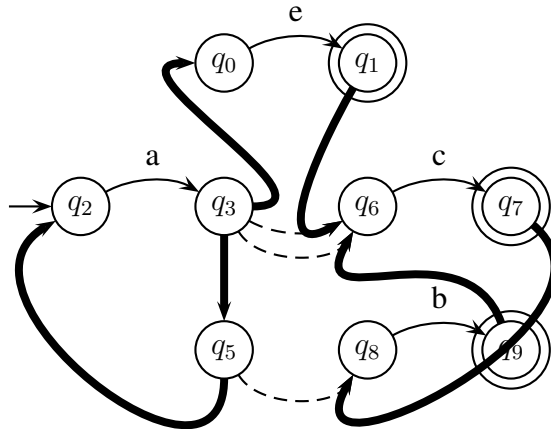


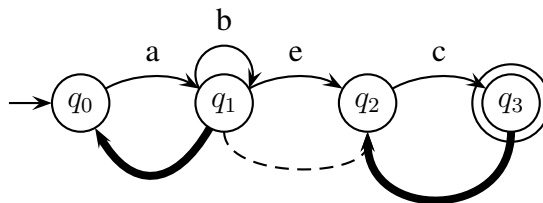
# Ling 5801: Problem Set 3

Due via Carmen dropbox at 11:59 PM 10/18.

- [10 pts.] Trace though the store states of the following PDA, on the input 'a a e c b c'.



- [10 pts.] Write a unary or higher branching CFG equivalent to the above PDA. Try to make your answer as concise as possible.
- [10 pts. – tricky] Write a unary or higher branching CFG equivalent to the following PDA (noting that CFGs are not defined to allow regular expressions on the right hand sides of rules). Try to make your answer as concise as possible.



- [10 pts.] PROGRAMMING: Using the syntax described in the lecture notes, but without directly using any regular expression functions, write a Python program containing at least one recursive function to read any tree from standard input (using the Tree class from the lecture notes) and print the total number of terminal and nonterminal symbols in that tree. For example, on the following input:

(V (N (N a big dog) with (N a hat) on it) (V-aN sat down (R-aN on (N the bed))))

Your program should print:

20

Try to make your program as concise as possible.

5. [10 pts.] PROGRAMMING: Using the syntax described in the lecture notes, but without directly using any regular expression functions, write a Python program containing at least one recursive function to read from standard input any number  $n$ , followed by any tree specified as above, and print, one on each line, all category labels at depth  $n$  (i.e. with a sequence of  $n$  edges extending between it and the root). For example, on the following input:

```
3
(V (N (N a big dog) with (N a hat) on it) (V-aN sat down (R-aN on (N the bed))))
```

your program should print:

```
a
big
dog
a
hat
on
N
```

Try to make your program as concise as possible.