# Solutions for Assignment #5

## Assignment Information

Maximum grade 20

Due date September 29, 2004

Instructions Textbook:
Page: 80
Problems: 2.5.2 and 2.5.3

2.5.2 a)

ε -closure(p) ={p, q, r}

ε -closure(q) = {q}

ε -closure(r) = {r}

2.5.2 b)

Strings of length 0: ε

Strings of length 1: a, b, c

Strings of length 2: aa, ab, ac, ba, bb, bc, ca, cb, cc

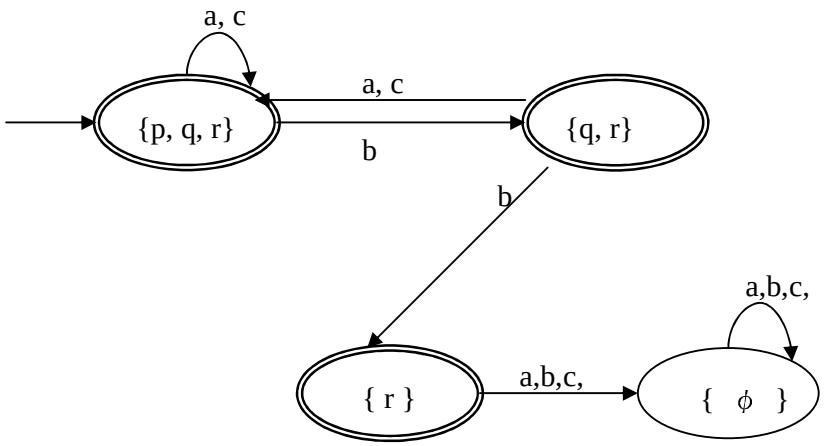
Strings of length 3: aaa, aab, aac, aba, abb, abc, aca, acb, acc, baa, bab, bac, bca, bcb, bcc, caa, cab, cac, cba, cbb, cbc, cca, ccb, ccc

2.5.2 c)

The transition table is as follows:

| | a | b | c |
|---|---|---|---|
| **ϕ** | **ϕ** | **ϕ** | **ϕ** |
| {p} | {p} | {q} | {r} |
| {q} | {p,q,r} | {r} | {p,q,r} |
| ***{r}** | **ϕ** | **ϕ** | **ϕ** |
| {p,q} | {p,q,r} | {q,r} | {p,q,r} |
| *{p,r} | {p,q,r} | {q} | {r} |
| ***{q,r}** | **{p,q,r}** | **{r}** | **{p,q,r}** |
| **→*{p,q,r}** | **{p,q,r}** | **{q,r}** | **{p,q,r}** |

After removing the unnecessary states, we get the following transition diagram.




2.5.3 a)

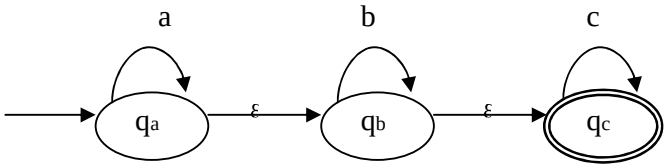
ε -NFA: E =(Q, Σ , δ ,qa, F), where

Q = {qa, qb, qc}

Σ = {a, b,c}

F = {qc }

And δ is shown as the following transition diagram.



2.5.3 b)

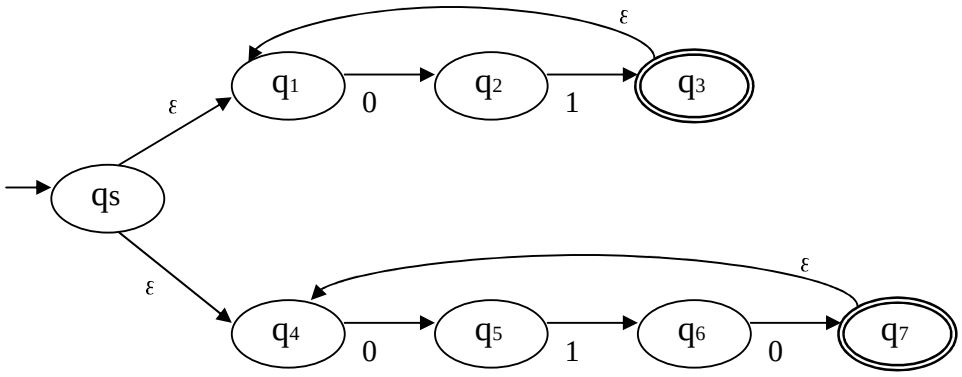
ε -NFA: E =(Q, Σ , δ ,qs, F), where

Q = {qs, $q_1$, $q_2$, $q_3$, $q_4$, $q_5$, $q_6$, $q_7$}

Σ = {0,1}

F = { $q_3$, $q_7$ }

And δ is shown as the following transition diagram.



2.5.3 c)

ε -NFA: E =(Q, Σ , δ ,qs, F), where

Q = {qs, $q_1$, $q_2$, $q_3$, $q_4$, $q_5$, $q_6$, $q_7$, $q_8$, $q_9$, $q_{10}$}

Σ = {0,1}

F = { $q_{10}$ }

And δ is shown as the following transition diagram.