CS 3530: Assignment 2b

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Exercise 2.9 (10 points)

Problem

Give a context-free grammar that generates the language

$$A = \{a^i b^j c^k | i = j \text{ or } j = k \text{ where } i, j, k \geq 0\}.$$

For all CFGs, describe the role that each rule performs as well as giving the actual rule.

Solution

a_1 :

$s_1 => s_1 c|E|\epsilon$,

E => aEb|ϵ

a_2 :

$s_2 => aS_2|F|\epsilon$

F => bFc|ϵ

Exercise 2.5be (10 points)

Problem

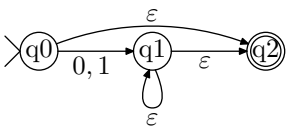
Give informal descriptions and state diagrams of pushdown automata for the languages in Exercise 2.4.

- **b.** $\{w|w$ starts and ends with the same symbol$\}$
- **e.** $\{w|w = w^R$, that is, w is a palindrome$\}$

Solution

b: - If there is more than one item, it gets added to the stack.

- Take the first item, add it to the stack. When reading the last item, if it matches the item in the stack, accept. If not, disregard.



e: - 1st half of the input is pushed into the stack.

- the second half is input and compared to what is in the stack. popping off the stack after each comparison.

- if it is the same then it is accepted.

a = $