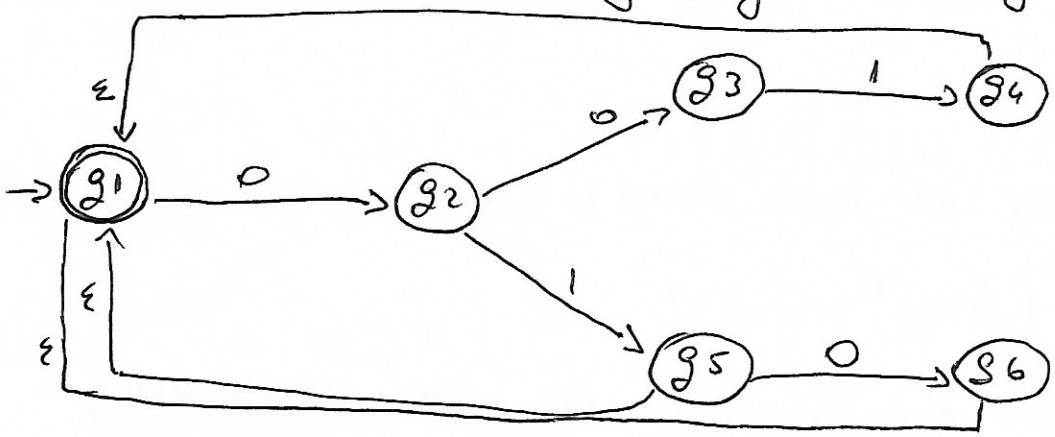
CMPS 130

Computational Models
Homework Assignment 4
VLADOI MARIAN

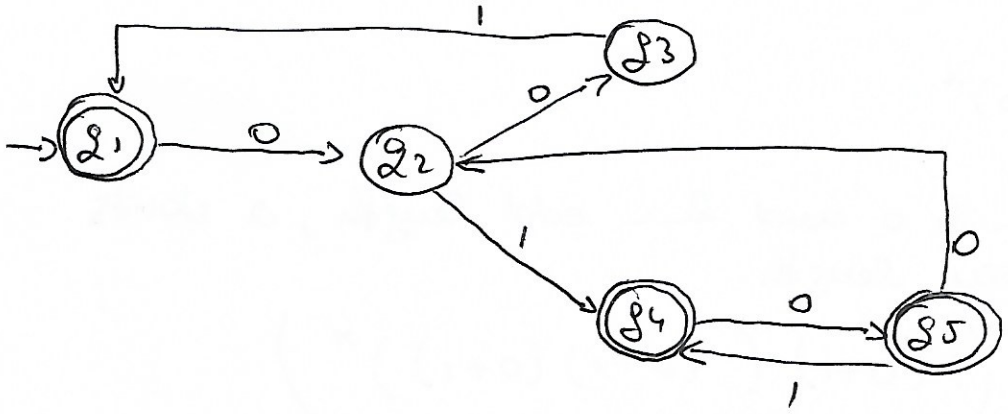
Spring 2017

Exercise 1.17 page 86.

(a) Give an NFA recognizing the language $(01 \cup 001 \cup 010)^*$



(b) Convert this NFA to an equivalent DFA. Give only the portion of the DFA that is reachable from the start state.



Exercise 1.18 page 86.

Give regular expressions generating the language of Exercise 1.6.

(a) $\{w \mid w$ begins with a 1 and ends with a $0\}$

$1(1+0)^* 0$

(b) $\{w \mid w$ contains at least three 1s$\}$

$(1+0)^* 1 (1+0)^* 1 (1+0)^* 1 (1+0)^*$

(c) $\{w \mid w$ contains the substring 0101, i.e., $w = x0101y$ for some x and $y\}$

$(1+0)^* 0101 (1+0)^*$

(d) $\{w \mid w$ has length at least 3 and its third symbol is a $0\}$

$(1+0)(1+0)0(1+0)^*$

(e) $\{w \mid w$ starts with 0 and has odd length, or starts with 1 has even length.

$$\left(0((1+0)(1+0))^*\right) + \left(1(0+1)((0+1)(0+1))^*\right)$$

(f) $\{w \mid w$ does not contain the substring $110\}$

$0^*(10^+)^* 1^*$

(g) $\{w \mid$ the length of w is at most $5\}$

$(\varepsilon \cup (1+0))^5$

(h) $\{w \mid w$ is any string except 11 and $111\}$

$\varepsilon \cup (1+0) \cup 0(1+0) \cup 10 \cup 0(1+0)(1+0) \cup 10(1+0) \cup$
$\cup 110 \cup (1+0)^3(1+0)^+$

(i) $\{w \mid$ every odd position of w a $1\}$

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

(j) $\{w \mid w$ contains at least 2 0's and at most 1 1's$\}$

$00^+ \cup 100^+ \cup 0^+10^+ \cup 00^+1$

(k) $\{\varepsilon, 0\}$

$0 \cup \varepsilon$

(l) $\{w \mid w$ contains an even number of 0, or contains exactly two 1's$\}$

$1^*(01^*01^*)^* \cup 0^*10^*10^*$

(m) the empty set

$\emptyset$

(n) All strings except the empty set

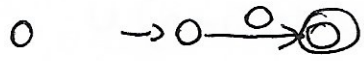
Σ^+

Exercise 1.13 page 86.

