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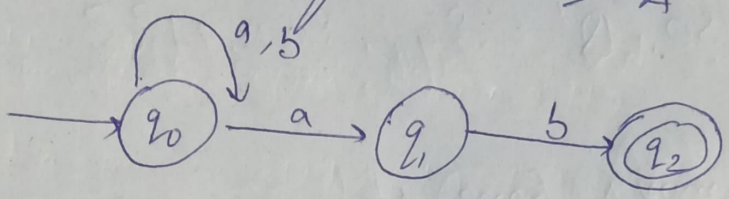
Answer

2 B) Conversion of NFA to DFA



$Q = \{q0, q1, q2\}$

$\Sigma = \{a, b\}$

$F = \{q_2\}$

δ = (Transition Fn of NFA)

State	a	b
q0	q0, q1	q0
q1		q2
q2		

Step 1 : $Q' = \phi$

Step 2 : $Q' = \{q0\}$

step 3 : For each state in Q', find the states for each i/p symbol

Currently, state in Q' is q0, find moves from q0 on i/p symbol a & b using transition Fn of NFA & update the transition table of DFA

δ' (Transition function of DFA

State	a	b
q0	{q0, q1}	q0

Now $\{q0, q1\}$ will be considered as a single state. As its entry is not in Q', add it to Q' : so, Q' = $\{q0, \{q0, q1\}\}$

Now, moves from state $\{q0, q1\}$ on diff i/p symbols are not present in transition table of DFA

$\delta'[\{q0; q1\}; a) = \delta(q0, a) \cup \delta(q1, a) = \{q0, q1\}$

$\delta'(\{q0, q1\}, b) = \delta(q0, b) \cup \delta(q1, b) = \{q0, q2\}$

δ' (Transition F= of DFA)

State	a	b
q0	{q0, q1}	q0
{q0, q1}	{q0, q1}	{q0, q2}

Now $\{q0, q2\}$ will be considered as single state : As its entry is not in Q', add it to Q'

$\therefore$ Q' = $\{q0, \{q0, q1\}, \{q0, q2\}\}$

Now, moves from state $\{q0, q2\}$ on diff i/p symbols are not present in transition table of DFA

$\delta'(\{q0, q2\}, a) = \delta(q0, a) \cup \delta(q2, a)$

$= \{q0, q1\}$

$\delta'(\{q0, q2\}, b) = \delta(q0, b) \cup \delta(q2, b)$

δ' (Transition Function of DFA)

State	a	b
$q0$	$\{q0, q1\}$	$q0$
$\{q0, q1\}$	$\{q0, q1\}$	$\{q0, q2\}$
$\{q0, q2\}$	$\{q0, q1\}$	$q0$

∴ There is no new state generated

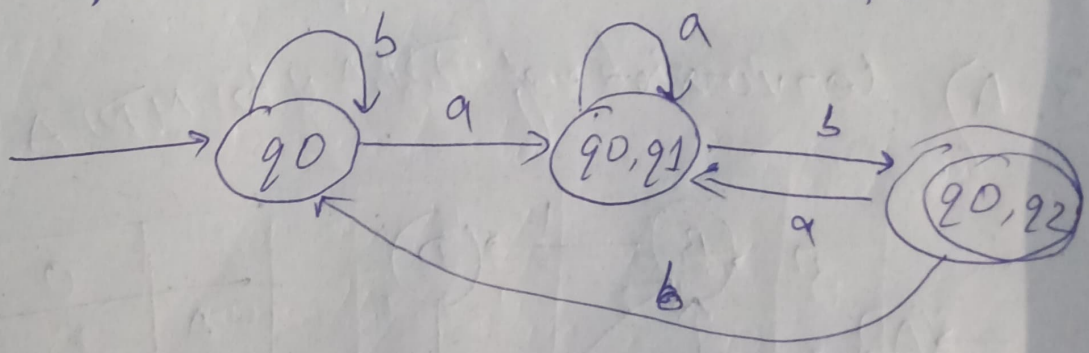
Final state of DFA will be state which has $q2$ as its component i.e $\{q0, q2\}$

$Q' = \{q0, \{q0, q1\}, \{q0, q2\}\}$

$\Sigma = (a, b)$

$F = \{\{q0, q2\}\}$ & transition function δ'.

