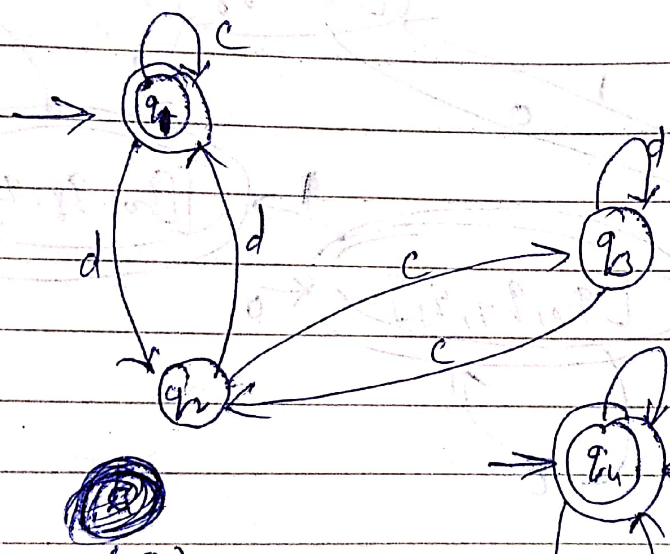
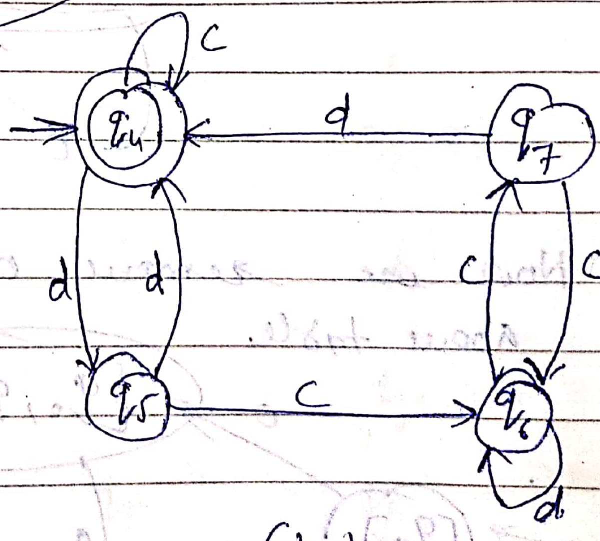
Note:- Constructing the transition graph equivalent to a given r.e., the operation (Concatenation, *, +) that is eliminated first, dependent on the regular expression.

Equivalence of two FA:-

Que:- Consider the following two DFAs M & M' as shown in below diagram.



(a)



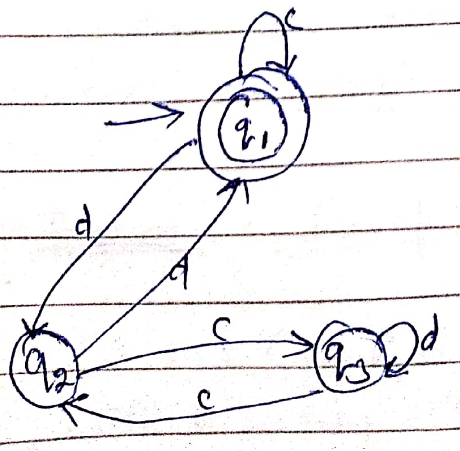
(b)

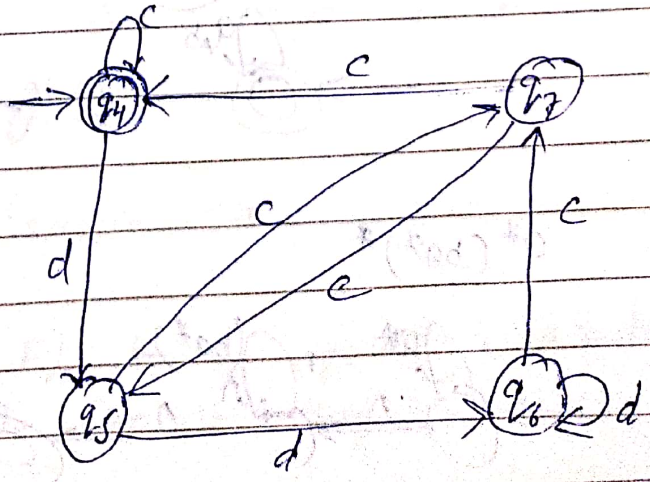
Sol:- Comparison table :-

(q, q')	c (q_c, q'_c)	d (q_d, q'_d)
(q_1, q_4)	(q_1, q_4)	(q_2, q_5)
(q_2, q_5)	(q_3, q_6)	(q_1, q_4)
(q_3, q_6)	(q_2, q_7)	(q_3, q_6)
(q_2, q_7)	(q_3, q_6)	(q_1, q_4)

As we do not get a pair (q, q') where q is final state and q' is a nonfinal state (or vice versa) at every row, we proceed until all the elements in the second and third columns are also in the first column. ie M and M' are equivalent.

Que:- Show that the automata M_1 & M_2 as shown in below diagram are not equivalent.





Sol: Comparison table :-

q_1, q_1'	q_c, q_i'	q_d, q_d'
(q_1, q_4)	(q_1, q_4)	(q_2, q_5)
(q_2, q_5)	(q_3, q_7)	(q_1, q_6)

In (q_2, q_5) transition of d reachable q_1 is final state & q_6 is non final state. Hence we can say they are not equivalent.

* *

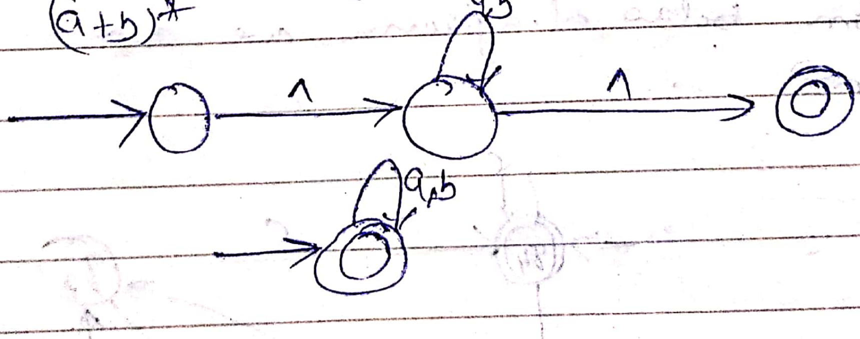
Equivalence of two regular Expressions :-

eg:-

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

Sol:- Let P and Q denote $(a+b)^*$ and $a^*(ba^*)^*$ respectively. Using the construction.

$(a+b)^*$



$a^*(ba^*)^*$