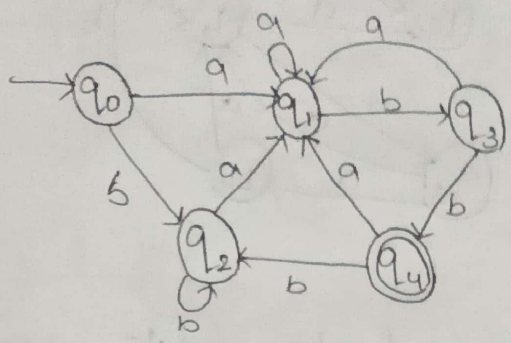
Assignment - 3 22/8/24

1. 

Minimization of DFA

2. i) Write the regular expression for Given language string ending with 011 string containing any number of one's & zero's

ii) string containing any no.of 1's and 0's start with 1 ending with 01

iii) The string of a's and b's whose length is even

3. Construct ϵ NFA for RE i) $*0+0$ ii) $(11+10)^*011$

iii) $(a+b)^*abb$

4. Construct NFA with ϵ and findout the minimization of DFA

Answers

① Transitition table

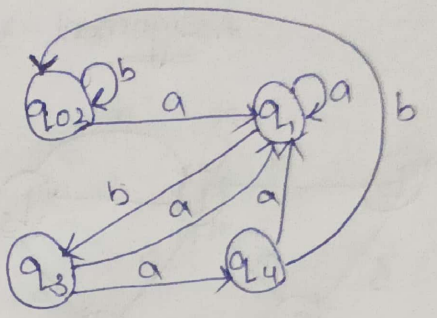
δ	a	b
q_0	q_1	q_2
q_0	q_1, q_4	q_3
q_2	q_1	q_2
q_3	q_1	q_4
q_4	ϕ	q_2

The unreachable states are not there separating the final states and non final states.

δ	a	b
$\rightarrow q_0$	q_1	q_2
q_1	q_1	q_3
q_2	q_1	q_2
q_3	q_1	q_4
$* q_4$	ϕ	q_2

The q_0, q_2 are having same rows Combine q_0 and q_2 as q_{02}

δ	a	b
$\rightarrow q_{02}$	q_1	q_{02}
q_1	q_1	q_3
q_3	q_1	q_4
$*\ q_4$	ϕ	q_{02}



2. i) string contains any no.of 0's and 1's. start with 1 and end with 01

$1\,00^*1\,01$ (or) $1\,1^*\,01$

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

ii) String ending with 011

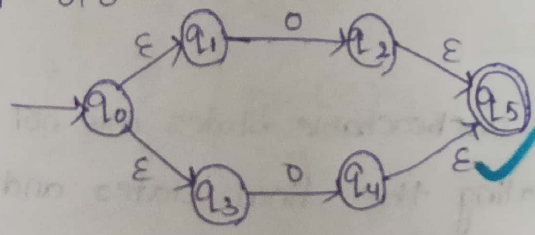
$1^*\,0^*\,011$

iii) string of a's and b's length is even

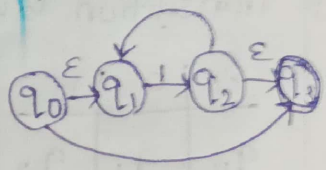
$(a+b)^*\,(a+b)^*$

3. expression for 1^*0+0

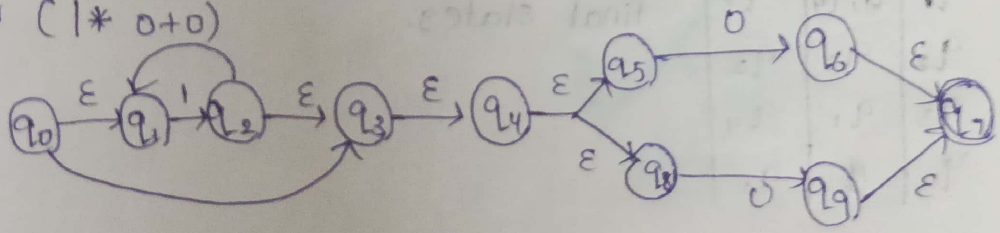
for 0+0



for (1^*)

