

CSC173 FLAT Module Exam

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Please write your name on the bluebook. This is a closed-book Exam. There are 75 possible points (one per minute). Best not to spend more minutes on a question than it's worth. Stay cool and please write neatly.

1 Regular Expression to Minimized DFA (25 min.)

Given the regular expression $(a \mid ab)^*$:

1. (10 min.) Create an equivalent nondeterministic finite automaton by our “mini-machine” method (Thompson’s method).
2. (10 min.) Use the subset construction to convert the NFA to a DFA.
3. (5 min.) Minimize the DFA using the equivalence class method, or prove it is already minimal using the equivalence class argument.

2 Regular Expressions and DFAs (20 min.)

1. (10 min.) Not using the above conversion process, directly write down the RE and a DFA diagram for the language “All strings from the set $\{x,y,z\}$ such that every z is directly preceded by two x ’s”. (So $xyxxzyyx$, $xyyxxxzyyx$, xxz are OK, but $xyyxzy$ and yyz are not).
2. (10 min.) Directly write down the DFA for the language “All strings with an even number (including zero) of 0’s and an odd number of 1’s”.

3 Parsing (20 min.)

Here's a CFG with starting symbol S , nonterminals S, P, Q, R, T ; terminals a, b, c, d, e ; λ the null symbol.

- $S \rightarrow PQ$
- $P \rightarrow abP$
- $P \rightarrow \lambda$
- $Q \rightarrow Qc$
- $Q \rightarrow Td$
- $Q \rightarrow Te$
- $Q \rightarrow aR$
- $R \rightarrow b \mid bQ$
- $T \rightarrow aT \mid bT \mid \lambda$

1. (5 min.) Is this an LL (left to right, left derivation) grammar? If not please say why not and fix it so it is LL.
2. (5 min. – doesn't depend on part 1.) What are the FIRST and FOLLOW sets of nonterminal Q ?
3. (5 min. – doesn't depend on part 1.) Is this grammar ambiguous? Show why or why not.
4. (5 min. – doesn't depend on earlier parts.) Show a parse tree for the string " $abdcc$ ".

4 FLAT (10 min)

Fill in the table (Hint: the top row is *not* $[0,1,2,3]$). You may write your table into your bluebook or write on this page, tear it off and and fold it in.

Chomsky Type	0			
Language Name		Regular Expressions		
Acceptance Complexity			Exponential	
Formal Machine				Pushdown Automaton