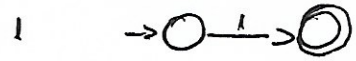
Use the procedure described in Lemma 1.55 to convert the following regular expressions to nondeterministic finite automata

(a) $(0 \cup 1)^* 000 (0 \cup 1)^*$

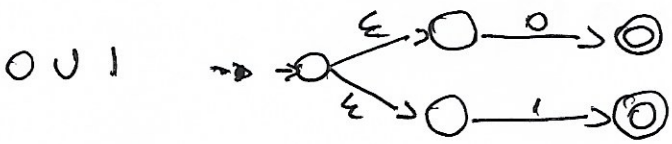
0



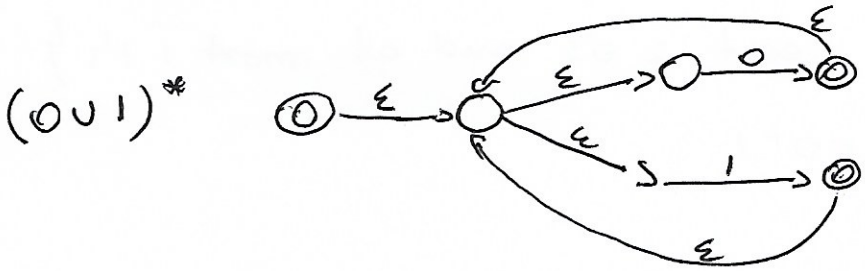
1



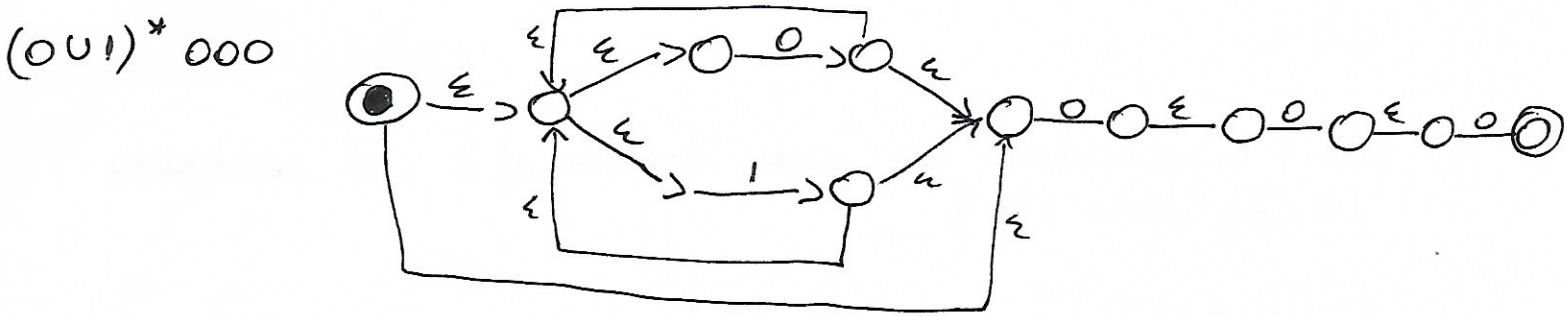
$0 \cup 1$



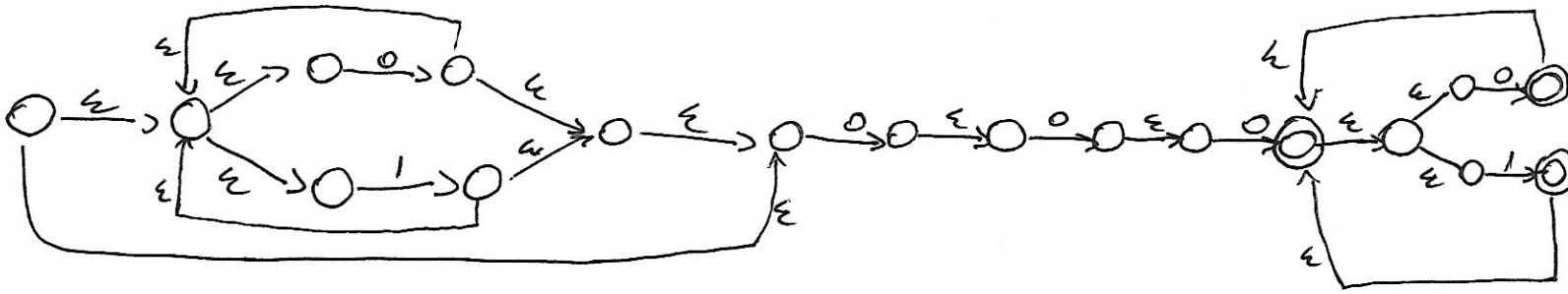
