

# Midterm Review

CSE 401 - 17wi

# Administrivia

- Parser questions?
- Midterm next Wednesday, 2/8
- Midterm review on Tuesday in EEB 037 at 4:30

# Interpreters and compilers -

- key differences

# Gross structure of compilers -

- tasks of front/middle/back ends

# Regular expressions and DFAs

- Standard regular expression operators
- Writing regular expressions to generate specific languages
- Constructing DFAs to recognize regular languages (but you are not responsible for the detailed RE -> NFA -> DFA construction algorithms)

## Scanners -

- transforming character streams to token streams

# Basic notions of grammars -

- productions, terminals, non-terminals

## Context-free grammars

- Derivations, leftmost, rightmost, etc.
- Constructing grammars to generate languages
- Ambiguity
- First, follow, and nullable

# LR parsing

- Shift-reduce parsing
- Construction of LR(0) and SLR parsers and tables
- Items, item sets, and parser states
- Shift-reduce and reduce-reduce conflicts and how to deal with them
- Differences between LR(0) and SLR parsers

# LL and recursive-descent parsers

- Predictive parser operation and grammar requirements (disjoint first sets)
- Constructing hand-written recursive-descent parsers
- Grammar problems and fixes for LL parsing - left recursion, left-factoring common prefixes, etc.

# Abstract Syntax Trees (ASTs) and the visitor pattern



# Static semantics -

- there may be some basic overview questions on these concepts based on lectures, but the midterm will not include details that won't be encountered until the next phase of the project.
- Typical kinds of conditions that are tested/verified in the semantics pass
- Attribute grammar general concepts
- General symbol table organization for languages like MiniJava

# Review Questions

## CSE 401 Midterm Exam 2/11/15

**Question 4.** (34 point) The oh noz, not again, parsing question. Here is a tiny grammar.

0.  $S' ::= S \$$  (\$ represents end-of-file)
1.  $S ::= aBc$
2.  $B ::= b$
3.  $B ::= \epsilon$

(a) (12 points) Draw the LR(0) state machine for this grammar.

# Review Questions

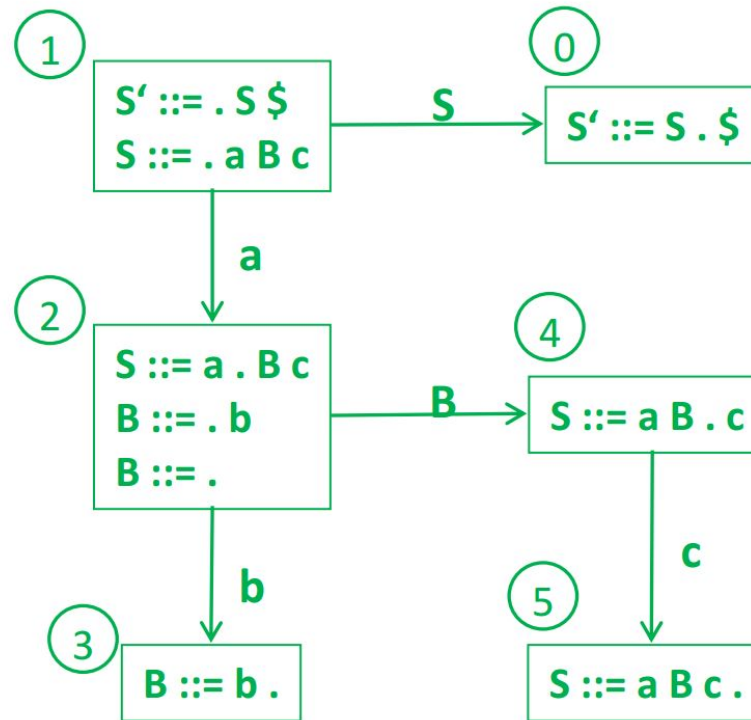
(b) (6 points) Compute *nullable* and the FIRST and FOLLOW sets for the nonterminals  $S$  and  $B$  in the above grammar:

Symbol	nullable	FIRST	FOLLOW
$S$			
$B$			

0.  $S' ::= S \$$
1.  $S ::= aBc$
2.  $B ::= b$
3.  $B ::= \varepsilon$

- 0.  $S' ::= S \$$
- 1.  $S ::= aBc$
- 2.  $B ::= b$
- 3.  $B ::= \epsilon$

# Review Answers



Symbol	nullable	FIRST	FOLLOW
$S$	false	$a$	$\$$
$B$	true	$b$	$c$

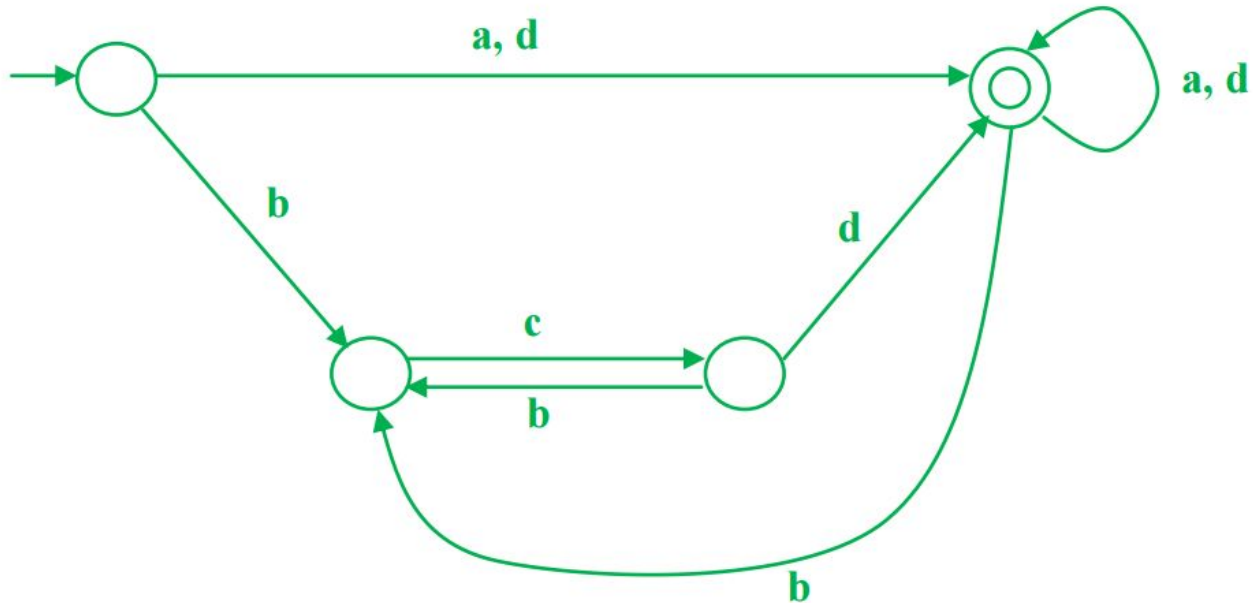
# Review Questions

**Question 3.** DFAs. (8 points) Draw a DFA that accepts strings generated by the regular expression  $(a | (bc)^* d)^+$

# Review Answers

**Question 3.** DFAs. (8 points) Draw a DFA that accepts strings generated by the regular expression  $(a | (bc)^* d)^+$

**Note that  $(bc)^*$  means empty or bc or bcbc or bcbebc..., but not an arbitrary sequence of b's and c's. That would be  $(b|c)^*$ .**



# Your Review Questions