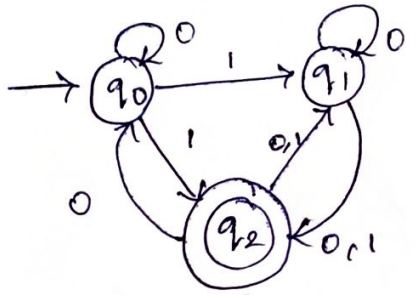
TOC

① NFA – DFA

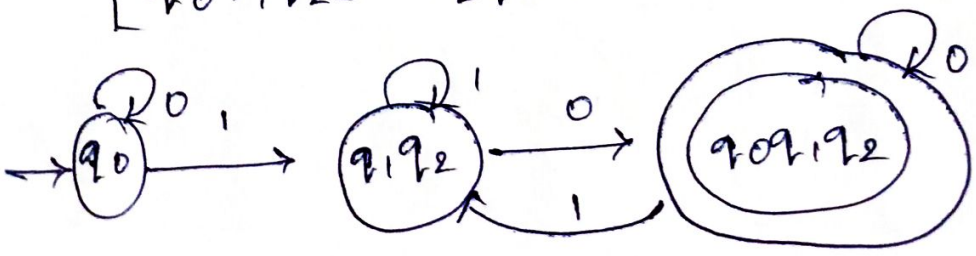


① NFA transition table

	0	1
→ q0	q0	q1 q2
q1	q1 q2	q2
* q2	q0 q1	q1

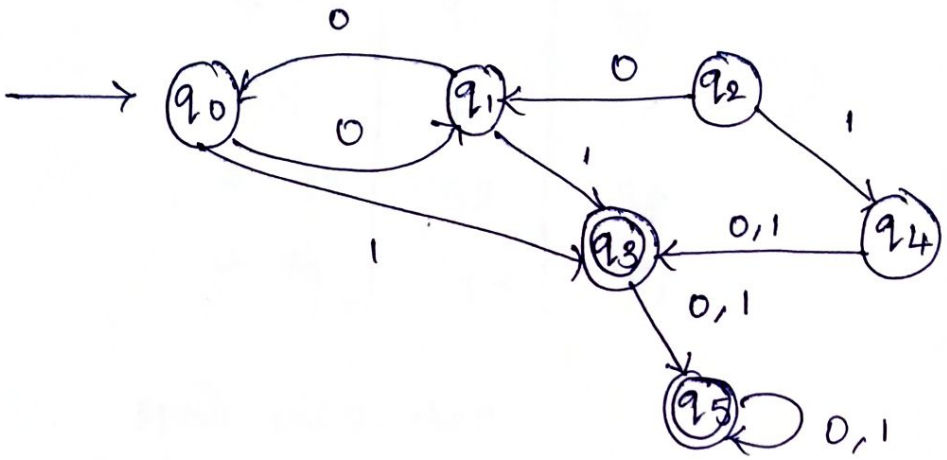
② DFA transition table

	0	1
q0	q0	[q1 q2] → new state
[q1 q2]	[q1 q2 q0]	[q2 q1] → ~~new state~~
[q0 q1 q2]	[q0 q1 q2]	[q2 q1]

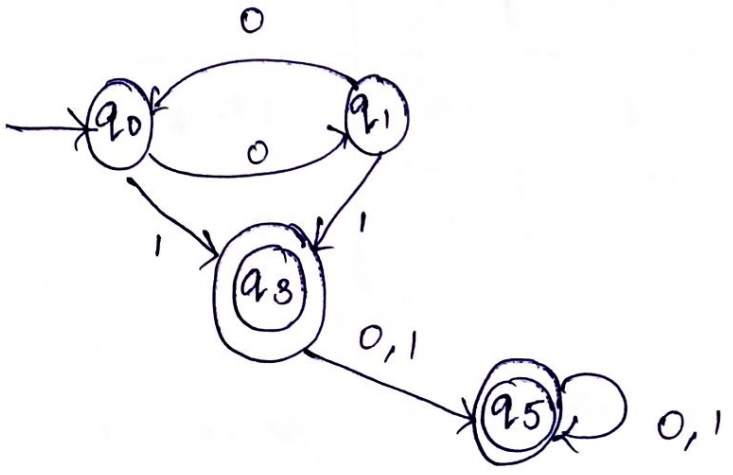


Minimization of DFA.

