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2.1.2

a-) $a(ba)^*$

b-) a^*b

c-) aynı sayıda a's ve b's'ye sahip olan ve hicbir öneki a's den 2 veya daha fazla bs icermeyen tüm diziler

d-) aynı sayıda ab ve bs'ye sahip olan ve hicbir önekin biden fazla a'ya sahip olamadığı tüm diziler veya tersi

e-) aab veya bba alt dizesini içeren tüm diziler

2.1.3

a-) {w: each a in w immediately preceeded by a b}:

$K = \{q_0, q_1, q_2\}$

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

$\delta = q_0$

$F = \{q_0, q_1\}$

q	σ	δ(q, σ)
q_0	a	q_2
q_0	b	q_1
q_1	a	q_0
q_1	b	q_2
q_2	a	q_2
q_2	b	q_2

b-) {w: neither abab is a substring of w}:

$K = \{q_0, q_1, q_2, q_3, q_4\}$

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

$\delta = q_0$

$F = \{q_4\}$

q	σ	δ(q, σ)
q_0	a	q_1
q_0	b	q_0
q_1	a	q_1
q_1	b	q_2
q_2	a	q_3
q_2	b	q_0
q_3	a	q_1
q_3	b	q_4
q_4	a	q_4
q_4	b	q_4

c-) {w: neither aa nor bb is a substring of w}

$K = \{q_0, q_1, q_2, q_3\}$

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

$\delta = q_0$

$F = \{q_0, q_1, q_2\}$

q	σ	δ(q, σ)
q_0	a	q_1
q_0	b	q_2
q_1	a	q_3
q_1	b	q_2
q_2	a	q_1
q_2	b	q_3
q_3	a	q_3
q_3	b	q_3

d-) $\{w : w$ has an odd number of a's and even number of b's$\}$:

$K = \{q_0, q_1, q_2, q_3\}$

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

$s = q_0$

$F = \{q_1\}$

q	σ	$\delta(q, \sigma)$
q_0	a	q_1
q_0	b	q_2
q_1	a	q_0
q_1	b	q_3
q_2	a	q_3
q_2	b	q_0
q_3	a	q_2
q_3	b	q_1

e-) $\{w : w$ has both ab and ba as substrings$\}$

$K = \{q_0, q_1, q_2, q_3, q_4, q_5\}$

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

$s = q_0$

$F = \{q_5\}$.

q	σ	$\delta(q, \sigma)$
q_0	a	q_1
q_0	b	q_1
q_1	a	q_2
q_1	b	q_1
q_2	a	q_3
q_2	b	q_4
q_3	a	q_2
q_3	b	q_5
q_4	a	q_5
q_4	b	q_5
q_5	a	q_3
q_5	b	q_5

2.1.7

Let M' be the machine forme from M by deleting the unreachable state e we show $L(M) = L(M')$. As a lemma, we will show that $(q_1, xy) \vdash^*_M (q_2, y)$ implies $(q, xy) \vdash^*_{M'} (q_2, y)$, where q_1 is any reachable state of M (q_2 is trivially reachable, as well, given the hypothesis) we prove this lemma by induction on $|w|$.

Basis step $|x| = 0$ then $x = e$, so that $(q, y) \vdash^*_M (q_2, y)$ which forses $q = q_2$. Thus by reflexivity $(q, y) \vdash^*_{M'} (q_2, y)$

Induction step: suppose $(q_1, xy) \vdash^*_M (q_2, y)$ where $|x| = n+1$. Then $x = w\sigma$, where $\sigma \in \Sigma$ and $|w| = n$ let r be the state such that $(q_1, x\sigma y) \vdash^*_M (r, \sigma y) \vdash_M (q_2, y)$. Because q_1 is reachable there is some string η such that $(s, \eta) \vdash^*_M (q, e)$. Therefore $(s, \eta_2) \vdash^*_M$ are both states of M' and $\delta_{M'}$, whenever it exists is the same as δ_M, $\delta_{M'}(r, \sigma) = \delta_M(r, a) = q_2$, so that $(r, \sigma y) \vdash_{M'} (q_2, y)$ and thus $(r, \sigma y) \vdash^*_M (q_2, y)$

Suppose now, that $w \in L(M)$ By definition of $L(M)$, $(s, w) \vdash^*_M (q, e)$ where $q \in F$. By the lemma $(s, w) \vdash^*_{M'} (q, e)$ so that $w \in L(M')$