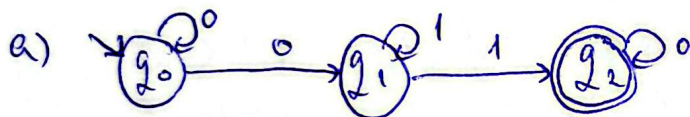
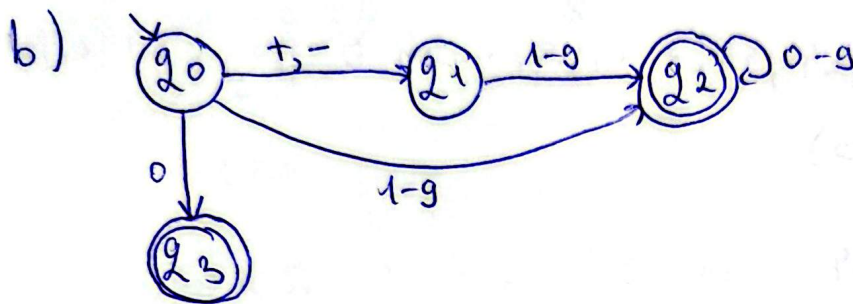
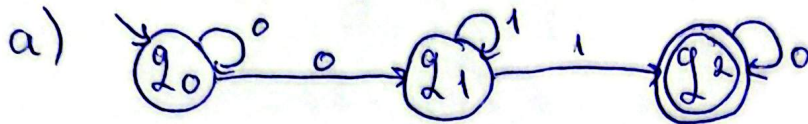


Homework 2
- Seminar 5 -

Ex 1

Find the equivalent RG for:



FA: $M = (Q, \Sigma, \delta, q_0, F = \{q_2\})$

RG: $G = (N, \Sigma, P, S)$

$N = Q = \{q_0, q_1, q_2\}$

$\Sigma = \{0, 1\}$

$S = q_0$

$P: \delta(q_0, 0) = q_0 \Rightarrow q_0 \rightarrow 0q_0$

$\delta(q_0, 1) = q_1 \Rightarrow q_0 \rightarrow 1q_1$

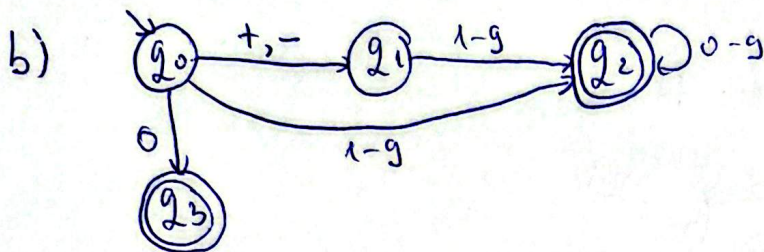
$\delta(q_1, 1) = q_1 \Rightarrow q_1 \rightarrow 1q_1$

$\delta(q_1, 0) = q_2 \Rightarrow q_1 \rightarrow 0q_2$

$\delta(q_2, 0) = q_2 \Rightarrow q_2 \rightarrow 0q_2$

$$P: \begin{aligned} q_0 &\rightarrow 0q_0 \mid 1q_1 \\ q_1 &\rightarrow 1q_1 \mid 1q_2 \mid 1 \\ q_2 &\rightarrow 0q_2 \mid 0 \end{aligned}$$

$$G = (\{q_0, q_1, q_2\}, \{0, 1\}, P, s)$$



$$FA: M = (\{q_0, q_1, q_2, q_3\}, \{+, -, 0, 1, 2, \dots, 9\}, \delta, q_0, F = \{q_2, q_3\})$$

$$RG: G = (N, \Sigma, P, s)$$

$$N = Q = \{q_0, q_1, q_2, q_3\}$$

$$\Sigma = \{+, -, 0, 1, 2, \dots, 9\}$$

$$s = q_0$$

$$P: \delta(q_0, +) = \delta(q_0, -) = q_1 \Rightarrow q_0 \rightarrow +q_1 \mid -q_1$$