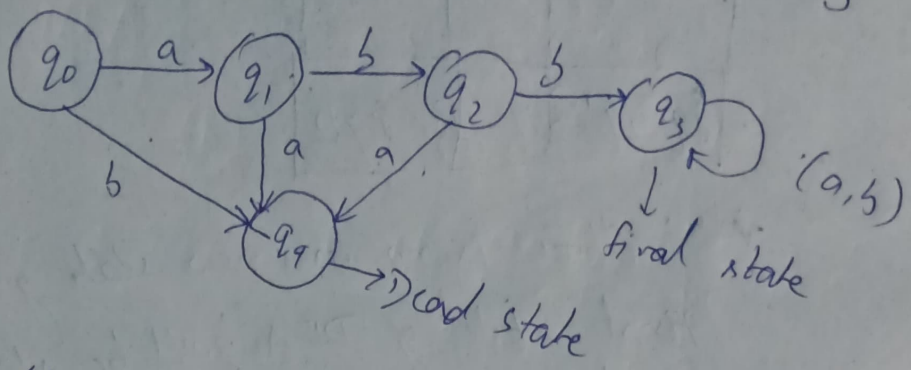
∴ Final DFA for above NFA :-



1. a) If the string starts with W_x.

Let $W = 'abb'$

So, $W_x = \{abb, abba, abbb, abbab\}$

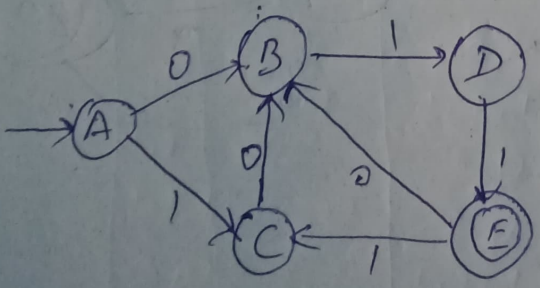


→ If there exist a DFA starting with W_x, there are 3 characters, abb.

→ So $n \Rightarrow 3$ & number of transitions to reach the final state in NFA for a string starting with DFA is 5.

∴ There will be $n+2$ states in DFA

3. A) Conversion of DFA to MDFA



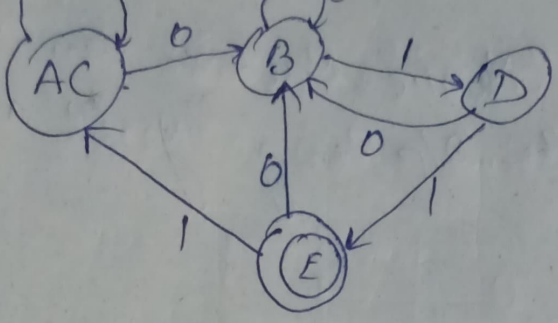
	0	1
A	B	C
B	B	D
C	B	C
D	B	E
(E)	B	C

0 Equivalence $\{A,B,C,D\}\{E\}$

1 Equivalence $\{A,B,C\}\{D\}\{E\}$

2 Equivalence $\{A,C\}\{B\}\{D\}\{E\}$

3 Equivalence $\{A,C\}\{B\}\{D\}\{E\}$



	0	1
A	B	C
B	B	D
C	B	C
D	B	E
(E)	B	C

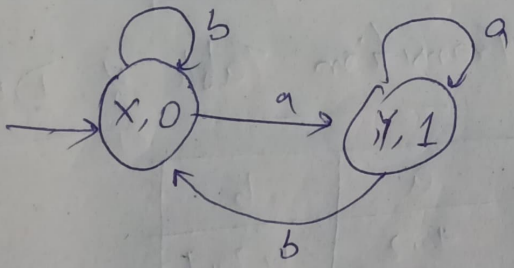
MDFA

(Minimal Deterministic Finite Automation)

4. A) Construction of machine that take a set of all string over $\{a,b\}$ as i/p & prints 1 as output for every occurance of 'a' as substring

Let, $E = \{a,b\}$, $\Delta = \{0,1\}$

Moore Machine

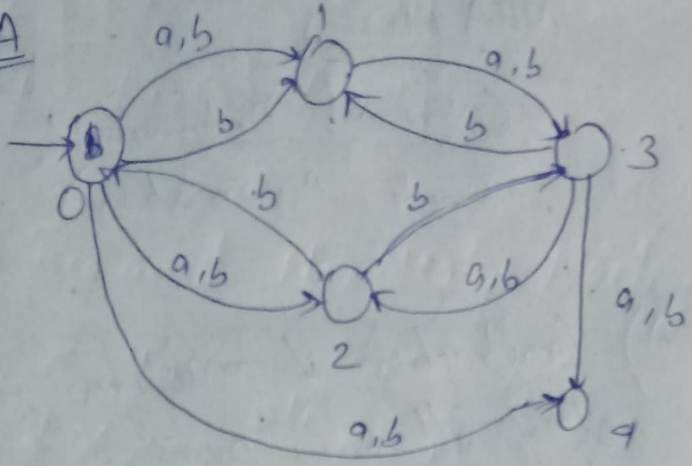


→ Here, initial state X on getting b as i/p it remains in the state of itself. & print '0' as o/p & on getting a as i/p it transits to state 'Y'. & prints 1 as o/p

→ The state 'Y' on getting 'a' as i/p, print 0 as o/p & on getting b as i/p prints 0 as o/p as it goes back to state 'X'

Thus, finally Moore Machine can easily print '1' as the O/p on getting 'a' as i/p substring.