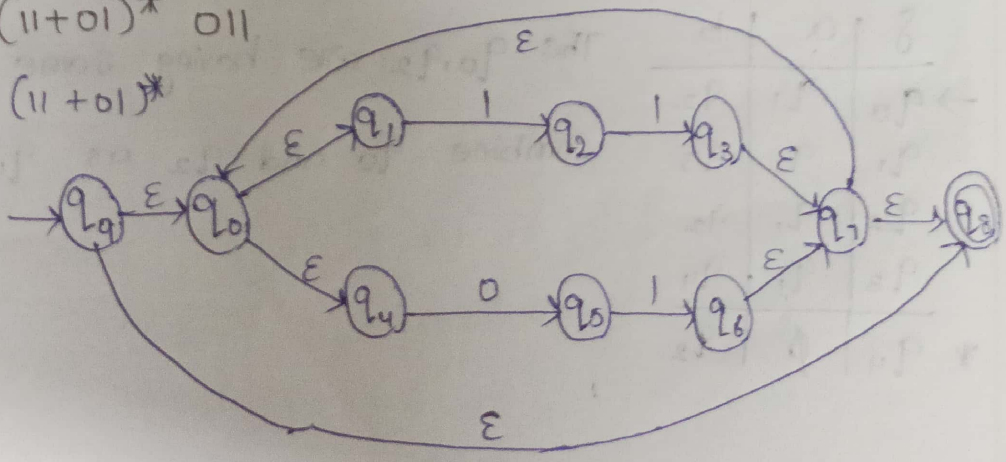


for $(1^*\,0+0)$

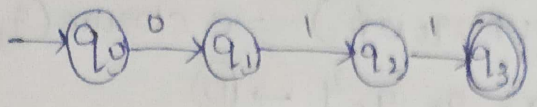


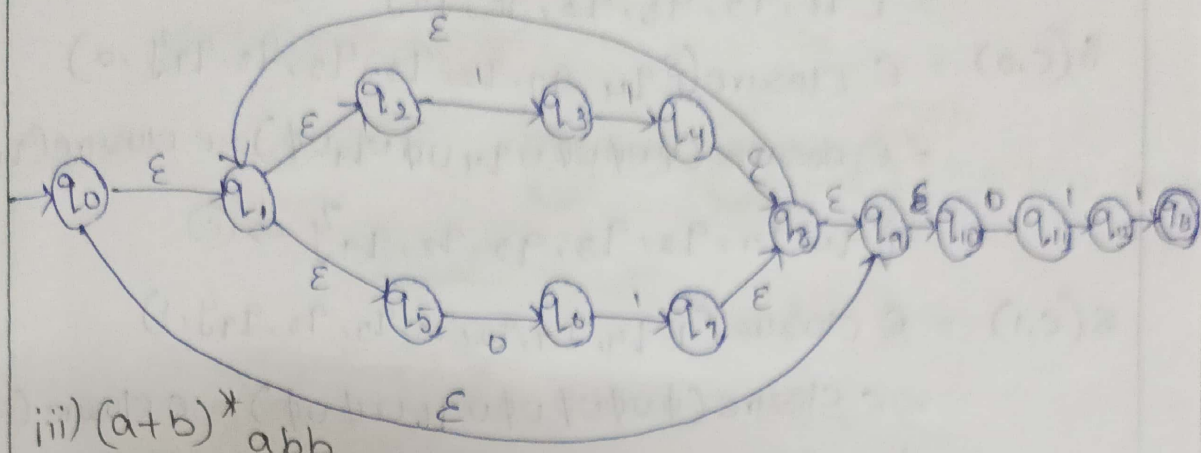
2) $(11+01)^*\,011$

for $(11+01)^*$

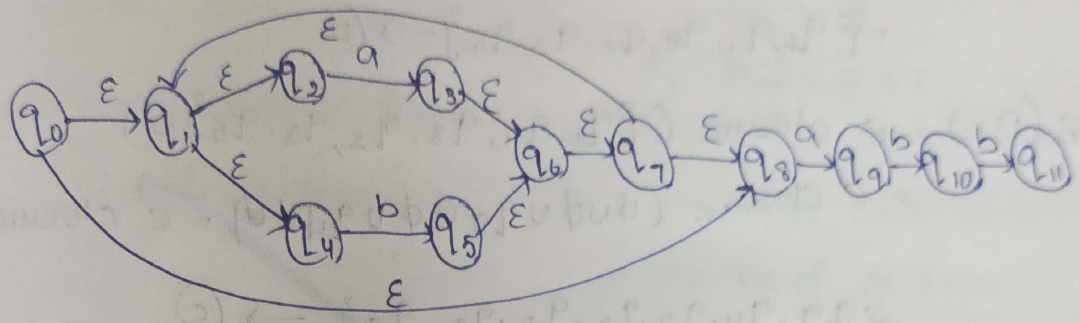


for 011





iii) $(a+b)^* abb$



4.

