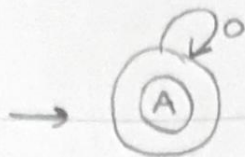
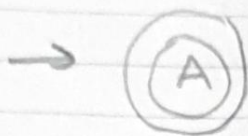


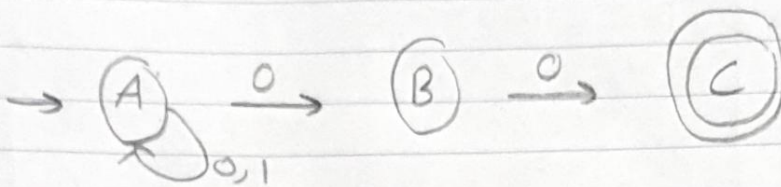
1) e)



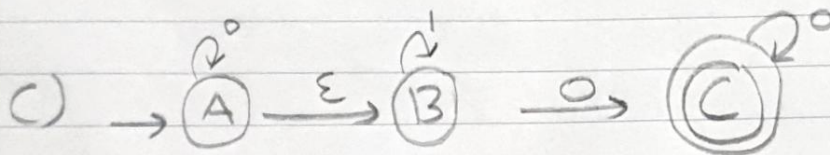
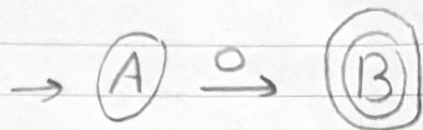
d)



a)



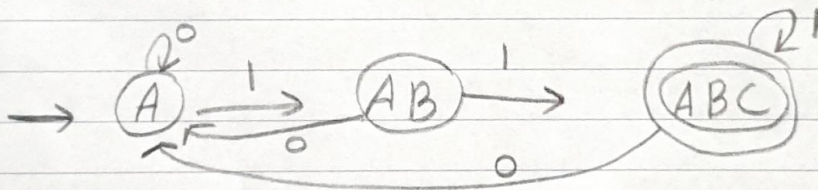
b)



2)

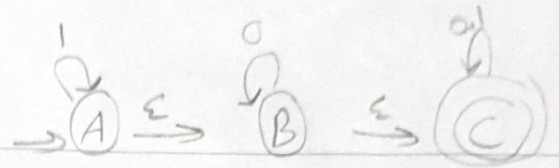
	0	1
→ A	A	A, B
B	$\emptyset$	C
Ⓢ	$\emptyset$	$\emptyset$

	0	1
→ A	A	AB
AB	A	ABC
Ⓢ	A	ABC





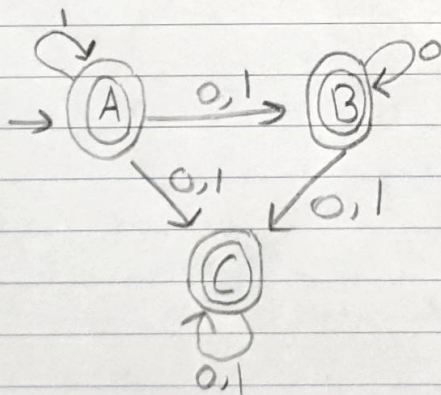
3)  $\epsilon$ -NFA  $\Rightarrow$  NFA



	$\epsilon^*$	0	$\epsilon^*$
A	$A \rightarrow A \rightarrow \phi$ $A \rightarrow B \rightarrow B \rightarrow C$ $A \rightarrow C \rightarrow C \rightarrow C$	$B \rightarrow B \rightarrow B \rightarrow C$ $B \rightarrow C \rightarrow C \rightarrow C$	
B		$B \rightarrow B \rightarrow B \rightarrow C$ $B \rightarrow C \rightarrow C \rightarrow C$	
C		$C \rightarrow C \rightarrow C \rightarrow C$	

	$\epsilon^*$	1	$\epsilon^*$
A	$A \rightarrow A \rightarrow A \rightarrow B$ $A \rightarrow B \rightarrow \phi$ $A \rightarrow C \rightarrow C \rightarrow C$		
B		$B \rightarrow B \rightarrow \phi$ $B \rightarrow C \rightarrow C \rightarrow C$	
C		$C \rightarrow C \rightarrow C \rightarrow C$	

	0	1
$\rightarrow$ A	{B, C}	{A, B, C}
B	{B, C}	{C}
C	{C}	{C}



4)

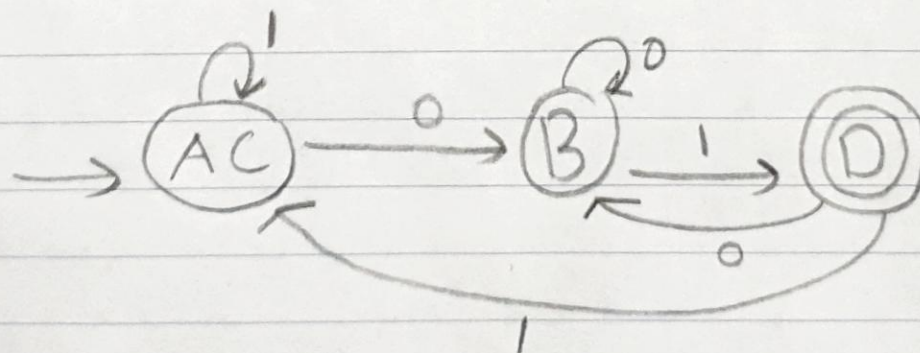
	0	1
→ A	B	C
B	B	D
C	B	C
ⓓ	B	C

0-equivalence:  $\{A, B, C\} \{D\}$

1-equivalence:  $\{AC\} \{B\} \{D\}$

2-equivalence:  $\{AC\} \{B\} \{D\}$

	0	1
→ AC	B	AC
B	B	D
ⓓ	B	AC





$$5) a) L_1 = \{a, b, \dots\}^*$$

$$R_1 = (a+b)^*$$

$$b) L_2 = \{\epsilon, a, b, aa, ab, ba, bb, aaa, aab, aba, abb, baa, bbb, bba, bab\}$$

