~~CMPE 222~~

CMPE 222 Final

FSA

2013 – 2014

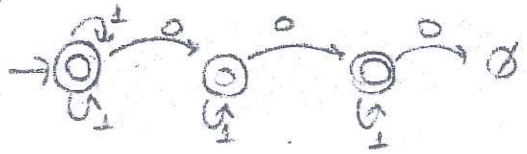
① DFA : (Deterministic) $\delta : Q \times \Sigma \rightarrow Q$ * Bir eleman bir kere kullanabilir.

② NFA : (Non-deterministic) $\delta : Q \times (\Sigma \cup \{\varepsilon\}) \rightarrow P(Q)$

Midterm

1) $L = \{ W \mid W$ has at most 2 0's $\}$ $\Sigma = \{0,1\}$

a) DFA



1^*

$1^* 0 . (1^* . 0 (1^*) . 0 ^*$

b) Regular Expression

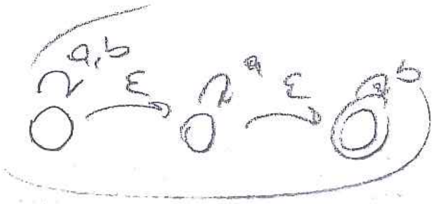
$(1^*) \cup (1^* 0) \cup (1^* 0 1^*) \cup (1^* 0 1^* 0) \cup (1^* 0 1^* 0)$

2) $R = \underbrace{(a \cup b)}_{R_1} \underbrace{a^*}_{R_2} \underbrace{b^*}_{R_3}$

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

$\Sigma^* = (a \cup b)^*$

NFA described by R



$(a \cup b) a^* b^*$

3) Let $B_n = \{ a^k \mid$ where k is a multiple of $n \}$

Show that for each $n \geq 1$, B_n is regular.

$B_3 = \{ a^3, a^6, a^9, \ldots \}$

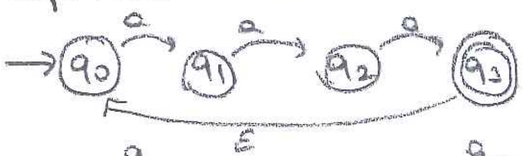
$B_1 = \{ a, aa, aaa, \ldots \} = a^+$

Proof by Induction:

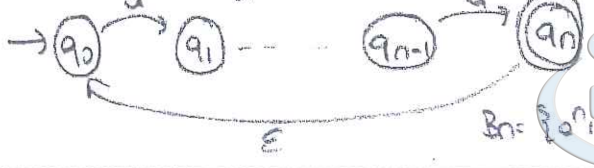
Base Step: B_1 :

Inductive Step: Assume the assertion holds for B_m. Show that it holds for B_{m+1}

M_{B_3} :



M_{B_n} :



$B_n = \{ a^n, a^{2n}, \ldots \}$

$M_{B_n} : (Q, \Sigma, \delta, q_0, F)$

$Q = \{ q_0, \ldots, q_n \}$

$\Sigma = \{a\}$

$\delta(q_i, r) = \begin{cases} q_{i+1} & \text{if } i \neq n, \ r = a \\ q_0 & \text{if } i = n, \ r = \varepsilon \end{cases}$

$q_0 = q_0$

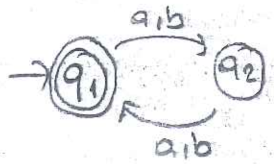
$F = \{q_n\}$

① Design the DFA recognizing the language

$L_1 = \{w \mid w = 2n \text{ for } n \geq 0\}$

$L_2 = \{w \mid w \text{ has an odd \# of a's}\}$

$L = \{w \mid w \text{ has an even length or odd \# of a's}\}$ Consider. $L = L_1 \cup L_2$

M_1: 

① $Q = \{q_1, q_2\}$

② $\Sigma = \{a, b\}$

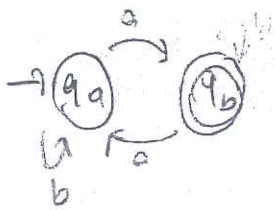
④ $q_0 = q_1$

⑤ $F_1 = \{q_1\}$

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

③

	a	b
q_1	q_2	q_2
q_2	q_1	q_1

M_2: 

① $Q = \{q_a, q_b\}$

② $\Sigma = \{a, b\}$

③

	a	b
q_a	q_b	q_A
q_b	q_a	q_b

$L_1 \to$ regular $L_2 \to$ regular $L_1 \cup L_2$ also regular

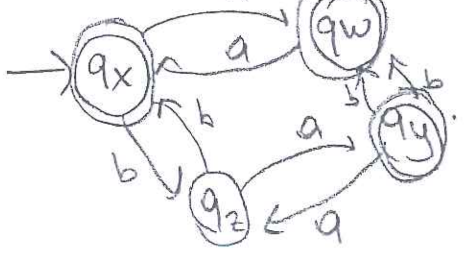
$M = (Q, \Sigma, \delta, q_0, F)$

① $Q = Q_1 \times Q_2 = \{(q_1, q_a), (q_1, q_b), (q_2, q_a)(q_2, q_b)\}$

② $\Sigma = \Sigma_1 = \Sigma_2$

③

		a	b	
q_x	q_1, q_a	q_2, q_b q_w	q_2, q_A q_z	*
q_y	q_1, q_b	q_2, q_a q_z	q_2, q_b q_w	*
q_z	q_2, q_a	q_1, q_b q_y	q_1, q_a q_x	
q_w	q_2, q_b	q_1, q_A	q_1, q_B q_x	*



④ $q_0 = q_x$

⑤ $F = \{q_x, q_y, q_w\}$