

Q1 Differentiate between NFA and DFA

ANS:

NFA

DFA

- NFA stands Non-deterministic finite automata.

- DFA stands for deterministic finite automata

- In NFA, each pair of the state and input symbol can have many possible next states

- In DFA, the next possible state is distinctly set.

- Time needed for executing an input string is more.

- Time needed to execute an input string is less

- Not all NFA are DFA

- All DFA are NFA

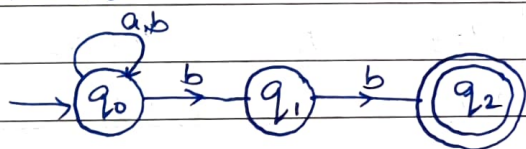
- NFA requires lesser space.

- DFA requires more space

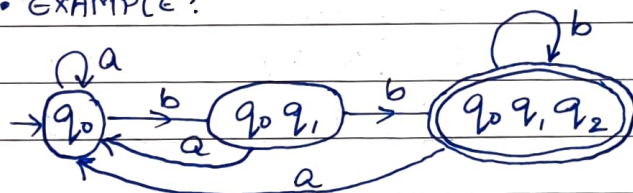
- $\delta: Q \times \Sigma \rightarrow Q$ i.e. next possible state belongs to Q .

- $\delta: Q \times \Sigma \rightarrow Q^2$ i.e. power set of Q

• EXAMPLE:

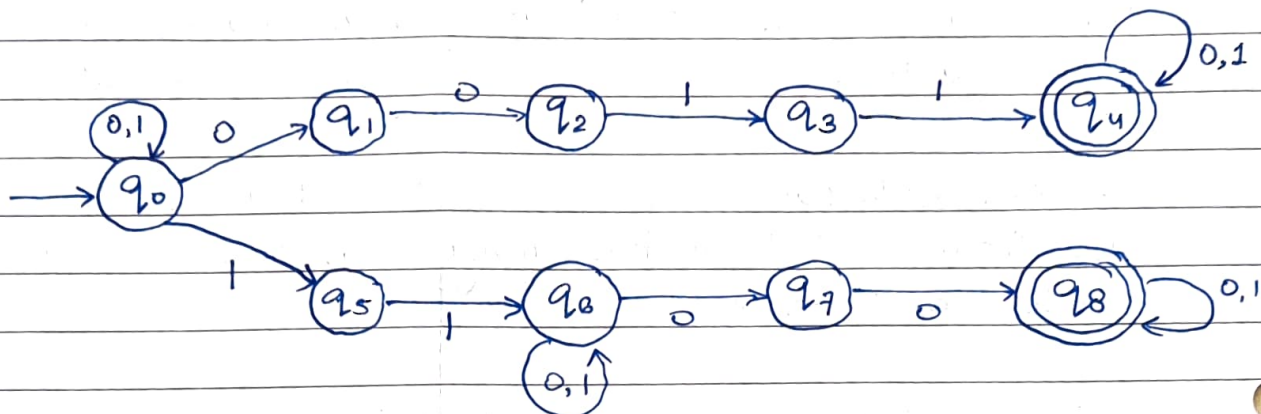


• EXAMPLE:



Q2 Design NFA for $L =$ all strings $\{0,1\}$ that have atleast 2 consecutive 0's and 1's

ANS



$L = \{ 0011, 1100, 101100, 011100, 110100, \dots \}$

Q3 Find DFA equivalent to

	a	b
q_0	q_0, q_1	q_2
q_1	q_0	q_1
q_2	—	q_0, q_1

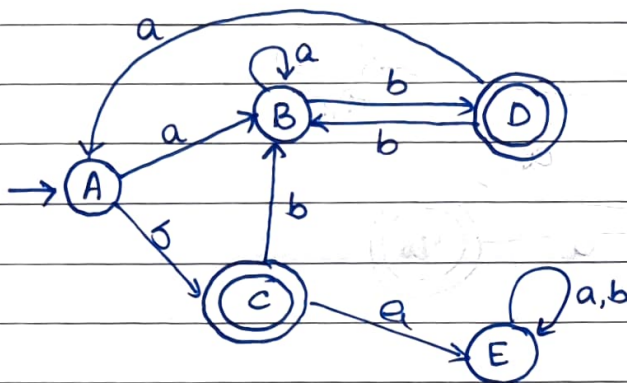
ANS

X	$Y = \epsilon\text{-closure}(x)$	$\delta(y, a)$	$\delta(y, b)$
A $\{q_0\}$	$\{q_0\}$	$\{q_0, q_1\}$ B	$\{q_2\}$ C
B $\{q_0, q_1\}$	$\{q_0, q_1\}$	$\{q_0, q_1\}$ B	$\{q_1, q_2\}$ D
C $\{q_2\}$	$\{q_2\}$	$\{\}$ E	$\{q_0, q_1\}$ B
D $\{q_1, q_2\}$	$\{q_1, q_2\}$	$\{q_0\}$ A	$\{q_0, q_1\}$ B
E $\{\}$	$\{\}$	$\{\}$ E	$\{\}$ E

