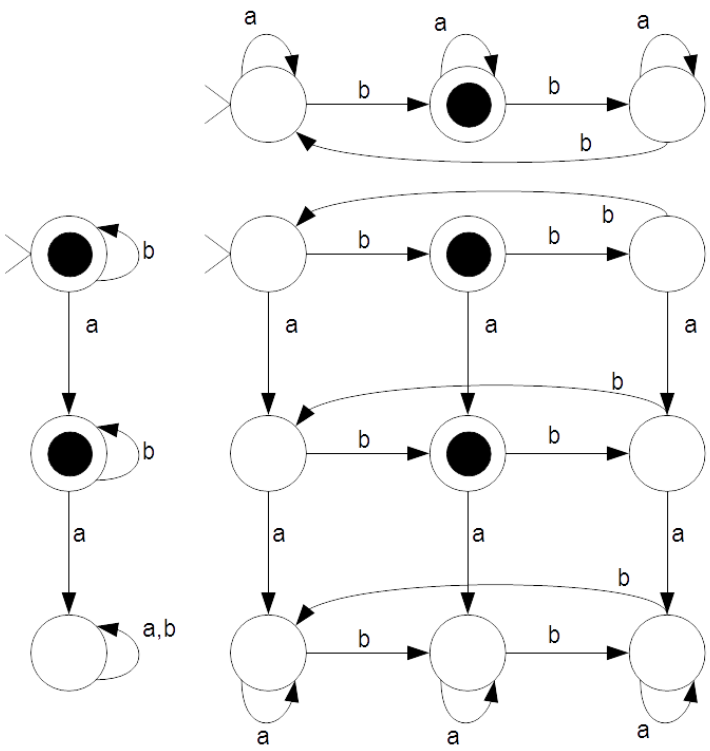
Name (block capital): April 2015

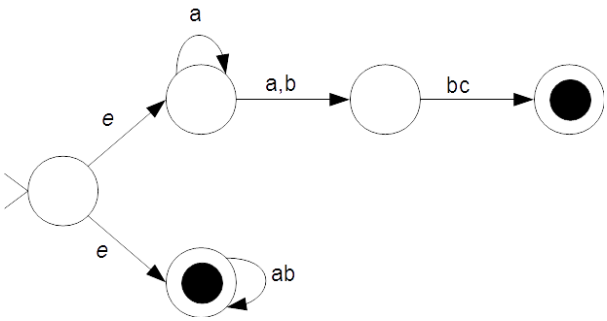
The theory of computation

1. Give DFA M with L(M) = {w∈{a, b}*| #a < 2 and #b mod 3 = 1}! (4p)

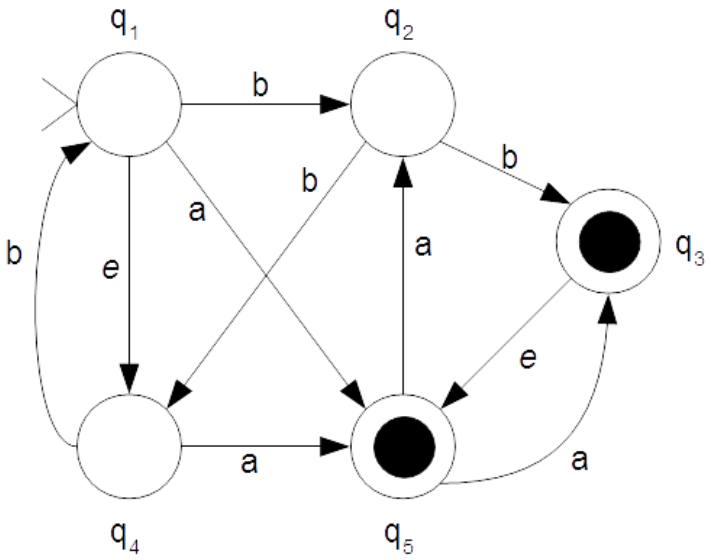


2. Give NFA M with equivalent with the following RE: (3p)

a*(aUb)bc U (ab)*

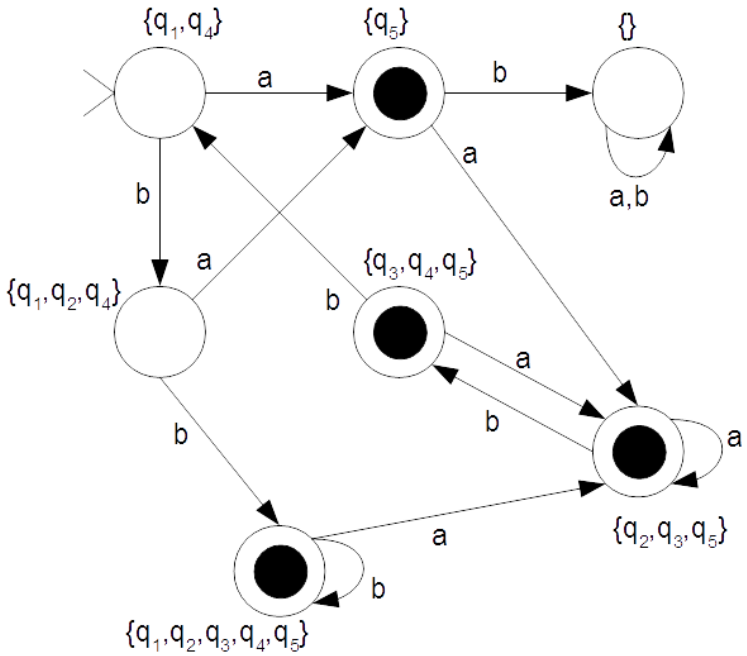


3. Give DFA M' such that L(M') = L(M)! (6p)



$E(q_1)=\{q_1,q_4\}$

$E(q_3)=\{q_3,q_5\}$



4. Give CFG G such that L(G) = $\{a(bc)^{n+1}adb^mc^pcd^{2m}a^nd \mid m, n, p \geq 0\}$? (3p)

V={a, b, c, d, S, N, M, P}

Σ ={a, b, c, d}

R={S→aNd, N→bcNa|bcadM, M→bMdd|Pc, P→cP|*e*}

S=S

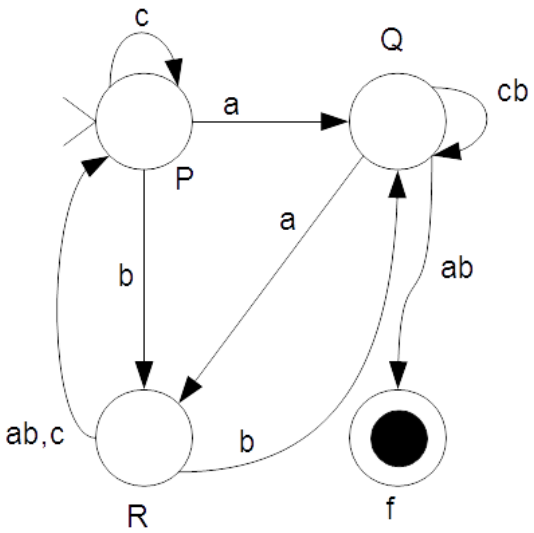
5. Construct such NFA M which is equivalent with the given RG! (3p)

V={a, b, c, P, Q, R}

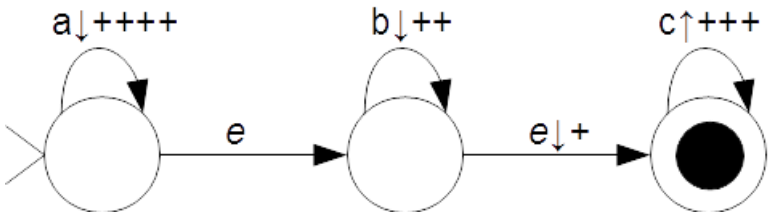
Σ ={a, b, c}

R={P→aQ|cP|bR, Q→ab|cbQ|aR, R→abP|cP|bQ}

S=P



6. Give the state diagram of PDA M for which L(M) = {w∈{a, b, c}* | w = $a^n b^m c^p$, 4n+2m+1=3p}! (4p)



7. Give the definition of NFA! (3p)

NFA M is an ordered five-tuple (K, Σ, Δ, s, F), where:
K is the set of states
Σ is the alphabet
Δ ⊆ K×Σ×K is the state transition relation
S ∉ K is the starting state
F ⊂ K is the set of final states

8. Prove that the set of languages accepted by finite automata are closed under intersection! (4p)

We already know that languages accepted by finite automata are closed under union and complementation.

Perform:

- NFA → DFA twice
- complementation theorem twice
- union once
- NFA → DFA
- complementation theorem once again

De'Morgan identity: $L(M)=L(M_1) \cap L(M_2) = (L(M_1)^C \cup L(M_2)^C)^C$