(1)



i) Remove unreachable states (q_2 and q_4)



② Transition table

	0	1
→ q_0	q_1	q_3
q_1	q_0	q_3
* q_3	q_5	q_5
* q_5	q_5	q_5

③ split into two

	0	1	
→ q_0	q_1	q_3	T1 (Non final states)
q_1	q_0	q_3	T1 (Non final states)
* q_3	q_5	q_5	T2 (final states)
* q_5	q_5	q_5	T2 (final states)

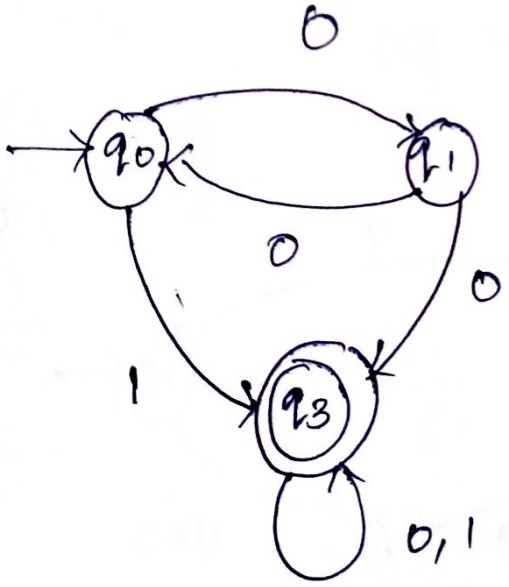
④ T1 have no similar rows, T2 has. So remove & replace with previous state

* q_3	~~q_5~~ q_3	~~q_5~~ q_3
* ~~q_5~~	~~q_5~~	~~q_5~~

⑤ Reduced transition table

	0	1
→ q_0	q_1	q_3
* q_1	q_0	q_3
* q_3	q_3	q_3

⑥ state diagram:-

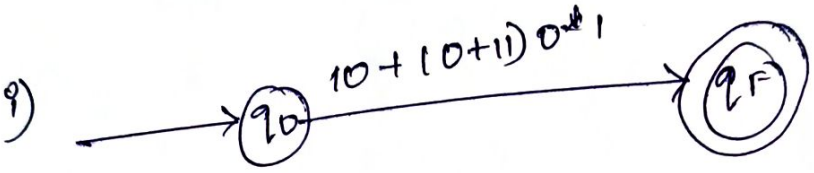


Regular expression

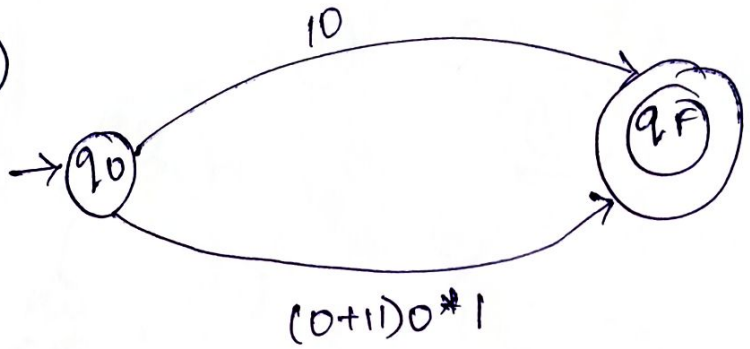
Subset method.

(a) $10 + (0+11)0^*1$

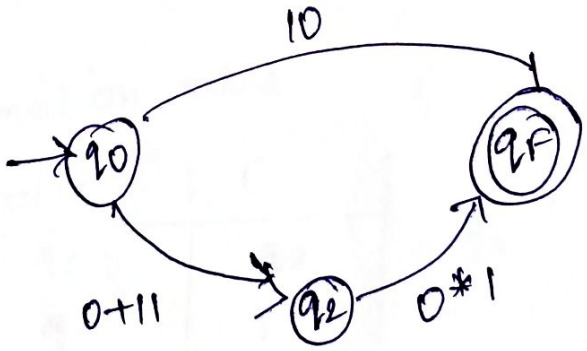
i)



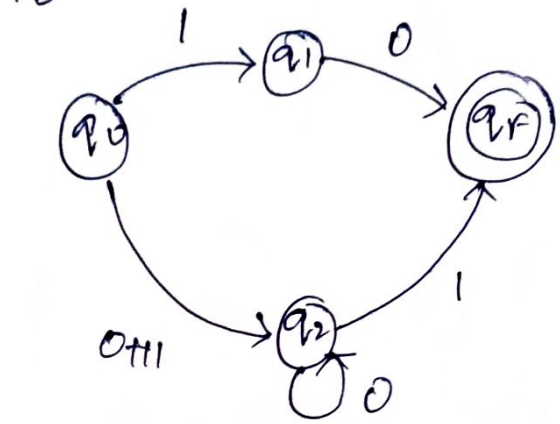
ii)



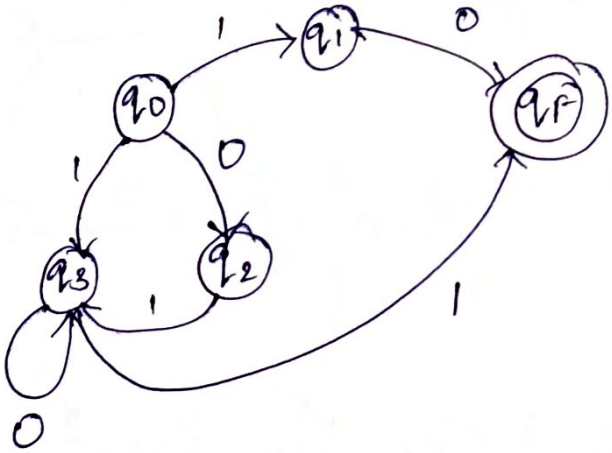
iii)



iv)



v)



