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) \( \text{LL}(0) \)
   (b) \( \text{LL}(1) \)
   (c) \( \text{LR}(0) \)
   (d) \( \text{LR}(1) \)
   (e) \( \text{SLR}(1) \)
   (f) \( \text{LALR}(1) \)
   (g) General precedence

2. [8] Is the language given by the grammar in problem above \( \text{LL}(1) \)? 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 \( A^nB^{2n} \) for \( n > 0 \) is \( \text{LR}(k) \). What is \( k \)?
   (b) Show that \( A^nB^{2n}C^n \) for \( n > 0 \) is not \( \text{LR}(k) \) 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:
       \( E \rightarrow E + T \ | \ E - T \ | \ E \times T \ | \ E/T \ | \ T \)
       \( T \rightarrow \text{number} \ | \ ( \ E ) \)

       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?