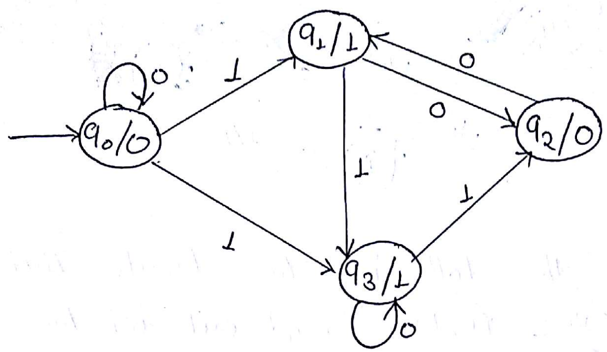
Q.1). Construct a melay machine equivalent to the given moore machine.



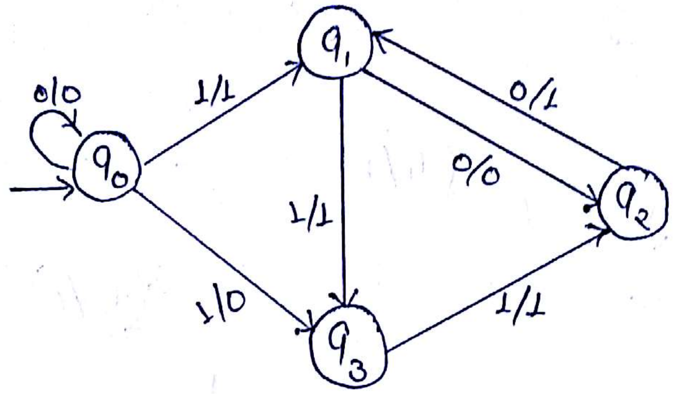
Sol. **Step 1 :**

Convert a moore diagram into a moore transition Table.

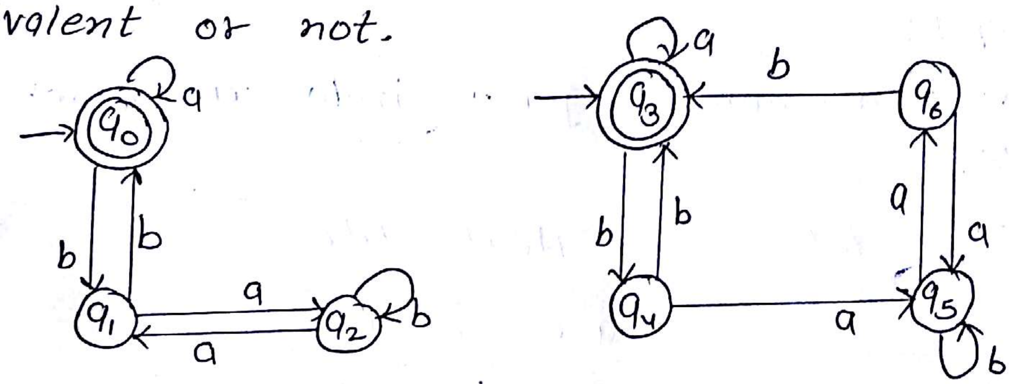
Present state	Next state		output
	a = 0	a = 1	O/P
→ q_0	q_0	q_1	0
q_1	q_2	q_3	1
q_2	q_1	q_3	0
q_3	q_3	q_0	1

Step 2 : State transition table for melay machine.

Present state	Next state			
	a = 0		a = 1	
	State	output	State	output
→ q_0	q_0	0	q_1	1
q_1	q_2	0	q_3	1
q_2	q_1	1	q_3	1
q_3	q_3	1	q_0	0



Q2). Consider the following two finite Automata FA1 & FA2 over {0,1}. Find out whether they are equivalent or not.



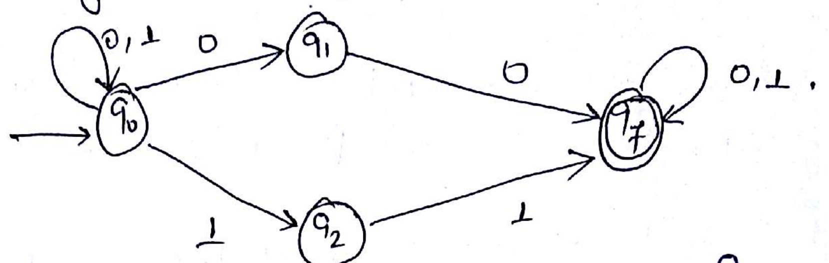
Sol. Comparison table :-

State	For Input a	For Input b
(q, q')	(q_a, q_a')	(q_b, q_b')
(q_0, q_3)	(q_0, q_3)	(q_1, q_4)
(q_1, q_4)	(q_2, q_5)	(q_0, q_3)
(q_2, q_5)	(q_1, q_6)	(q_2, q_5)
(q_1, q_6)	(q_2, q_5)	(q_0, q_3)

In each entry in table (q, q') is such q is Final state at FA1 then q' is also Final state else both are non-final.