ε closure q_0: $\{q_0\}$ → (A)

ε closure q_1: $\{q_1, q_2, q_3, q_5, q_8\}$

ε closure q_2: $\{q_2, q_3, q_5\}$

ε closure q_3: $\{q_3\}$

ε Qourse q_4: $\{q_4, q_7, q_2, q_3, q_5, q_8\}$

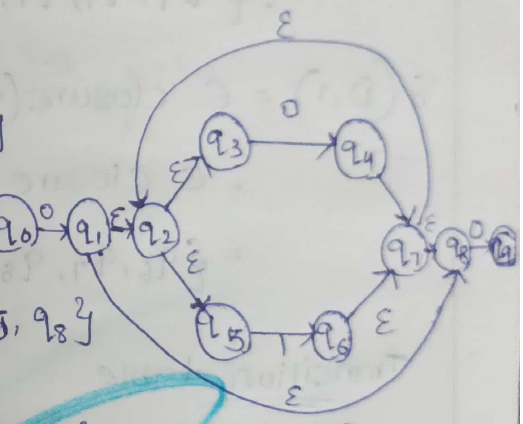
ε closure q_5: $\{q_5\}$

ε closure q_6: $\{q_6, q_7, q_8, q_3, q_2, q_5\}$

ε closure q_7: $\{q_7, q_8, q_2, q_3, q_5\}$

ε closure q_8: $\{q_8\}$

ε closure q_9: $\{q_9\}$



$\delta(A, 0)$ = ε closure $(\{q_0\}, 0)$ = ε closure (q_1)

$= \{q_1, q_2, q_3, q_5, q_8\}$ → (B)

$\delta(A, 1)$ = ε closure $\{(q_0), 1\} = \phi$

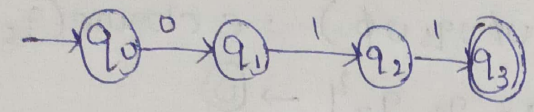
$\delta(B, 0)$ = ε closure $(\{q_1, q_2, q_3, q_5, q_8\}, 0)$

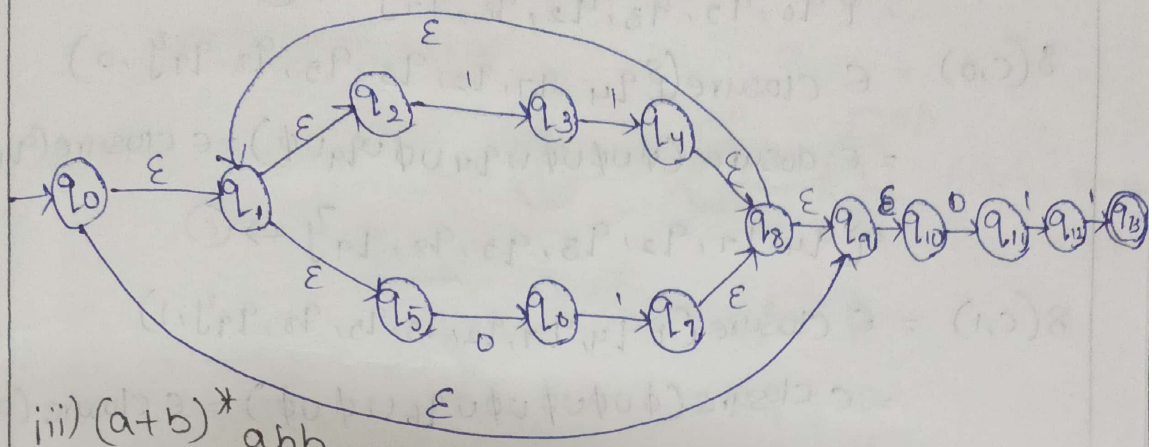
= ε closure $(\phi \cup \phi \cup q_4 \cup \phi \cup q_9)$

= $\{$ ε closure $(q_4 \cup q_9)$

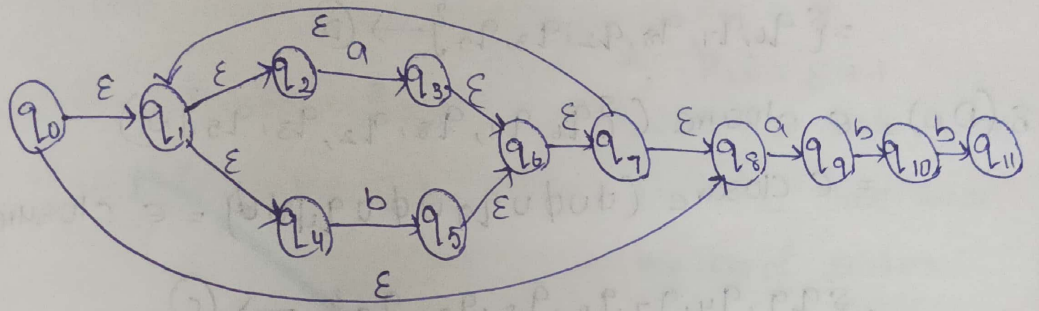
→ (C)

for 011





iii) $(a+b)^* abb$



4. ε closure q_0: $\{q_0\}$ → (A)

