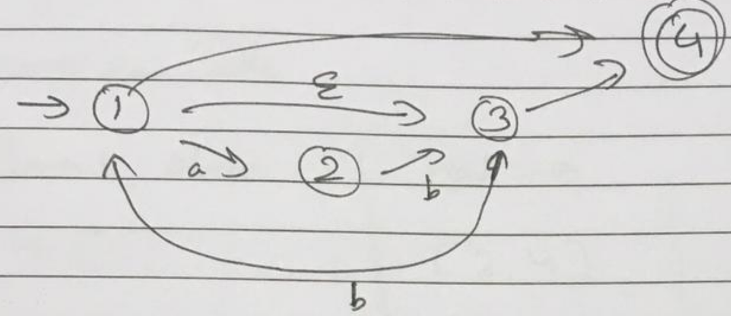
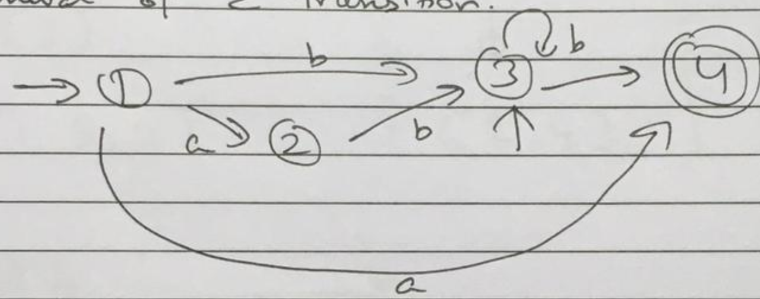
HW4

1) 

Remaval of ε transition.



Conversion of NFA to DFA

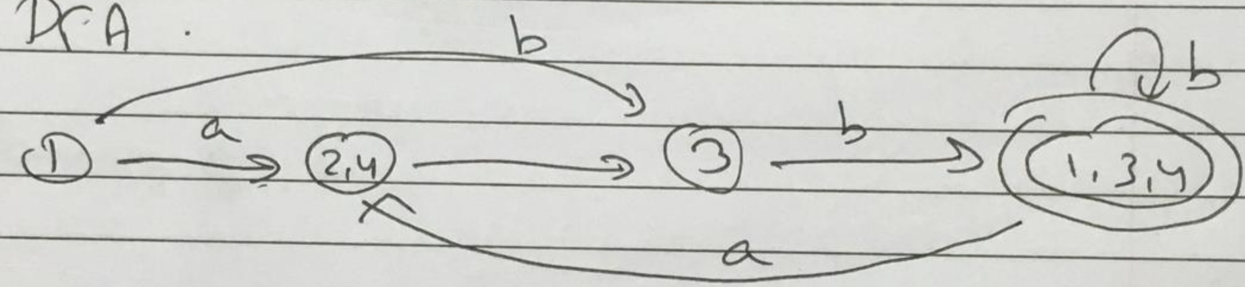
Transition. of state

	input = a	input = b
→1	{2,4}	{3}
2	φ	{3}
→3	φ	{3,1,4}
(4)	φ	φ

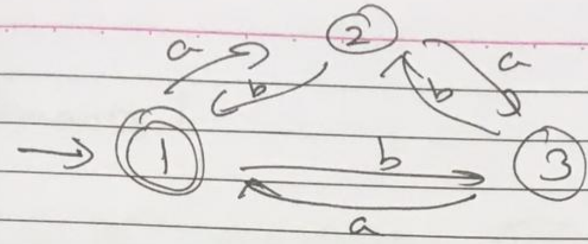
Conversion Table.

Present state	input = a	input = b
→ [1]	[2, 4]	[3]
[2, 4]	ϕ	[3]
[3]	ϕ	[1, 3, 4]
[1, 3, 4]	[2, 4]	[1, 3, 4]

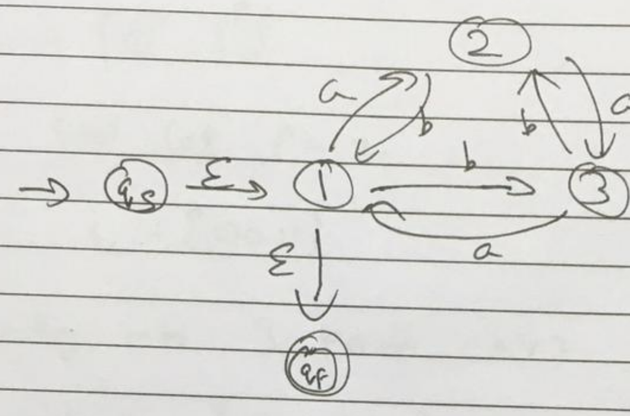
DFA .