$(0 \cup 1)^*$



$(0 \cup 1)^* 000$



$(0 \cup 1)^* 000 (0 \cup 1)^*$



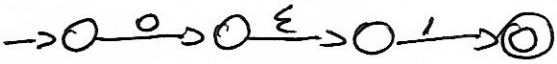
③ $(((00)^* (11)) \cup 01)^*$

0

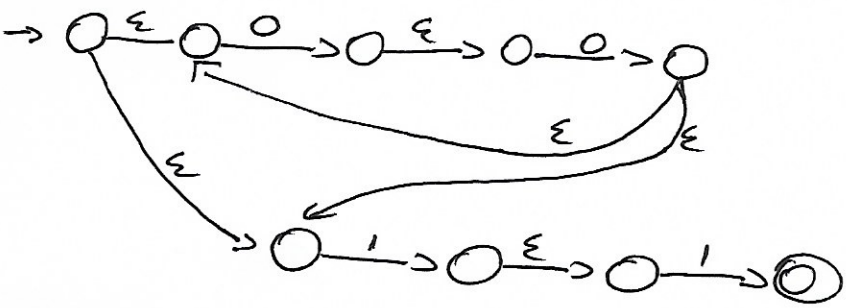
1

00

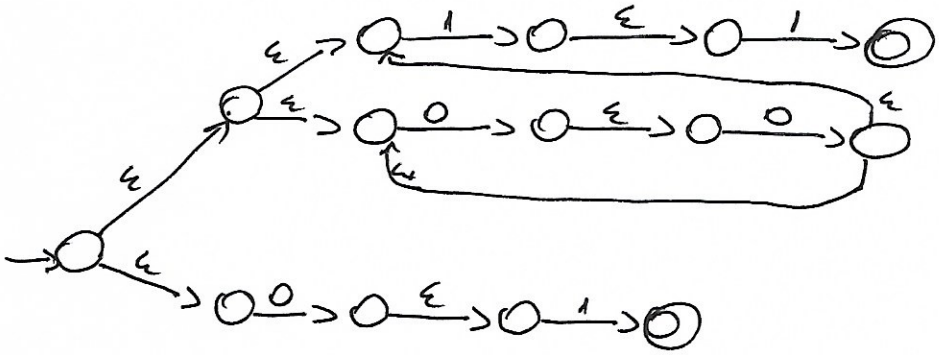
11

01 

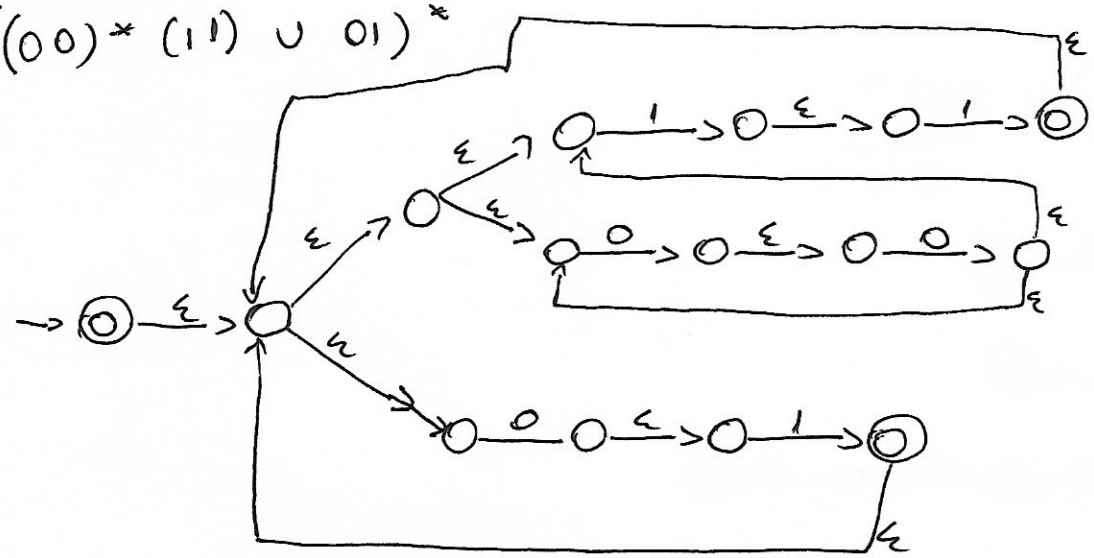
$(00)^*$

$(00)^* 11$ 

$(00)^* (11) \cup 01$



$((00)^*(11) \cup 01)^*$



(c) ϕ^*

ϕ → 0

ϕ^* → 0 —ε→ ◎