This FA1 & FA2 are equivalent.

Q) 3) Convert the following NDFA system to DFA.



Sol^n: - Construction of state transition table for the given NDFA.

States	Input 0	Input 1
$\to q_0$	q_0, q_1	q_0, q_2
q_1	q_f	ϕ
q_2	ϕ	q_f
q_f	q_f	q_f

Step 1 : - Input Symbol for the resultant DFA
= Input symbols for the given NDFA
= 0 & 1.

Step 2 : - Start State for the resultant DFA
= set of start state of given NDFA
= q_0

Step 4 : - Since there are 4 states in the given NDFA. So the no. of states in the resultant DFA = 2^4.
All the states of resultant DFA = set of subset of the set of states of the given NDFA
= ϕ, q_0, q_1, q_2, q_f, $[q_0, q_1]$, $[q_0, q_2]$, $[q_0, q_f]$
... $[q_0, q_1, q_2]$, $[q_0, q_1, q_f]$, ... $[q_0, q_1, q_2, q_f]$.

Step 4 : — we will find out the accessible states from the step 3.

$\delta(q_0, 0) = [q_0, q_1]$

$\delta(q_0, 1) = [q_0, q_2]$

$\delta([q_0, q_1], 0) = \delta(q_0, 0) \cup \delta(q_1, 0)$
$= [q_0, q_1] \cup [q_f]$
$= [q_0, q_1, q_f]$

$\delta([q_0, q_1], 1) = \delta(q_0, 1) \cup \delta(q_1, 1)$
$= [q_0, q_2] \cup \phi$ $= [q_0, q_2]$

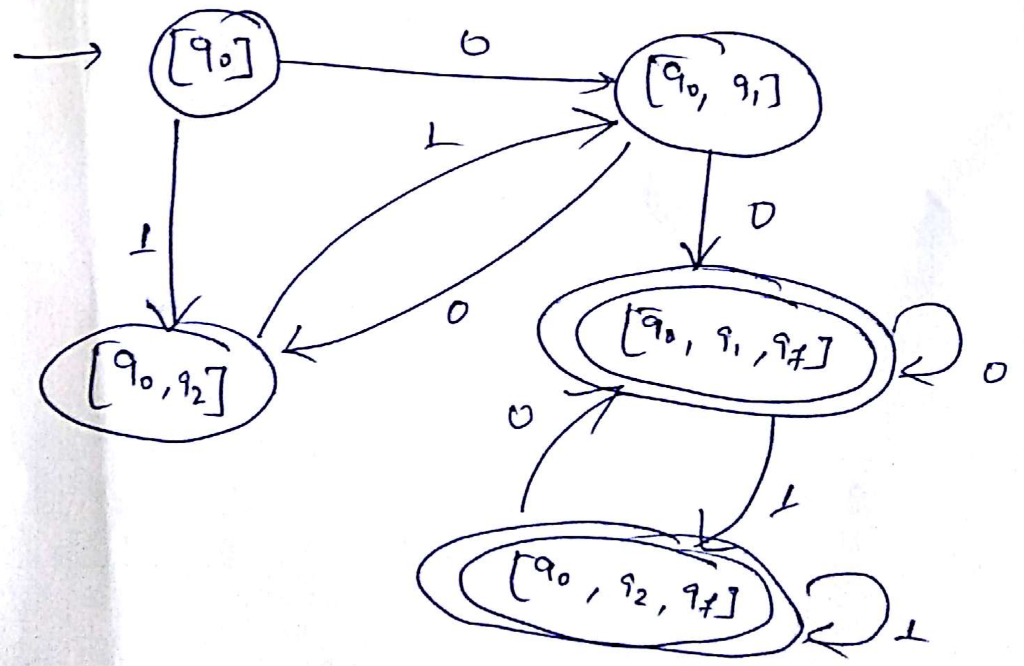
The accessible states are

$[q_0]$, $[q_0, q_1]$, $[q_0, q_2]$, $[q_0, q_1, q_f]$, $[q_0, q_2, q_f]$.

