

CS 3100 – Models of Computation – Fall 2011

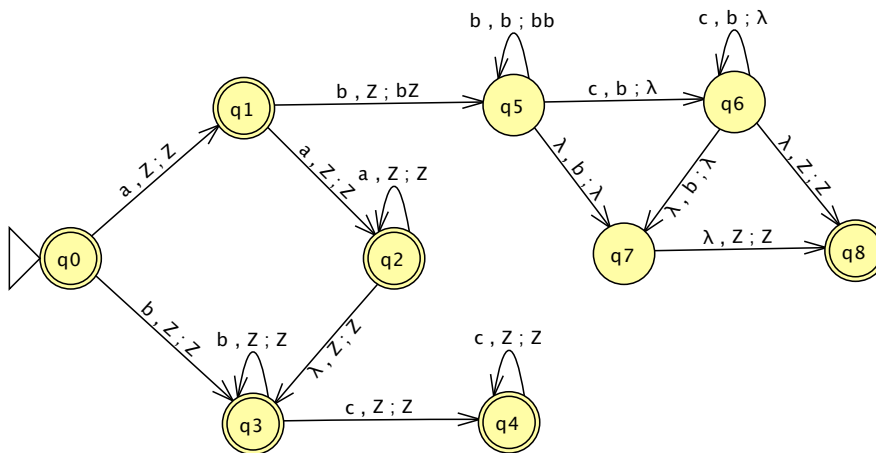
Assignment 9 – Given 11/3/11, Due 11/11/11 FRIDAY 11:59pm – 100 points, 10% of assignment points

1. (20 points) Design a CFG for $L_2 = \{a^i b^j c^k \mid i, j, k \geq 0, \text{ if } (i = 1) \text{ then } 0 \leq j - k \leq 1\} \dots$

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S -> OneA B1C | NotOneA BsCs
NotOneA -> @ | a a As
As -> @ | a As
BsCs -> Bs Cs
Bs -> @ | b Bs
Cs -> @ | c Cs
OneA -> a
B1C -> b BMC | BMC
BMC -> @ | b BMC c
    
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2. (20 points) Design a PDA for L_2 directly (without converting the CFG to a PDA using direct conversion)...



3. (20 points) Convert L_2 's CFG from Question ?? to a PDA ...

Ask the TAs if you can't design this.

4. (20 points) Simplify the grammar G_4 below, clearly documenting the simplification steps. Argue that the grammar is consistent and complete with respect to the language

$$L_{balpar} = \{w \mid w \in \{(,)\}^*, \text{ and in any prefix } p \text{ of } w, \#_{(}(p) \geq \#_{)}(p), \text{ and } \#_{(}(w) = \#_{)}(w)\}$$

This is worked out in my book chapter kept online.

5. (20 points) Find out whether the language of S is regular or context-free.

S \rightarrow T T | U
T \rightarrow 0 T | T 0 | #
U \rightarrow 0 U 0 0 | #

Answer: Consider

T \rightarrow 0 T | T 0 | #

T is regular

S \rightarrow T T is regular.

U is not regular.

PL proof: Pump

$$\{0^i \# 0^{2i} \mid i \geq 0\}$$

and prove that U is not regular.

TT union U is not-regular as their intersection is empty why?

how many # in TT ? - 2 #s

how many # in U ? - 1 #

hence TT and U can't have common strings! Then use the "Immiscible Theorem." Hence S's language is context-free!