$$\delta(q_0, 1) = q_2 \Rightarrow q_0 \rightarrow 1q_2 \mid 1$$

$$\delta(q_0, 0) = q_3 \Rightarrow q_0 \rightarrow 0q_3 \mid 0$$

$$\delta(q_1, 1) = q_2 \Rightarrow q_1 \rightarrow 1q_2 \mid 1$$

$$\delta(q_2, 0) = q_2 \Rightarrow q_2 \rightarrow 0q_2 \mid 0$$

$$P: \begin{aligned} q_0 &\rightarrow +q_1 \mid -q_1 \mid 1q_2 \mid 1 \mid 0q_3 \mid 0 \\ q_1 &\rightarrow 1q_2 \mid 1 \\ q_2 &\rightarrow 0q_2 \mid 0 \end{aligned}$$

$$G = (\{q_0, q_1, q_2, q_3\}, \{+, -, 0, 1, 2, \dots, 9\}, P, s)$$

Ex 2

Find the equivalent FA for:

$G = (N, \Sigma, P, S)$ where $N = \{S, B, C\}$, $\Sigma = \{a, b, c\}$

$P: S \rightarrow aB \mid b$

$B \rightarrow bB \mid cC \mid aC$

$C \rightarrow aS \mid c$

FA: $M = (Q, \Sigma, \delta, q_0, F)$

$Q = N \cup \{K\} = \{S, B, C, K\}$

$\Sigma = \{a, b, c\}$

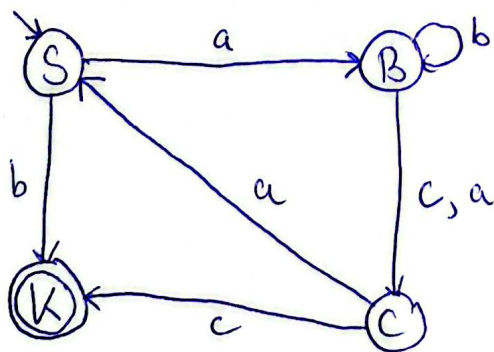
$q_0 = S$

$F = \{K\}$

$\delta:$

- $S \rightarrow aB \Rightarrow \delta(S, a) = B$
- $S \rightarrow b \Rightarrow \delta(S, b) = K$ (final)
- $B \rightarrow bB \Rightarrow \delta(B, b) = B$
- $B \rightarrow cC \Rightarrow \delta(B, c) = C$
- $B \rightarrow aC \Rightarrow \delta(B, a) = C$
- $C \rightarrow aS \Rightarrow \delta(C, a) = S$
- $C \rightarrow c \Rightarrow \delta(C, c) = K$ (final)

$M = (\overset{Q}{\{S, B, C, K\}}, \overset{\Sigma}{\{a, b, c\}}, \delta, q_0, F = \{K\})$



Ex 3

Find the equivalent RE for:

$$G = (\{S, B, C\}, \{a, b, c\}, P, S)$$

$$P: S \rightarrow aB|b$$

$$B \rightarrow bB|cC$$

$$C \rightarrow aC|b$$

$$\begin{cases} S = aB + b \\ B = bB + cC \\ C = aC + b \end{cases}$$

$$\rightarrow \text{sol: } C = a^*b$$

$$\Rightarrow \begin{cases} S = aB + b \\ B = bB + cC \\ C = a^*b \end{cases} \Leftrightarrow \begin{cases} S = aB + b \\ B = bB + ca^*b \\ C = a^*b \end{cases} \rightarrow \text{sol: } B = b^*ca^*b$$

$$\Rightarrow \begin{cases} S = ab^*ca^*b + b \\ B = b^*ca^*b \\ C = a^*b \end{cases}$$

$$\Rightarrow S = ab^*ca^*b + b$$