Step 5:- final state for the resultant DFA

$= (q_0, q_1, q_f), [q_0, q_2, q_f)$

States	Input 0	1
$\rightarrow [q_0]$	$[q_0, q_1]$	$[q_0, q_2]$
$[q_0, q_1]$	$[q_0, q_1, q_f]$	$[q_0, q_2]$
$[q_0, q_2]$	$[q_0, q_1]$	$[q_0, q_2, q_f]$
$[q_0, q_1, q_f]$	$[q_0, q_1, q_f]$	$[q_0, q_2, q_f]$
$[q_0, q_2, q_f]$	$[q_0, q_1, q_f]$	$[q_0, q_2, q_f]$



This is the required solution.

Elimination of Λ-moves from Transition system

Q4) Given the steps required to convert a transition system with Λ-moves into an equivalent transition system without Λ-moves.

Step 1 :- The pair of vertex which containing Λ-moves

(q_0, q_1) & (q_1, q_2).

Step 2 :- First of all we have to replace the Λ-transition from vertex (q_0) to the vertex (q_1)

vertex no - 1 = q_0

vertex 2 - q_1

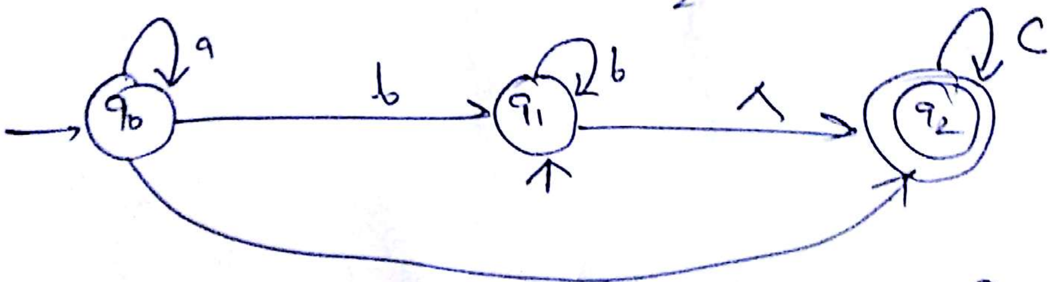
Step 3 :- $q_1 \xrightarrow{b} q_1$

$q_1 \xrightarrow{\Lambda} q_2$

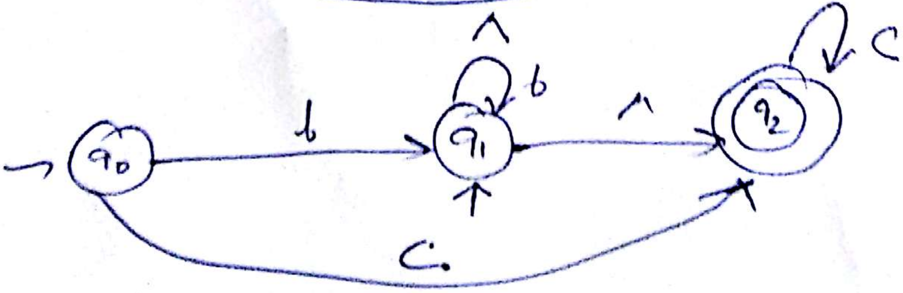
Step 4 > Also, we have to make transition from vertex q_0.

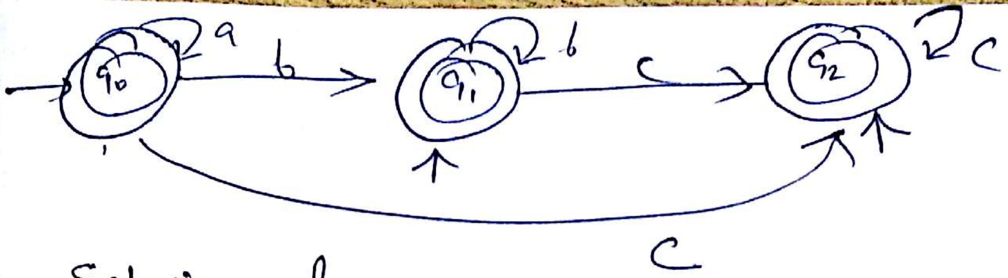
$q_0 \xrightarrow{b} q_1$

$q_0 \xrightarrow{\Lambda} q_2$



Step 5 :-





Solution of question no 4.

fig:- Desired Transition system with Λ (null) moves.