Maggie Johnson
CS109

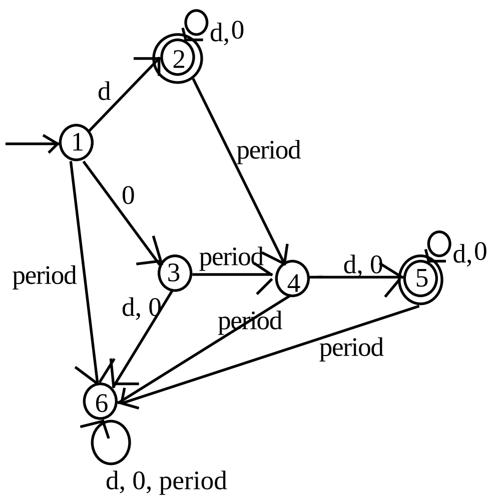
Problem Set #7 Solutions

1a) 0^+1
1b) $(0+1)(0+1)^+\ 000^+$
1c) $0^*1^* + 1^*0^*$
1d) $1^+(00)^*$
1e) $\partial + 1 + (1 + \partial)(0 + 01)^*$
1f) $1 + 0(0+1)^* + 11(0+1)^+ + 10(0+1)^* + \partial$

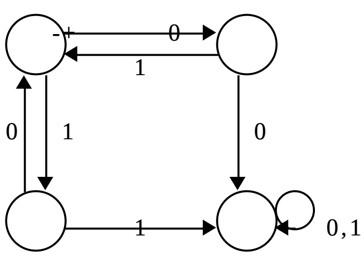
2a) All even length strings.
2b) All strings ending in 0.

3)

d=1,2,3,4,5,6,7,8,9



4)



5a) S -> aaSbbb | ∂
5b) S -> ABA
A -> aA | ∂
B -> bB | ∂
5c) S -> abA
A -> bbA | ∂

5d) S -> Δ | Z | E
Z -> b | bZ
E -> bE | aO | Z
O -> a | aE | bO

5e) S-> aSa | bSb | a | b | ∂

6) S -> SS | cMM | McM | MMc
M -> bS | SbS | Sb | b

7a) If S1 is the starting symbol for G1 and S2 is the starting symbol for G2, we can create a grammar for L(G1) U L(G2) by relabelling all productions in G2 s.t. all non-terminals are different from the non-terminals in G1 and then putting all productions together with the production:
S->S1 | S2 where S is the start symbol of this new grammar.

7b) Similarly, we can create a grammar for L(G1)L(G2) by putting all productions for G1 and G2 and the new production S->S1S2 where S is the start symbol of this new grammar.

7c) We can create a grammar for L(G1)* by taking all the productions of G1 and adding S->SS | d where S is the start symbol of G1.