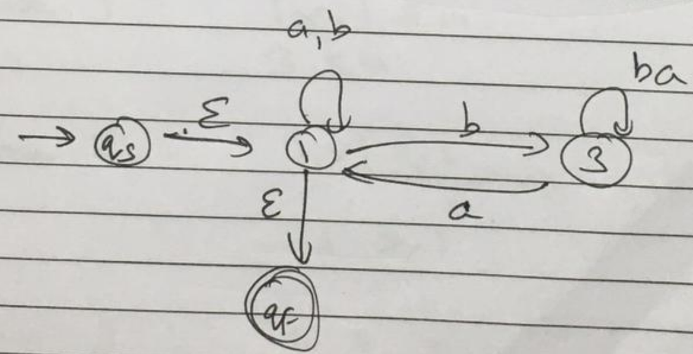
2)



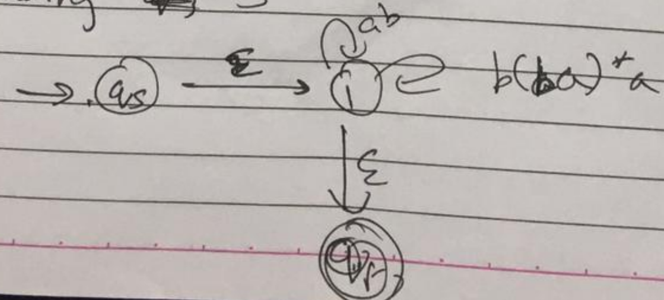
Step 1 and 2



Removing ~~q2~~ 2



Removing ~~q3~~ 3



Removing 1

$$\rightarrow q_s \xrightarrow{ab+b(ba)^*a} q_f$$

3 $L = \{0^p, 1^p\}$

We let $p = 2$

$L = \{0011\}$

Dividing into 3 parts xyz

$$L = \{\underbrace{0}_{x}\underbrace{0}_{y}\underbrace{11}_{z}\}$$

Case 1 : $|xy| \leq n$

$3 \leq 4$

Case 2 : $|y| \geq 1$

$1 \geq 1$

Case 3 : $L = xy^iz$; $i \geq 0$

let $i = 2$

$xy^2z = 00111$ → not true

In our contradiction, our language contains equal number of 0's and 1's. so this is the incorrect part of the proof. as 0^*1^* allows an arbitrary no. of 0's.

$\therefore 0^p1^p$, the frequency of both 0 and 1 cannot be the same in this pumping lemma. The error is in choosing s.

4. To prove using pumping Lemma
Assume L is regular

Let $L' = L \cap 1^* \# 1^*$.

$L' = \{1^n \# 1^n : n \geq 0\}$.

Assume L' is regular and k is the constant

Choose $w = 1^k \# 1^k$, which is in L and satisfies $|w| \geq k$. For every possible way of writing $w = xyz$ such that $|xy| \leq k$ and $|y| \geq 1$

We have $x = 1^r$, $y = 1^s$, $z = 1^{k-r-s} \# 1^k$,

here $r+s \leq k$ and $t \geq 1$.

Take xy^iz where $i = 0$, then $1^{k-s} \# 1^k$

Since $s \geq 1$, it follows that $w \notin L$ is a contradiction and hence not regular.

5.

a) $S \to 0P0 \mid 1P1 \mid 0 \mid 1$

$P \to 0P \mid 1P \mid \varepsilon$

b) $S \to 0 \mid 1 \mid 00S \mid 01S \mid 10S \mid 11S \mid$

or.

$S \to 0X \mid 1X$

$X \to 0S \mid 1S \mid \varepsilon$

c) $\cancel{S \to 0 \mid 1 \mid 0}$

$\cancel{S \to 0S0 \mid 0}$

$S \to 0S0 \mid 1S1 \mid 00 \mid 11$

c) $S \to 0 \mid 1 \mid 0S0 \mid 1S1 \mid \varepsilon$

d) $S \to S$