Transition table

states	0	1
q_0	q_2	$q_1 q_3$
q_1	q_f	ϕ
q_2	ϕ	q_3
q_3	q_3	q_f
q_f	ϕ	ϕ

Kleen's theorem

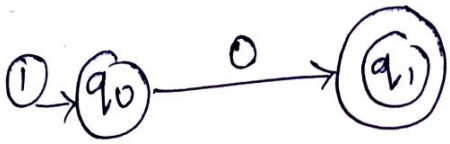
$r = 1^*0 + 0$

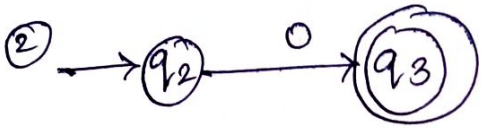
$r = r_1 + r_2$

$r_1 = 1^*0$ $\quad r_2 = 0$

$r_1 = r_3 \cdot r_4$ $\quad r_3 = 1^*$ $\quad r_4 = 0$

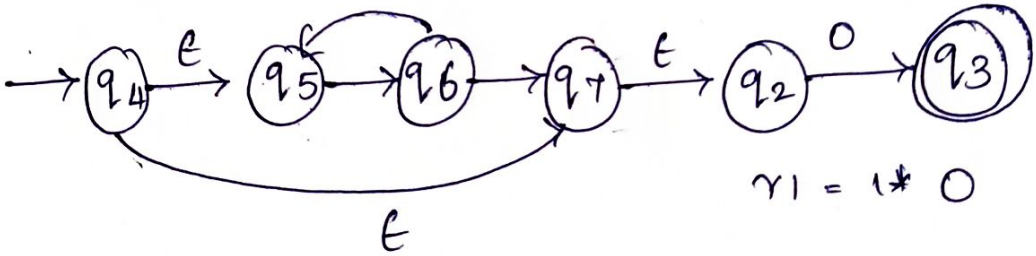
Argumentation for $r_2 = 0$





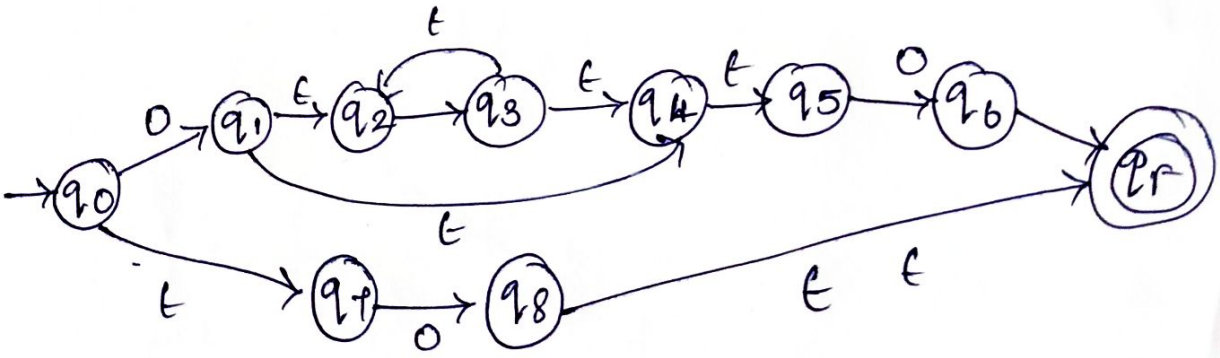
$r_4 = 0$

3

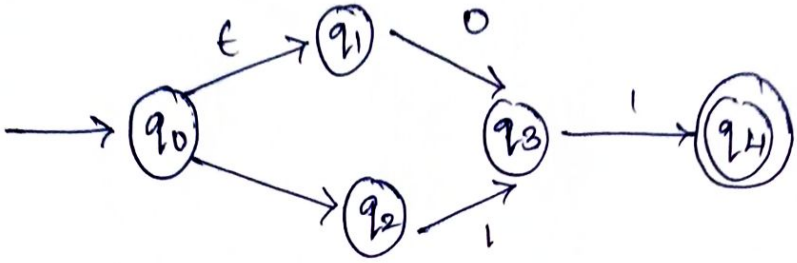


$r_1 = 1^*0$

4



2) ϵ closure NFA to DFA



i) ϵ closure of $\{q_0\} = \{q_0, q_1, q_2\} \rightarrow A$

$\{q_1\} = \{q_1\} \rightarrow B$

$\{q_2\} = \{q_2\} \rightarrow C$

$\{q_3\} = \{q_3\} \rightarrow D$

$\{q_4\} = \{q_4\} \rightarrow E$

ii) $\delta'(A, 0) = \epsilon$ closure $\{\delta((q_0, q_1, q_2), 0)\}$

$= \epsilon \{\delta(q_0, 0) \cup \delta(q_1, 0) \cup \delta(q_2, 0)\}$

$= \underline{\epsilon \text{ closure } \{q_3\}}$

$= \{q_3\}$