

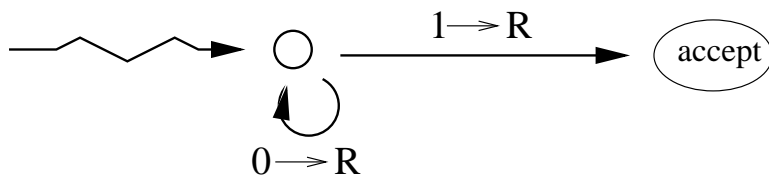
Practice for the CS456 Final Examination: Part II

1. Prove that the language $\{a^n b^n : n \geq 0\}$ is not regular.

2. Give a context-sensitive grammar for $L = \{a^n b^n c^n : n \geq 1\}$

3. Give a context-free language whose complement is not context-free.

4. Write a regular expression for the binary language accepted by the Turing machine illustrated below.



5. Give a polynomial time reduction of the subset sum problem to the partition problem.

6. Give a polynomial time reduction of 3SAT to the independent set problem.

7. Prove that the language L given in problem 2 is not context-free.

8. Prove that the halting problem is undecidable.

9. The Dyck language, where left and right parentheses are replaced by a and b , is generated by the following unambiguous context-free grammar:

1. $S \rightarrow S_{1,3}a_2S_3b_4$
2. $S \rightarrow \lambda$

Fill in the Action and Goto tables of an LALR parser for this grammar. I have done lines 0 and 4.

	a	b	\$	S
0	r2		r2	1
1				
2				
3				
4	r1	r1	r1	

10. The following unambiguous context-free grammar generates the same language. Fill in the Action and Goto tables of an LALR parser for this grammar.

1. $S \rightarrow a_2S_3b_4S_5$
2. $S \rightarrow \lambda$

	a	b	\$	S
0				
1				
2				
3				
4				
5				

11. The Dyck language contains the empty string. Let L be the Dyck language minus the empty string, which is generated by the CF grammar:

1. $S \rightarrow aSb$
2. $S \rightarrow SS$
3. $S \rightarrow ab$

Find a CNF (Chomsky Normal Form) grammar for L .