Answer to question no. 1

The five tuples of a DFA are,

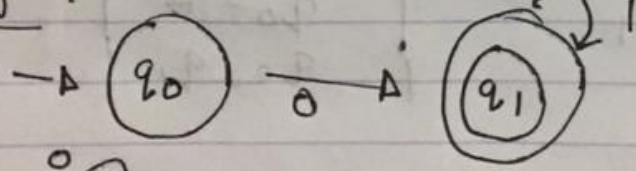
i) Q - finite set of states.
ii) Σ - finite set of symbols or alphabets.
iii) δ - the transition function where; $\delta : Q \times \Sigma \rightarrow Q$
iv) q_0 - Initial state
v) F - final state

DFA - For each input we can determine the state if the machine will move or not.

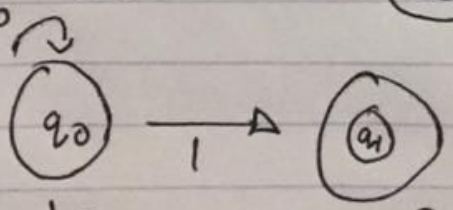
NFA - For each input the machine can move to any combination of states so therefore we cannot determine the exact state of the machine.

ϵ-NFA - Without any input the machine moves to another state.

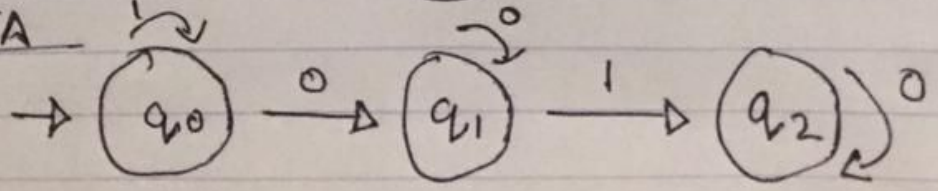
DFA



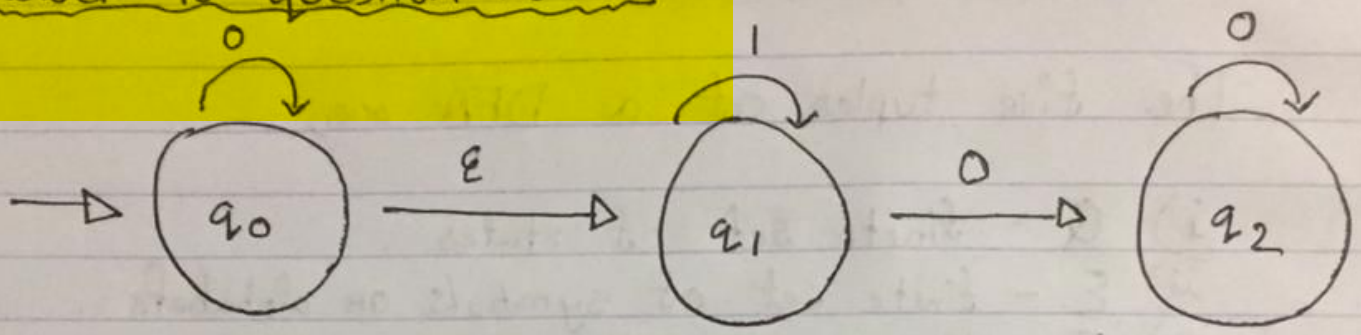
NFA



ϵ NFA



Answer to question no. 2



$(q_0, 0) = q_0$
$(q_0, \varepsilon) = q_1$

$(q_1, 0) = q_2$
$(q_1, 1) = q_1$

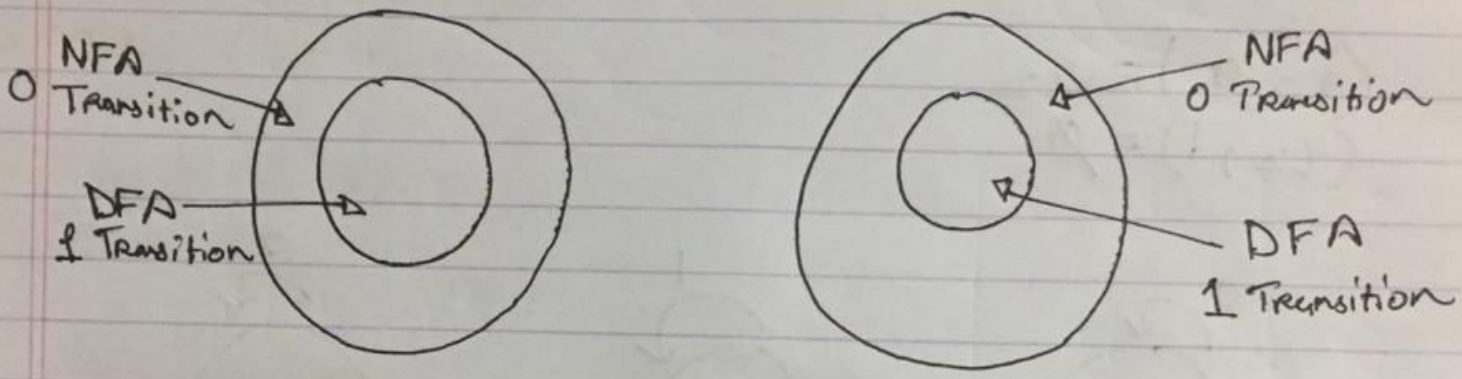
$(q_2, 0) = q_2$
$(q_2, 1) = \emptyset$
$(q_2, \varepsilon) = \emptyset$

States	ε of states	Symbols		ε of states	
		0	1	0	1
