Name_____

CS5003
Final Exam

Thursday, July 22, 2009

#1 (5 Points).

$\lceil 2.44 \rceil$ = ?

Answer

#2. (10 Points) Given Turing Machine M:

	B	a	b
0	1,B,R		
1		1,a,R	2,b,R
2		3,a,R	2,b,R
3 (final)			

True or False and justify your answer:

L(M) = a*bb*a (a ∪ b)*

Answer

#3. a) (5 Points) Define Chomsky Normal Form (I am having you do this for the next parts. There are 2 different definitions and I need to know which one you are using)

Answer

b) (5 Points) Name the steps an algorithm would take to convert an arbitrary context free grammar to Chomsky Normal Form

Answer

c) (10 Points) Convert the following grammar to Chomsky Normal Form

S → A | 1 B | λ
A → 0 | λ
B → 1 | A C
C → 0 C | 0
Answer

#4. (5 each) For each of the following languages, determine where in the Chomsky hierarchy it belongs. State your answer and then prove it. Specifically:

- **If the language is *regular*, prove it is regular.**
- **If the language is *context-free, but not regular*, prove that it is context-free and prove that it is not regular**
- **If the language is *recursive*, *but not context-free*, prove that it is recursive and prove that it is not context-free**
- **If the language is *recursively enumerable (r.e.)*, *but not recursive*, prove that it is recursively enumerable and prove that it is not recursive.**
- **If the language is *not recursively enumerable*, prove that it is not recursively enumerable.**

For any answer involving Turing machines, you need only describe how the Turing Machine works.

a) L = {<M,w> | M halts on input w}
Answer

b) The reverse of a regular language, L
Answer

c) L(G) where

G: S → 0 S | 1 S | ε
Answer

d) L where L is the reverse of a re language that is not recursive.

Answer

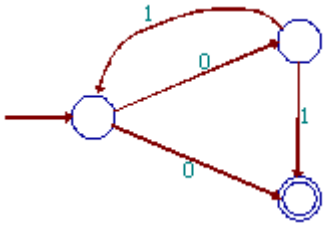
e) L(G) where

G: S → 0 S 1 | ε

Answer

f) L(M) where

M:



Answer