Eric Dennis

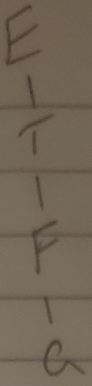
CSIS 616

HW2

9/24/2020

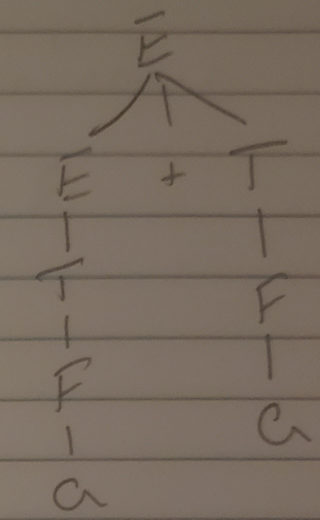
2.1 a) $S = a$

$E \Rightarrow T \Rightarrow F \Rightarrow a$



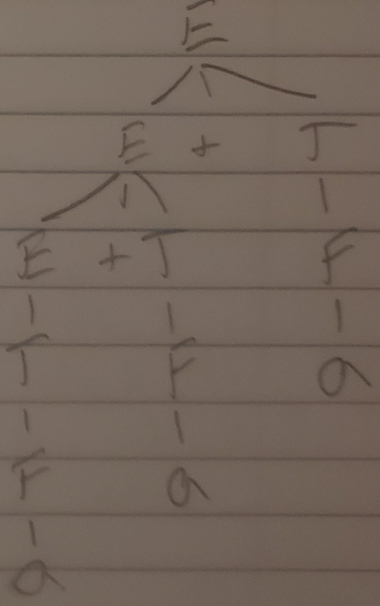
b) $S = a + a$

$E \Rightarrow E+T \Rightarrow T+T \Rightarrow$
$F+F \Rightarrow a+a$



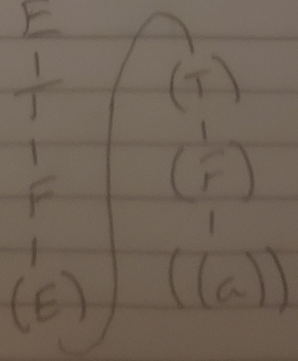
c) $S = a+a+a$

$E \Rightarrow E+T \Rightarrow E+T+T \Rightarrow$
$T+T+T \Rightarrow F+F+F \Rightarrow a+a+a$



d) $S = ((a))$

$E \Rightarrow T \Rightarrow F \Rightarrow (E) \Rightarrow (T) \Rightarrow$
$(F) \Rightarrow ((a))$