→ q_0	q_0				
	q_1	q_0	θ		
		q_2	q_1		

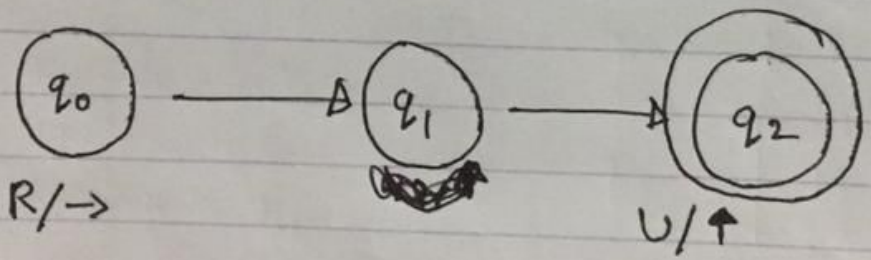
Answer to question no. 3

$\mathcal{E} = Q \times \Sigma = 2^Q$

DFA is one kind of NFA so no need to convert.



R/→ = 2 U/↑ = 1



$Q = q_0, q_1, q_2$

$\mathcal{E} = R/\rightarrow, U/\uparrow$

$q_0 = q_0$

$F = q_2$

Answer to question no. 3

$q_0, R/\rightarrow = q_1$

$q_0, U/\uparrow = \emptyset$

$q_1, R/\rightarrow = \emptyset$

$q_1, U/\uparrow = q_2$

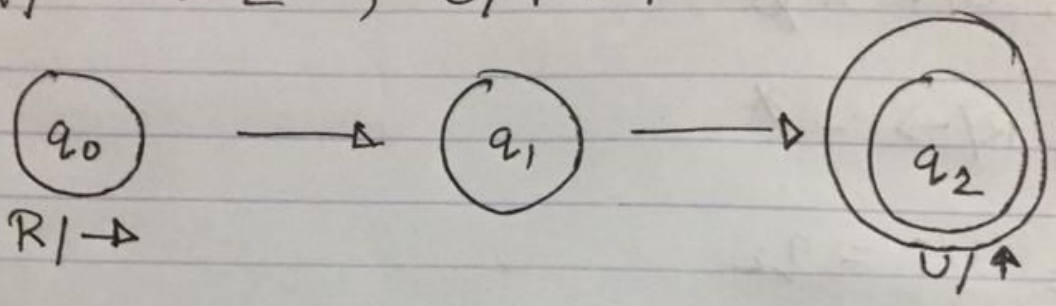
$q_2, R/\rightarrow = \emptyset$

$q_2, U/\uparrow = \emptyset$

Answer to question no. 4

We know,

$R/\rightarrow = 2$, $U/\uparrow = 1$



$Q = q_0, q_1, q_2$

$\Sigma = R/\rightarrow, U/\uparrow$

$q_0 = q_0$

$F = q_2$

State	R/→	U/↑
q_0	q_1	q_0
q_1	q_1	q_2
q_2	$\emptyset$	$\emptyset$

$q_0, R/\rightarrow = q_1$
$q_0, U/\uparrow = q_0$
$q_1, R/\rightarrow = q_1$

$q_1, U/\uparrow = q_2$
$q_2, R/\rightarrow = \emptyset$
$q_2, U/\uparrow = \emptyset$

State	Symbols	
	1	2
q_0	q_1	q_0
q_1	q_1	q_2
q_2	q_0	q_0