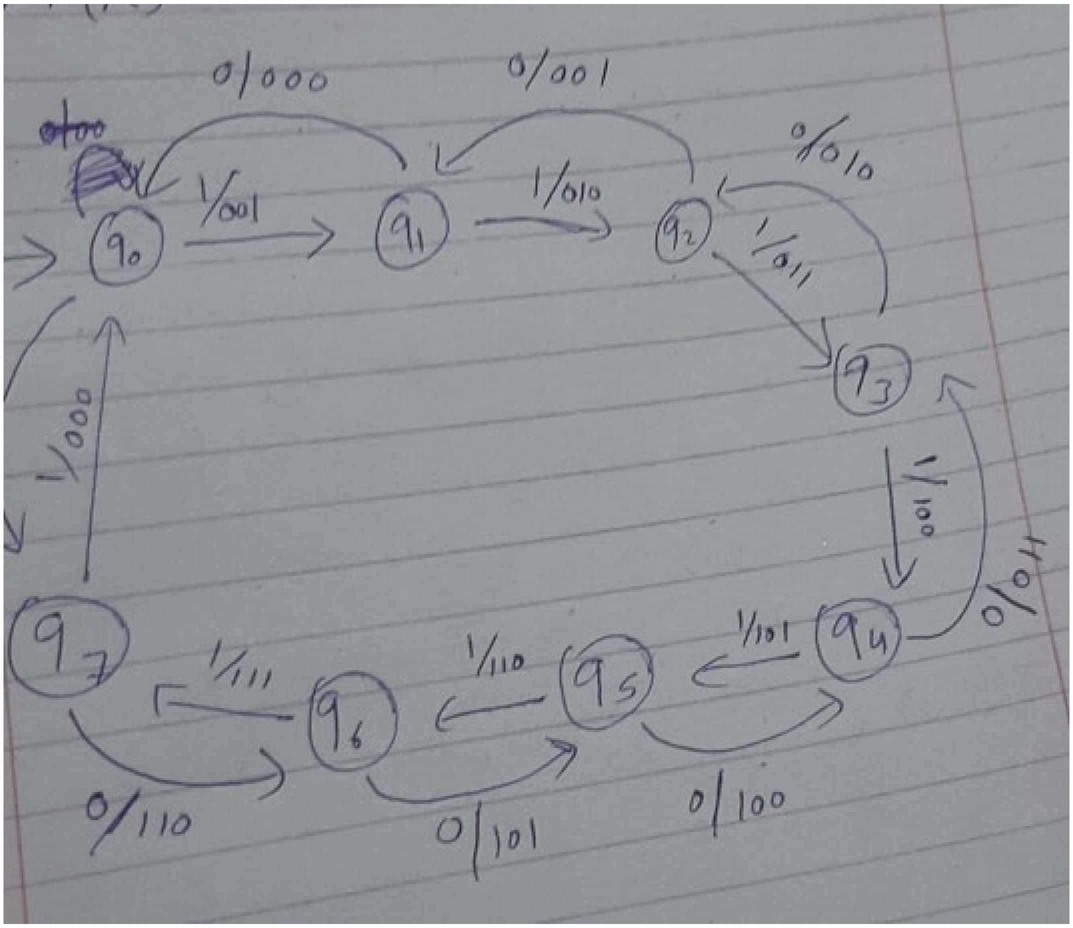
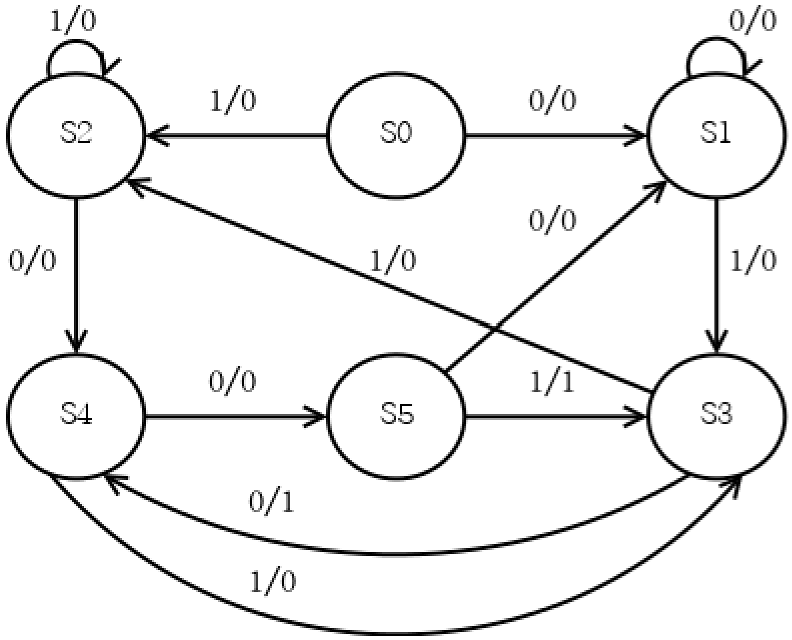