4 d) $\{w|$ the length of w is odd and its mid symbol is $0\}$

$S \to 0 \mid 0S0 \mid 0S1 \mid 1S0 \mid 1S1$

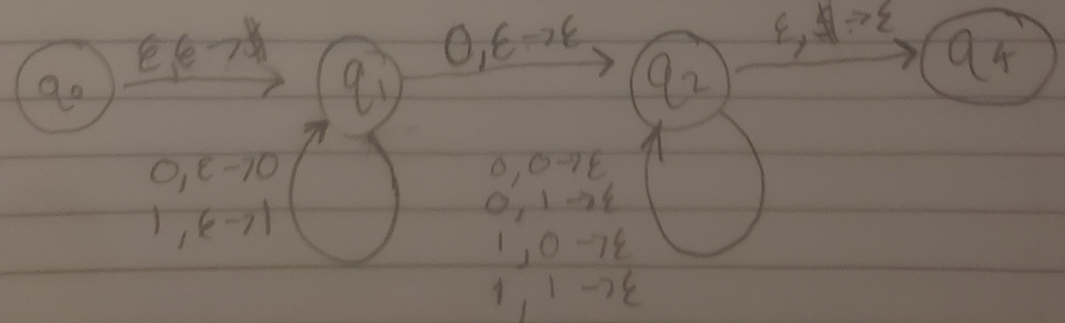
e) $\{w | w = w^R$, w is a palendrome

$S \to 0 \mid 1 \mid 0S0 \mid 1S1 \mid \varepsilon$

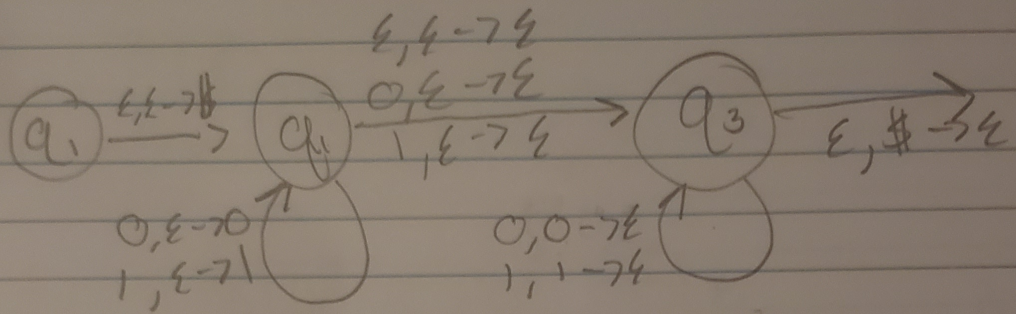
f) The Empty set

$S \to S$

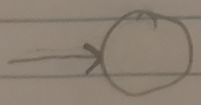
25 d) Read symbols from the input, as each 0 or 1 are read push them to the stack. The PDA nondeterministicly guesses at the middle. If a 0 is scanned at that point, then nothing is pushed to the stack. The PDA goes on to pop a symbol off the stack for each symbol scanned. If the stack is empty after the PDA finishes scanning, then it accepts (guessed middle correctly)



e) Read symbols from input and push to stack Nondeterministicly guess that the middle symbol has been reached. Continue to scan and read/pop symbols from stack. If each scanned symbol is the same as the symbol popped from the stack, and the stack is empty when scan is finished, then accept



