# Ling 5801: Problem Set 3
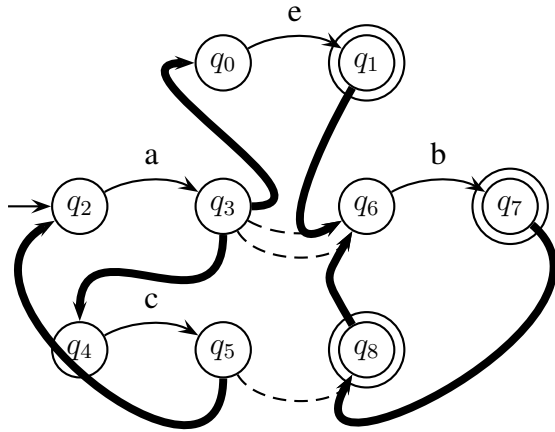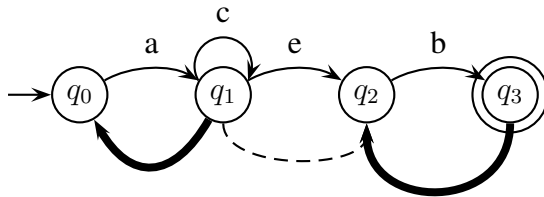
Due via Carmen dropbox at 11:59 PM 10/10.

1. [10 pts.] Trace though the store states of the following PDA, on the input 'a c a e b b'.



2. [10 pts.] Write a CFG equivalent to the above PDA. Try to make your answer as concise as possible.

3. [10 pts. – tricky] Write a CFG equivalent to the following PDA (noting that CFGs are not defined to allow regular expressions on the right hand side). Try to make your answer as concise as possible.



4. [10 pts.] PROGRAMMING: Write a <u>recursive</u> Python program to read any tree (using the Tree class from the lecture notes) and print the total number of terminal and nonterminal symbols in that tree. You may not use string functions to solve this problem. Try to make your program as concise as possible. For example, on the following input:

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

Your program should print:

```
20
```

5. [10 pts.] PROGRAMMING: Write a <u>recursive</u> Python program to read any number $n$, followed by any tree specified as above, and print the $n$th word in the tree. You may not use string functions to solve this problem. Try to make your program as concise as possible. For example, on the following input:

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

your program should print:

```
cat
```