5. B) NFA



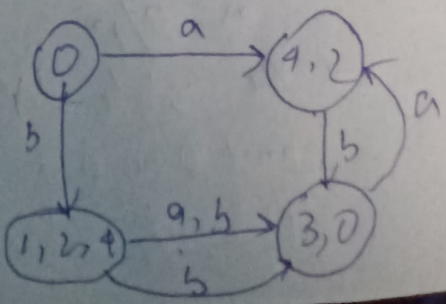
Transition Table of NFA

	a	b
0	4,2	1,2,4
1	3,0	—
2	—	3,0
3	2,4	1,2,4
4	—	—

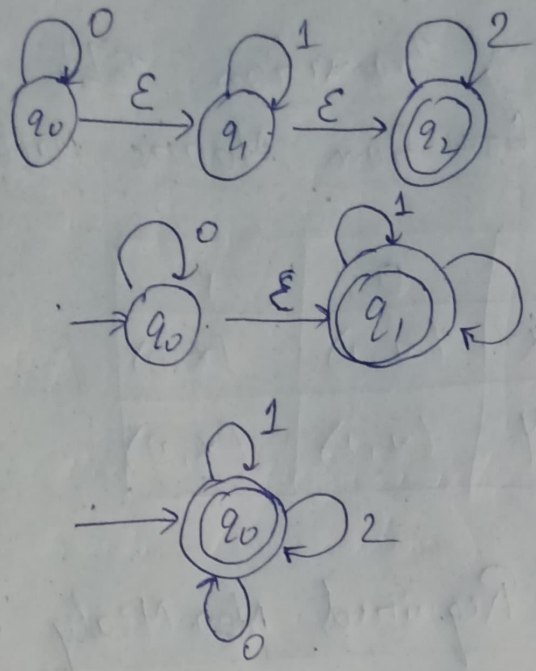
Transition Table of DFA

	a	b
0	4,2	1,2,4
4,2	—	3,0
1,2,4	3,0	3,0
3,0	4,2	1,2,4

∴ DFA



6. A)



Firstly, we eliminate rightmost epsilon & interchange initial to final or vice-versa.

∴ q_1 becomes final

Similarly, q_0 now becomes final accepting 0, 1, 2.

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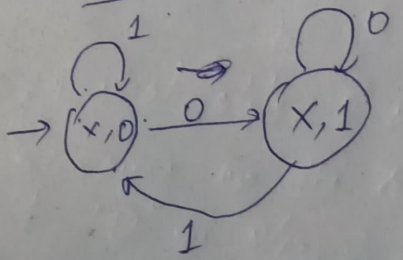
7. A) ATQ,

Moore Machine



(Diagram)

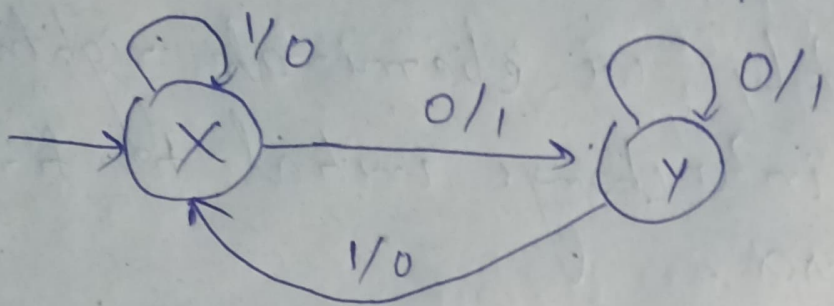
State Transition Table of Moore Machine

	0	1	Δ
→ X	Y	X	0
Y	Y	X	1

Formation of Transition Table of Mealy Machine from Moore Machine

	0	1
X	(Y, 1)	(X, 0)
Y	(Y, 1)	(X, 0)

∴ Required Mealy Machine Diagram



It takes binary number {0, 1} as i/p & produce 1's complement of that no. as o/p such that i/p string is read from LSB & end carry is discarded.