$$R_2 = \epsilon + a + b + aa + ab + ba + bb + aaa + aab + aba + abb + baa + bbb + bba + bab$$

$$= (\epsilon + a + b)(\epsilon + a + b)(\epsilon + a + b)$$

$$6) q_1 = \epsilon + q_1 0$$

$$q_2 = q_1 1 + q_2 0$$

$$q_3 = q_2 1 + q_3 0 + q_3 1$$

Final state  $q_1$

$$\underbrace{q_1}_{R} = \underbrace{\epsilon}_{Q} + \underbrace{q_1}_{R} \underbrace{0}_{P}$$

$$R = Q + RP$$

$$= QP^*$$

$$q_1 = \epsilon 0^*$$

$$= 0^*$$

Final state  $q_2$

$$\underbrace{q_2}_{R} = \underbrace{q_1}_{Q} 1 + \underbrace{q_2}_{R} \underbrace{0}_{P}$$

$$R = Q + RP$$

$$= QP^*$$

$$q_2 = q_1 1 0^*$$

$$= 0^* 1 0^*$$

$$q_1 = 0^*$$

$R = \text{union of both Final states}$   
 $= 0^* + 0^* | 0^*$

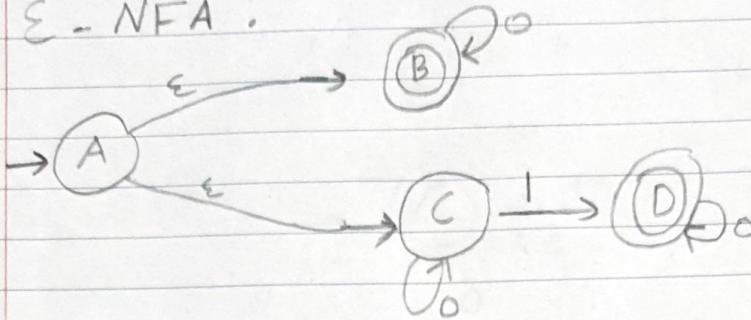
$$= 0^* (\epsilon + 1) 0^*$$



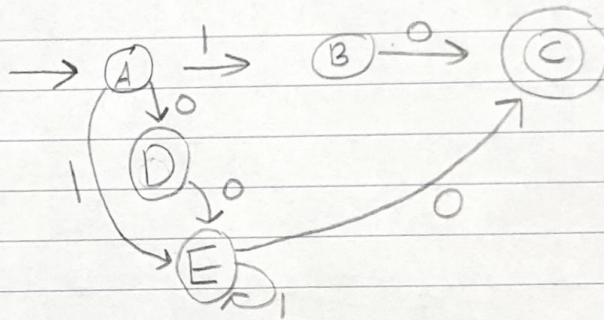
7) Regular exp.  $\rightarrow$  Finite automata

a)  $0^* + 0^*10^*$

$\Sigma$  - NFA :



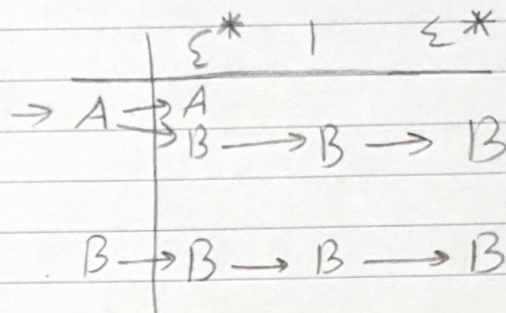
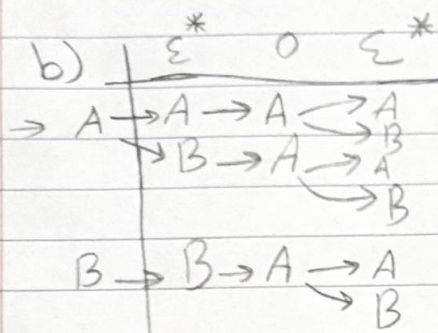
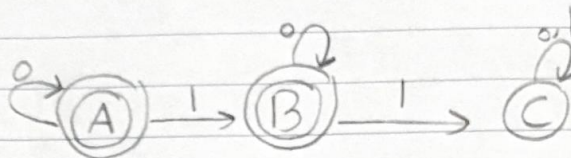
b)



8) a)

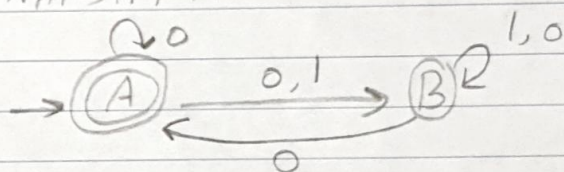
	0	1
A	A	B
B	B	$\emptyset$

	0	1
A	A	B
B	B	C
C	C	C



$\Sigma$ -NFA  $\rightarrow$  NFA

	0	1
$\rightarrow A$	$\{A, B\}$	$\{B\}$
$B$	$\{A, B\}$	$\{B\}$



	0	1
$\rightarrow A$	AB	B
AB	AB	B
B	AB	B

