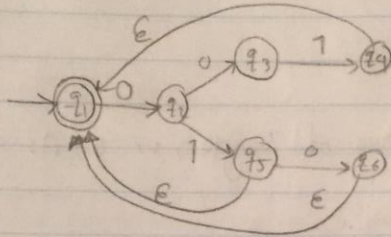


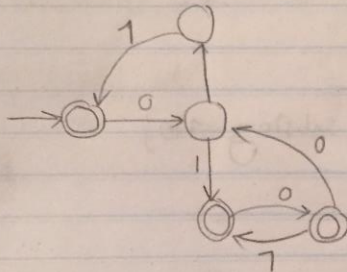
HW#4

1.17

(a) Language: $(01 \cup 001 \cup 010)^*$



(b)



1.18

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

$$1 \Sigma^* 0$$

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

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

any string $\leftarrow \Sigma^*$

c) $\{w \mid w \text{ contains the substring 0101}\}$

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

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

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

Σ
any string

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

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

f) $\{w \mid w \text{ doesn't contain the substring } 110\}$

$$0^*(100^*)^*1^*$$

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

$$(\Sigma)^5$$

Σ = any strings

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

$$\Sigma^* \cup 0\Sigma^* \cup 10\Sigma^* \cup 110\Sigma^* \cup 111\Sigma^* \cup 1111\Sigma^* \cup \dots$$

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

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

j) $\{w \mid w \text{ contains at least two } 0\text{'s and at most one } 1\}$

$$000^* \cup 1000^* \cup 00^*100^* \cup 000^*1$$

k) $\{\epsilon, 0\}$

0VE

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

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

m) The empty set

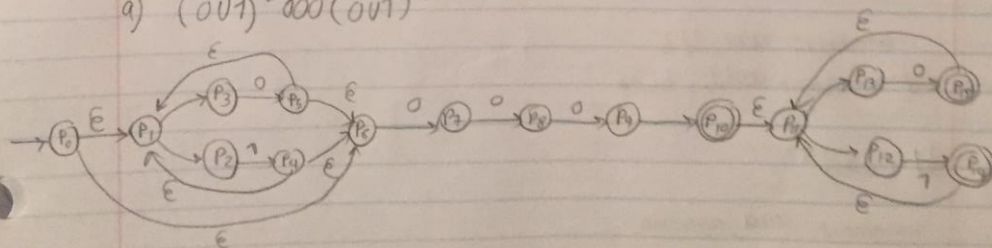
\emptyset

n) All strings except the empty string

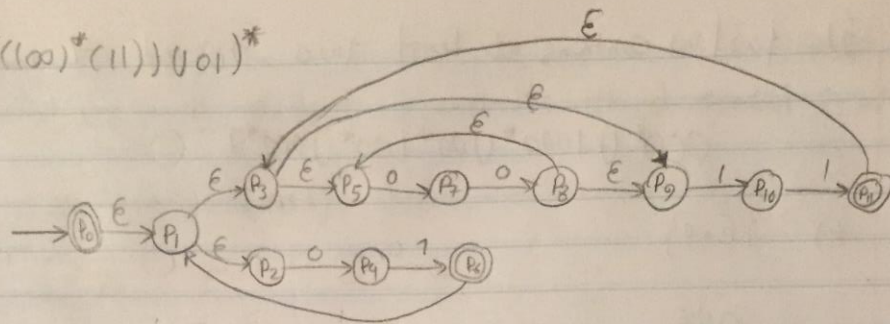
$$\frac{(0+1)(0+1)^*}{\Sigma}$$

7.19

a) $(001)^*000(001)^*$



b) $((100)^*(11))(01)^*$



c) \emptyset^* \rightarrow

1.20

a) a^*b^*

members: ab, abb

not members: ba, bba

b) $a(ba)^*b$

members: $ab, ababab$

not members: $aba, babb$

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

members: aaa, bbb

not members: $aabb, bbaa$

d) $(aaa)^*$

members: $aaa, aaaaaa$

not members: $a, aaaa$

$(0+1)^*$ → Based on what prof. told us but it would not change the answer, so I left them as Σ^* .

e) $\Sigma^* a \Sigma^* b \Sigma^* a \Sigma^*$

members: aba, bbaaa baqbb

not members: a, b

f) $aba \cup bab$

members: aba, bab

not members: ababab, ba

g) $(\epsilon \cup a)b$

members: b, ab

not members: a, ba

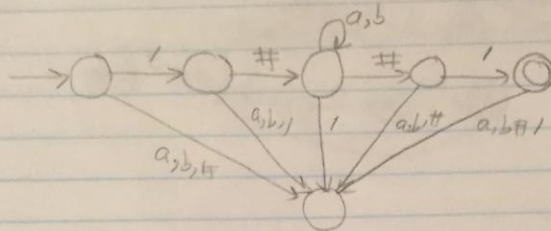
h) $(a \cup ba \cup bb)\Sigma^*$

members: a, bbab

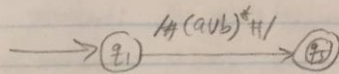
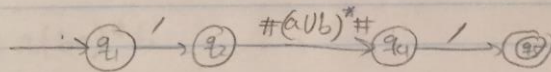
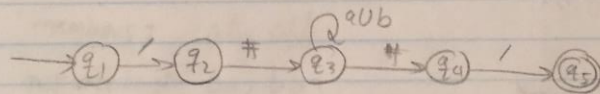
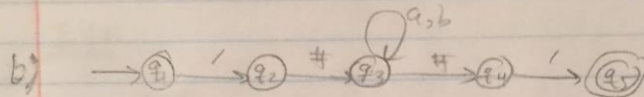
not members: b, ϵ

1.22

a) Begins with '#' and end with '#'



DFA that recognizes this language is:



$/\#(a|b)^*\#/$