f) The empty set has no transitions or accept states

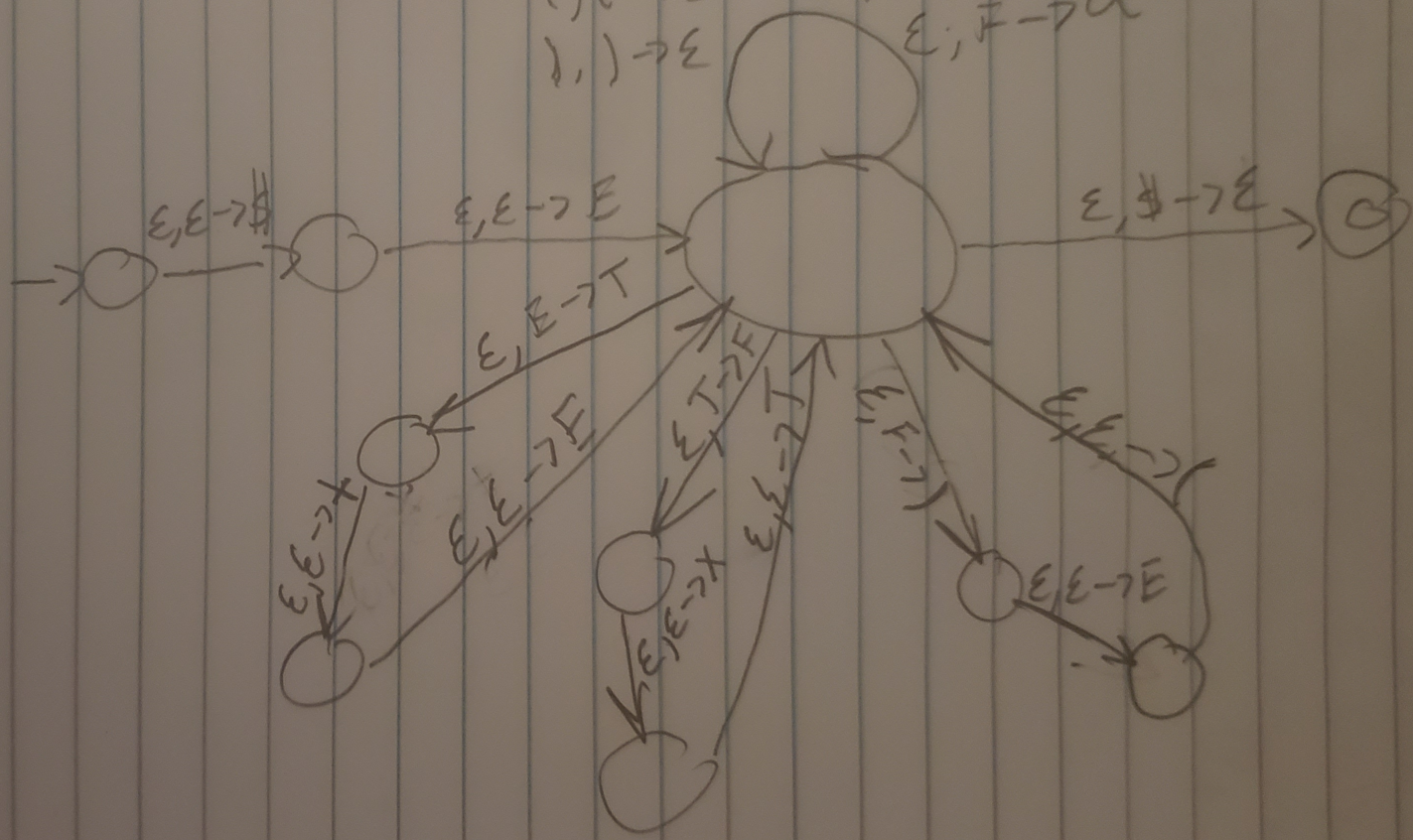


2.11 CFG -> PDA

$E \to E+T \mid T$

$T \to T \times F \mid F$

$F \to (E) \mid a$



.13 L(G) is a language made up of 0's and #'s. If two # are in the string, then there will be the same number of 0's as #'s. If there is only one #, then there will be twice as many 0's on the right of # as there are 0's on the left of #

* notes additions at each step

2.14 $A \to BAB \mid B \mid \varepsilon$ → $A_0 \to A$ $B \to \varepsilon$
$B \to CC \mid \varepsilon$ $A \to BAB \mid B \mid \varepsilon$
$B \to CC \mid \varepsilon$

$A_0 \to A$
$A \to BAB \mid B \mid \varepsilon \mid AB^* \mid BA^* \mid A^*$ $A \to \varepsilon$
$B \to CC$

$A_0 \to A \mid \varepsilon$ $A \to A$
$A \to BAB \mid B \mid AB \mid BA \mid A \mid BB^*$ $A \to B$
$B \to CC$

$A_0 \to BAB^* \mid CC^* \mid AB^* \mid BA^* \mid BB^* \mid \varepsilon$ $B \to CC$
$A \to BAB \mid CC \mid AB \mid BA \mid BB$
$B \to CC$

$A_0 \to BAB \mid B_1B_1^* \mid AB \mid BA \mid BB \mid \varepsilon$ $AB = A_1 = A_2$
$A \to BAB \mid B_1B_1^* \mid AB \mid BA \mid BB$
$B \to B_1B_1^*$
$B_1^* \to C$

$A_0 \to BA_1^* \mid AB \mid BA \mid BB \mid B_1B_1 \mid \varepsilon$
$A \to BA_2^* \mid AB \mid BA \mid BB \mid B_1B_1$
$B \to B_1B_1$
$B_1 \to C$
$A_1^* \to AB$
$A_2^* \to AB$