TRANSITION TABLE

$Q \backslash \Sigma$	a	b
\rightarrow A	B	C
B	B	D
* C	E	B
* D	A	B
E	E	E

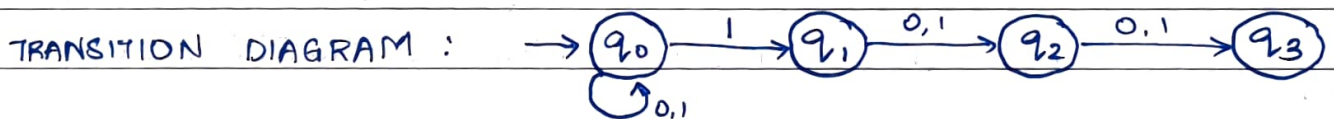
TRANSITION DIAGRAM



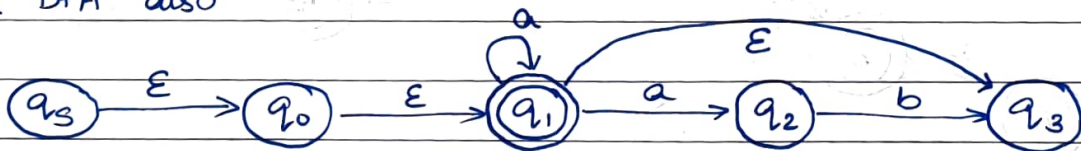
Q4 Construct NFA with ϵ -moves for set of all strings such that the 3rd from right end is 1 over $\Sigma = \{0, 1\}$

ANS

REGULAR EXPRESSION: $(0+1)^*1(0+1)(0+1)$



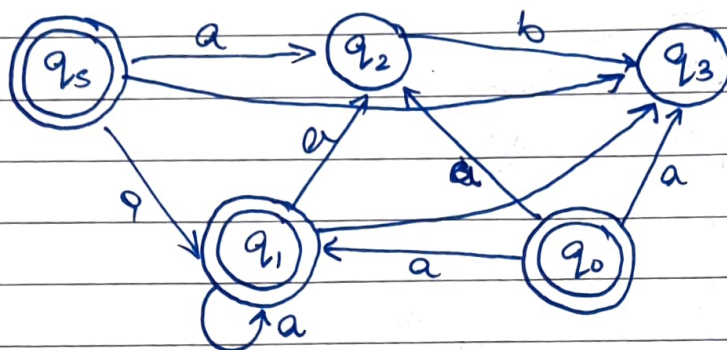
Q5 For the NFA below, find equivalent NFA w/o moves and find DFA also



ANS

	a	b
q_3	$\{q_1, q_2, q_3\}$	$\{\}$
q_0	$\{q_1, q_2, q_3\}$	$\{\}$
q_1	$\{q_1, q_2, q_3\}$	$\{\}$
q_2	$\{\}$	q_3
q_3	$\{\}$	$\{\}$

ϵ NFA to NFA



NFA TRANSITION DIAGRAM

TRANSITION TABLE

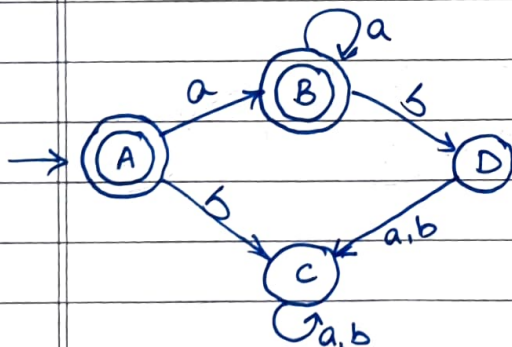
Q \ Σ	a	b
$\rightarrow^* A$	B	C
$* B$	B	D
C	C	C
D	C	C



Q \ Σ	a	b
$\rightarrow^* AB$	AB	CD
C, D	CD	CD

Minimized transition table

TRANSITION GRAPH



MINIMIZED TRANSITION GRAPH

