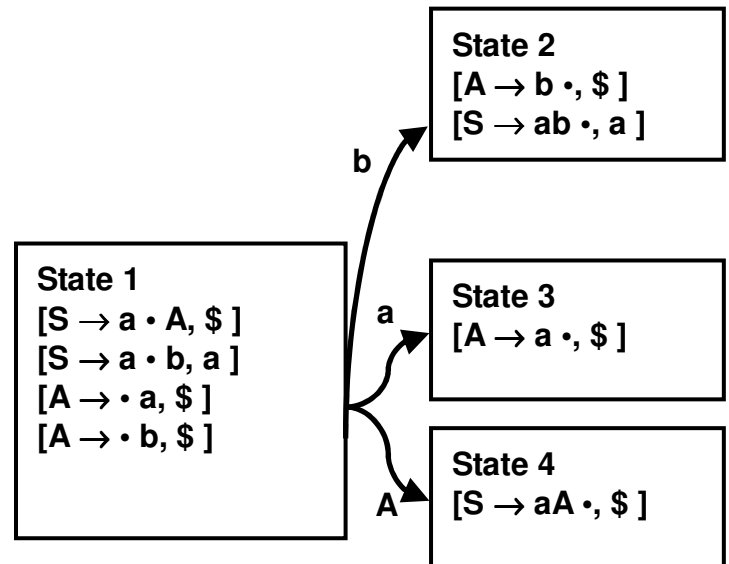
[illegible]

3. (10 pts) Shift-reduce parsing

Given the ACTION/GOTO table above, show the parse if the current stack contents are 4 A 2 (i.e., current state is 2) and the remaining input is “bb”.

[illegible]

5. (16 pts) LR(1) parse table construction
 Given the following sets of LR(1) items, construct the corresponding entries in the LR(1) parse table.



State	ACTION			GOTO	
	a	b	\$	S	A
1					
2					
3					
4					

6. (12 pts) LR(1) conflicts

Consider the following LR(1) items in a single state of a shift/reduce parser. List any conflicts that exist and describe for what lookaheads they occur.

$[A \rightarrow \cdot dAd, b]$
 $[B \rightarrow dab \cdot h, a]$
 $[C \rightarrow b \cdot ad, c]$
 $[D \rightarrow ab \cdot d, h]$
 $[E \rightarrow cab \cdot, a]$
 $[F \rightarrow aAab \cdot, c]$
 $[G \rightarrow hab \cdot, c]$
 $[H \rightarrow aA \cdot, b]$

7. (14 pts) LALR(1) parsers

- a. (6 pts) Consider the following states in a LR(1) parser for a grammar G. Which states would be merged in a LALR(1) parser?

State 1
 $[A \rightarrow ab \cdot, c]$
 $[A \rightarrow b \cdot, a]$
 $[A \rightarrow \cdot ba, b]$

State 2
 $[A \rightarrow ab \cdot, c]$
 $[A \rightarrow b \cdot, b]$
 $[A \rightarrow b \cdot a, c]$

State 3
 $[A \rightarrow ab \cdot, c]$
 $[A \rightarrow \cdot b, c]$
 $[A \rightarrow b \cdot a, c]$

State 4
 $[A \rightarrow ab \cdot, b]$
 $[A \rightarrow b \cdot, c]$
 $[A \rightarrow b \cdot a, c]$

- b. (4 pts) What new state(s) would result after the merge?

- c. (4 pts) Is the grammar G an LALR(1) grammar? Explain.