CIS770 Homework 4

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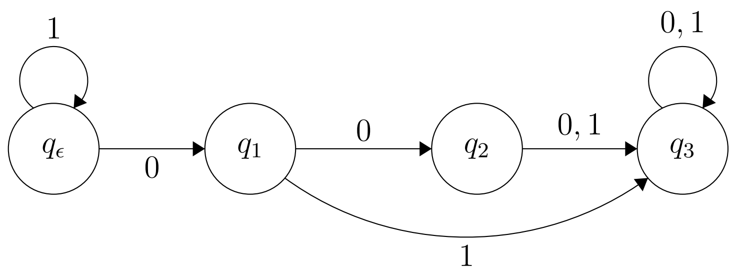
Problem1

1.1.

I first converted the Language L = $\mathbf{L}(1^{*}0(00\cup01\cup1)(0\cup1)^{*})$ into a DFA M:



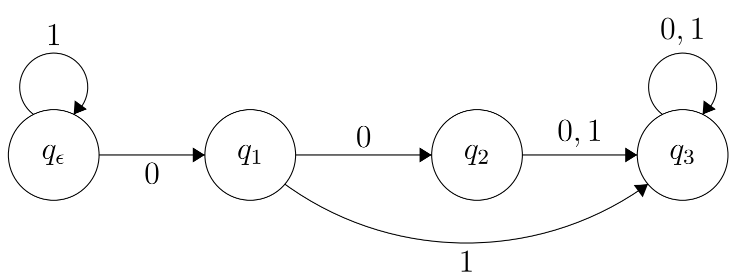
Now we can list the suffix language for each state in M.

q_ϵ = L
$q_1 = (00 \cup 01 \cup 1)(0\cup1)^{*}$
$q_2 = (0 \cup 1)(0 \cup 1)^{*}$
$q_3 = (0 \cup 1)^{*}$

Because M is a DFA that accepts L, the suffix languages derived from M cover all suffix languages in the language L.

1.2.

The DFA M used to come up with solution to *problem 1.1* is the minimal state DFA M^L accepting L:



Problem 2

2.1.

By the definition of Homomorphism discussed in class
A Homomorphism is a function h : $\Sigma^* \rightarrow \Delta^*$ defined as:

h(ϵ) = ϵ and for a $\in \Sigma$, h(a) is any string in Δ^*
For a = $a_1 a_2 .. a_n \in \Sigma^*$ (n $\geq$ 2), h(a) = h(a_1)h(a_2)...h(a_n).

By using the second axiom from our definition:

a = xy
a_1 = x, a_2 = y and n = 2
we can see that h(a) = h(a_1)h(a_2) = h(x)h(y)

2.2.

h($L_1 \cup L_2$) = h(L_1) $\cup$ h(L_2)
h($L_1 \cup L_2$) = { h(w) | $w \in L_1 \cup L_2$}
Let $w \in$ h($L_1 \cup L_2$)

$\Rightarrow \exists\ u.\ u \in L_1 \cup L_2$ and w = h(u)
$\Rightarrow \exists\ u.\ u \in L_2$ and w = h(u)
$\Rightarrow w \in$ h(L_2)
$\Rightarrow w \in$ h(L_1) $\cup$ h(L_2)

2.3.

h($L_1 \circ L_2$) = h(L_1) $\circ$ h(L_2)
h($L_1 \circ L_2$) = { h(w) | $w \in L_1 \circ L_2$}
Let $w \in$ h($L_1 \circ L_2$) $\Rightarrow \exists\ u.\ u \in L_1 \circ L_2$ and w = h(u)
Let $a \in$ h(L_1) $\Rightarrow \exists\ x.\ x \in L_1$ and a = h(x)
Let $b \in$ h(L_1) $\Rightarrow \exists\ y.\ y \in L_1$ and b = h(y)

$\Rightarrow u = x \circ y$
$\Rightarrow w = a \circ b$
$\Rightarrow w \in$ h(L_1) $\circ$ h(L_2)