ε closure q_1: $\{q_1, q_2, q_3, q_5, q_8\}$

ε closure q_2: $\{q_2, q_3, q_5\}$

ε closure q_3: $\{q_3\}$

ε closure q_4: $\{q_4, q_7, q_2, q_3, q_5, q_8\}$

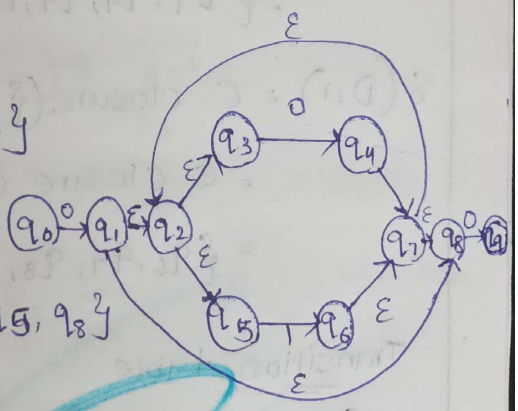
ε closure q_5: $\{q_5\}$

ε closure q_6: $\{q_6, q_7, q_8, q_3, q_2, q_5\}$

ε closure q_7: $\{q_7, q_8, q_2, q_3, q_5\}$

ε closure q_8: $\{q_8\}$

ε closure q_9: $\{q_9\}$



$\delta(A, 0)$ = ε closure $(\{q_0\}, 0)$ = ε closure (q_1)

$= \{q_1, q_2, q_3, q_5, q_8\}$ → (B)

$\delta(A, 1)$ = ε closure $\{(q_0), 1\} = \phi$

$\delta(B, 0)$ = ε closure $(\{q_1, q_2, q_3, q_5, q_8\}, 0)$

= ε closure $(\phi \cup \phi \cup q_4 \cup \phi \cup q_9)$

= $\{$ε closure $(q_4 \cup q_9)$

= $\{q_4, q_7, q_2, q_3, q_5, q_8, q_9\}$ → (C)

$\delta(B,1) = \epsilon$ closure $(\{q_1, q_2, q_3, q_5, q_8\}, 1)$

$= \epsilon$ closure $(\phi \cup \phi \cup \phi \cup q_6 \cup \phi) = \epsilon$ closure (q_6)

$= \{q_6, q_5, q_3, q_2, q_8, q_7\} \rightarrow$ (D)

$\delta(C,0) = \epsilon$ closure $(\{q_4, q_7, q_2, q_3, q_5, q_8, q_9\}, 0)$

$= \epsilon$ dosure $(\phi \cup \phi \cup \phi \cup q_4 \cup \phi \cup q_9 \cup \phi) = \epsilon$ closure $(q_4 q_9)$

$= \{q_4, q_7, q_2, q_3, q_5, q_8, q_9\} \rightarrow$ (C)

$\delta(C,1) = \epsilon$ closure $(\{q_4, q_7, q_2, q_3, q_5, q_8, q_9\}, 1)$

$= \epsilon$ closure $(\phi \cup \phi \cup \phi \cup \phi \cup q_6 \cup \phi \cup \phi) = \epsilon$ closure (q_6)

$= \{q_6, q_7, q_8, q_2, q_3, q_5\} \rightarrow$ (D)

$\delta(D,0) = \epsilon$ closure $(\{q_6, q_7, q_8, q_2, q_3, q_5\}, 0)$

$= \epsilon$ closure $(\phi \cup \phi \cup q_9 \cup \phi \cup q_4 \cup \phi) = \epsilon$ closure $(q_4 q_9)$

$= \{q_9, q_4, q_7, q_2, q_3, q_5, q_8\} \rightarrow$ (C)

$\delta(D,1) = \epsilon$ closure $(\{q_6, q_7, q_8, q_2, q_3, q_5\}, 1)$

$= \epsilon$ closure (q_6)

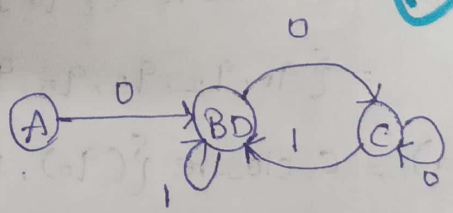
$= \{q_6, q_7, q_8, q_2, q_3, q_5\} \rightarrow$ (D)

Transition table

	δ	0	1
→	A	B	ϕ
	B	C	D
*	C	C	D
	D	C	D

minimizing table i.e B, D have same states.

δ	0	1
→ A	BD	ϕ
BD	C	BD
* C	C	BD



Minimized diagram.