

Answer all questions in the exam book. You may keep the exam questions after you are done.

1. [56] Consider the following grammar G:

1. $S \rightarrow X a \perp$
2. $X \rightarrow Y b$
3. $X \rightarrow Y Z c$
4. $Y \rightarrow d$
5. $Z \rightarrow b$

For each of the following grammar classes, if G is of that class, give the appropriate parsing table. If it is not of that class, fully explain why it isn't.

- (a) LL(0)
- (b) LL(1)
- (c) LR(0)
- (d) LR(1)
- (e) SLR(1)
- (f) LALR(1)
- (g) General precedence

2. [8] Is the **language** given by the grammar in problem above LL(1)? Prove your answer.

3. [12] For the regular expression

$$(00)^* (0 | 1)^* (11)^*$$

- (a) Give the non-deterministic FSA that accepts the same set.
- (b) Give the minimal state DFA that recognizes the same set.
- (c) Give a regular grammar that recognizes the same set.

4. [8] (a) Show that the language $A^n B^{2^n}$ for $n > 0$ is LR(k). What is k?

(b) Show that $A^n B^{2^n} C^n$ for $n > 0$ is not LR(k) for any k.

5. [12] Answer each of the following:

(a) Assuming the usual grammar for expressions, give the Polish Postfix for the expression: $(3+4*(2+7)+8*5)$

(b) If the grammar for an expression is given by the grammar:

$$E \rightarrow E + T \mid E - T \mid E * T \mid E / T \mid T$$

$$T \rightarrow \text{number} \mid (E)$$

Give the parse tree for the expression in (a).

(c) Using the grammar in (b), give the Postfix for the expression in (a).

(d) Give a set of quads that would be the output of a parser for the expression in (a).

6. [4] Why do you want only synthesized attributes in YACC? What would happen if you defined YACC with inherited attributes?