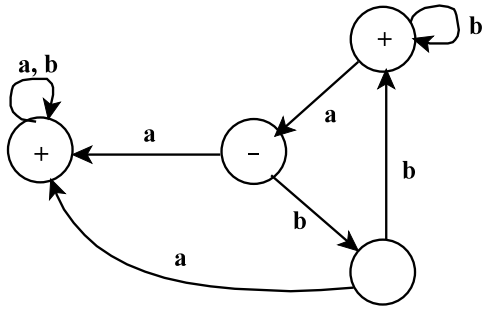
Trent University

Computing and Information Systems 3050H

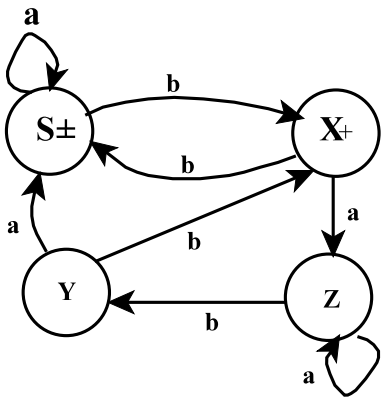
Fall 2020

Assignment 3: Due December 9, 2020

1) Convert the following FA into a PDA.



2) Convert the following FA into a CFG.



3) Eliminate Λ-productions for the CFG:

S → aXbX

X → aY | bY | Λ

Y → X | ZY | b

Z → XY | c

4) Convert the following CFG into CNF.

S → ABC

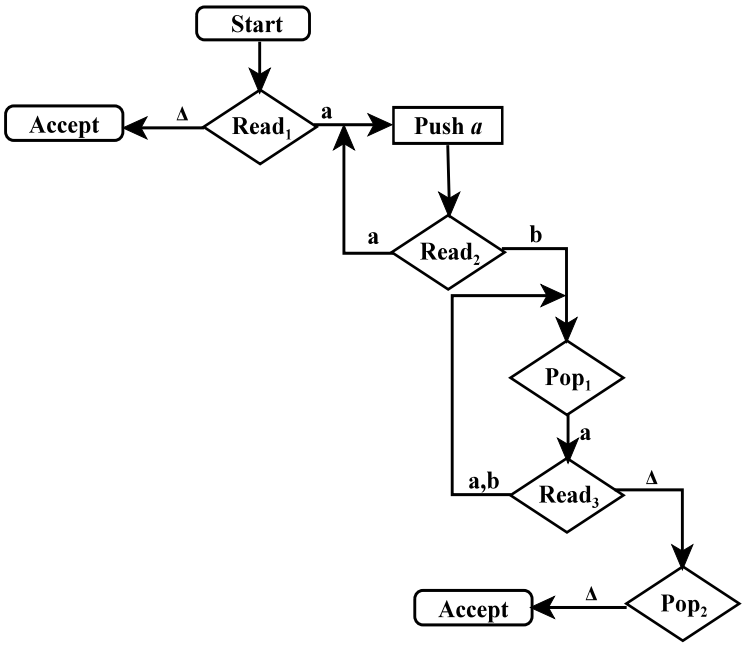
A → aAS | a | Λ

B → SbS | A | bb

C → b

5) Consider the following non-deterministic PDA. Are the following words accepted by this PDA? For those that are rejected, indicate which state the PDA is in when the crash occurs.

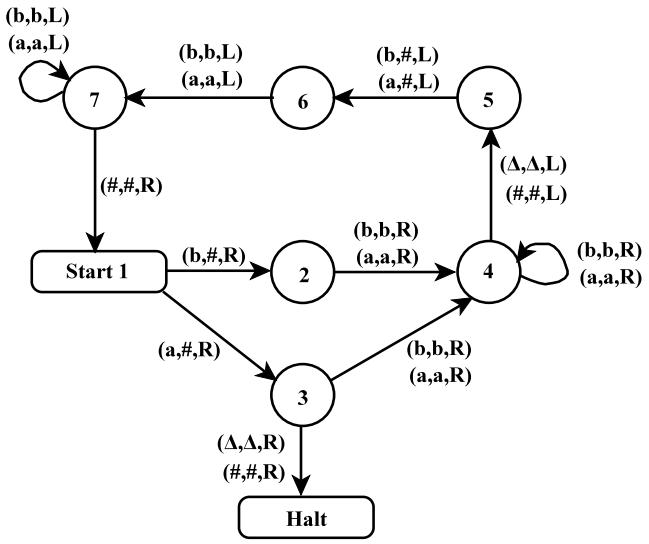
(a) aaabbb
(b) bbbaaa
(c) aaabbaa
(d) aaaabaa
(e) aaabaa



6) Use the algorithmic approach given in Module 5, Advanced CFLs to create a CFG for the language L = b(a*b+a)*

7) Consider the following Turing Machine: Show the execution traces using each of the following input strings (use the same format as shown in Module 6, Turing Machines):

(a) aaa
(b) aba
(c) ababb
(d) What does the machine do?



8) Build a Turing Machine over the alphabet Σ = {a,b} that accepts all words which start and end with the same letter. Note that this is a Regular Language. Show the execution traces with the following input strings:

(a) baa
(b) aba
(c) b

9) Build a TM over the alphabet E={a, b} that accepts the language DoubleA where each word has twice as many a's as b's. You might find it easier if you use the Insert# routine.