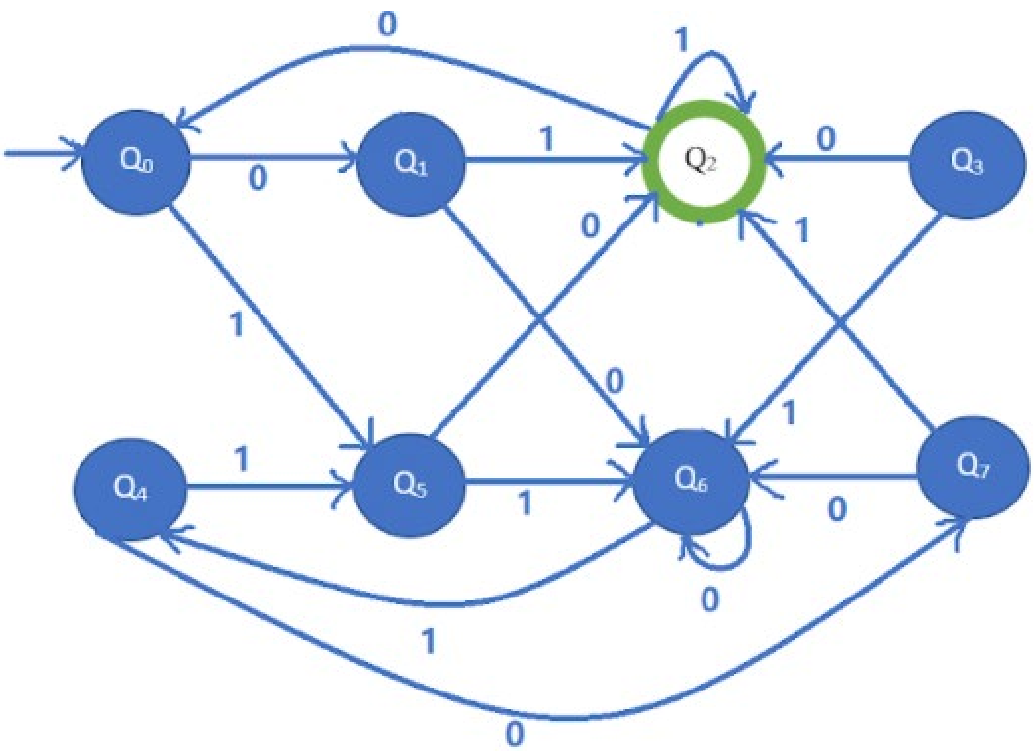
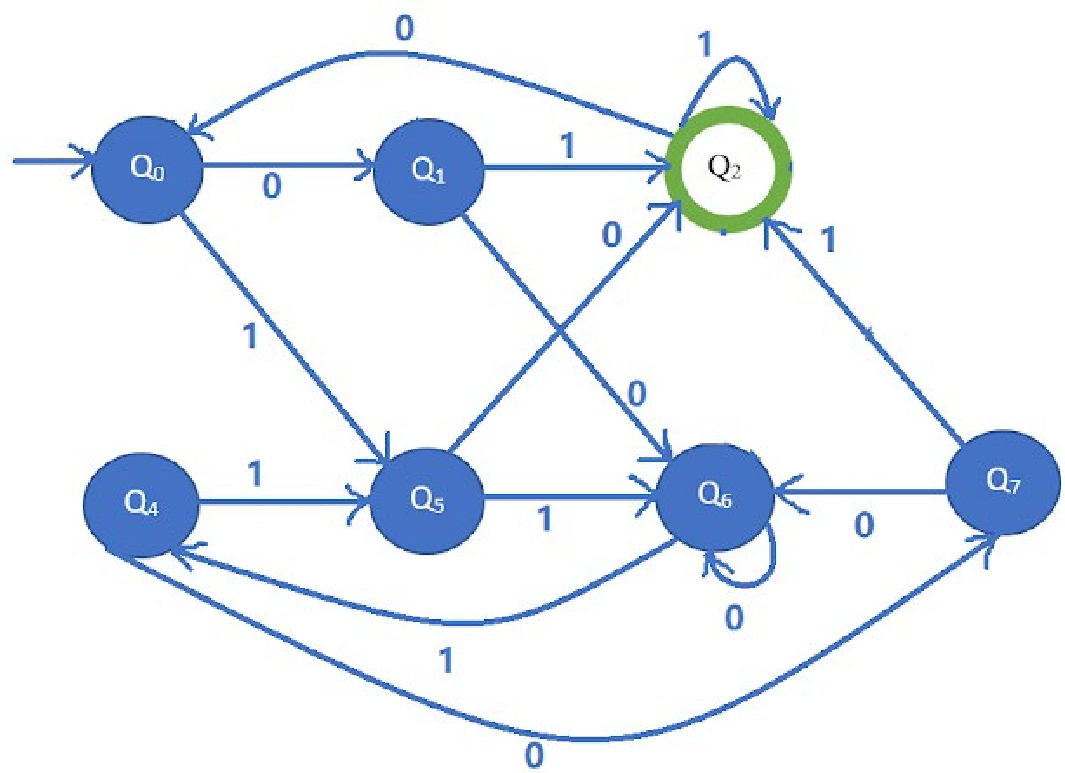
Q.1 a. Solution




S0
S1
S2
S3
S4
S5
1/0
0/0
1/0
0/0
0/0
1/0
1/0
0/0
1/1
0/1
1/0

Q.2 Solution


Q_0
Q_1
Q_2
Q_3
Q_4
Q_5
Q_6
Q_7
0
1
1
0
0
1
1
0
1
1
1
0
0
1
0



Present State	Next State	
	Input a	Input b
→ Q_0	Q_1	Q_5
Q_1	Q_6	$*Q_2$
$*Q_2$	Q_0	$*Q_2$
Q_4	Q_7	Q_5
Q_5	$*Q_2$	Q_6
Q_6	Q_6	Q_4
Q_7	Q_6	$*Q_2$

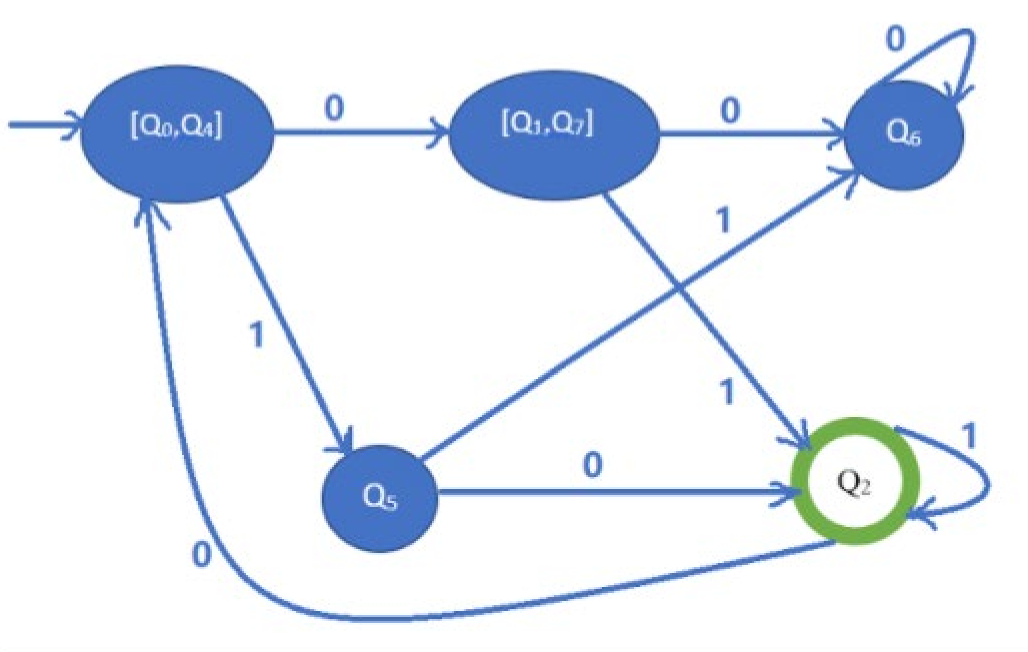
Step-3: Find out equivalent sets:

0-Equivalent Set: [Q_0, Q_1, Q_4, Q_5 , Q_6, Q_7] [Q_2]

1-Equivalent Set: [Q_0, Q_4, Q_6] [Q_1, Q_7] [Q_5] [Q_2]

2-Equivalent Set: [Q_0, Q_4] [Q_6] [Q_1, Q_7] [Q_5] [Q_2]

3-Equivalent Set: [Q_0, Q_4] [Q_6] [Q_1, Q_7] [Q_5] [Q_2]



Q3. Solution

Part A. In line iii., Bilal did wrong split of w. As 0 is finite in w, therefore cannot be pumped and hence invalidate the proof. In another words, Bilal is not permitted to pick a specific split of w.

Part B. In line iii, Amjad didn't split s correctly. Since the given language is regular with p ≥2, therefore, we can write $s=0^{2p}$ as $s=\epsilon\ 00\ 0^{2(p-1)}$ ($x=\epsilon$, $y=00$, $z=0^{2(p-1)}$). We have $|\epsilon 00|\leq p$, $|00|>1$ and $(00)^i 0^{2(p-1)} \in L$ for all $i\geq 0$.

Q. 5 Solution

i. S--> aSb|aaS|Sbb|Δ

ii. S-->aSb|aaa

iii. Language is not CFL