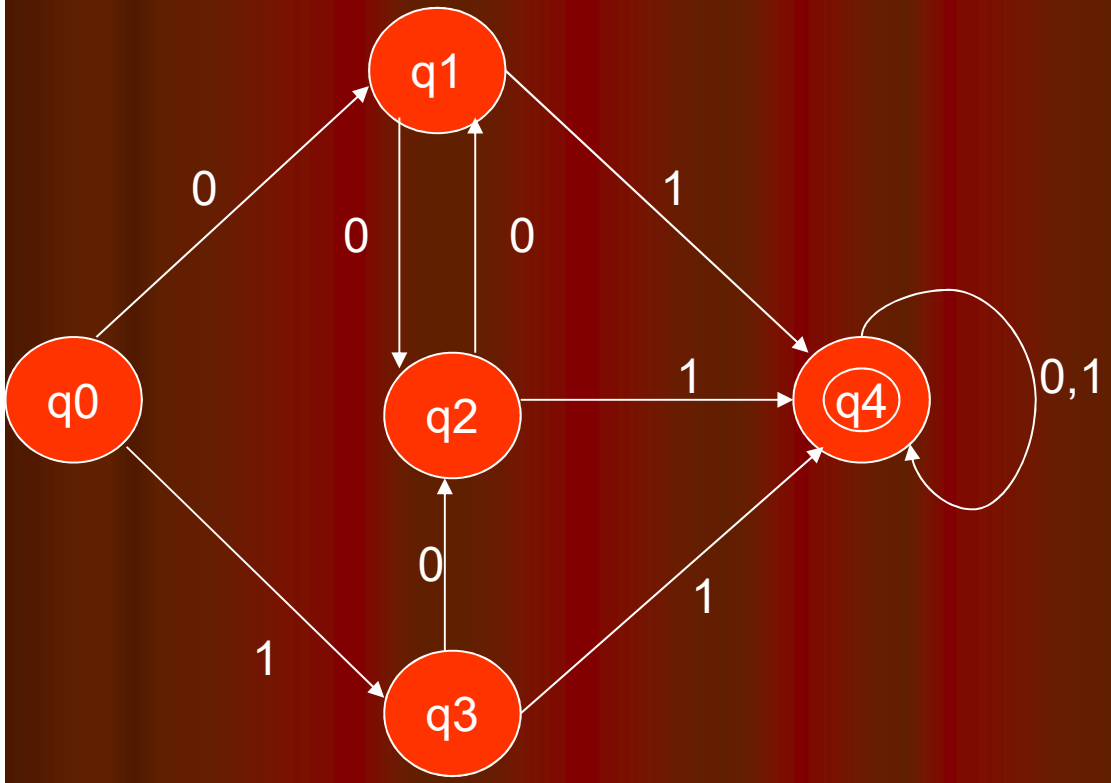
Theory of Automata & Formal Languages

(Theory of Computation)

Compiled By

Prof. M. S. Bhatt

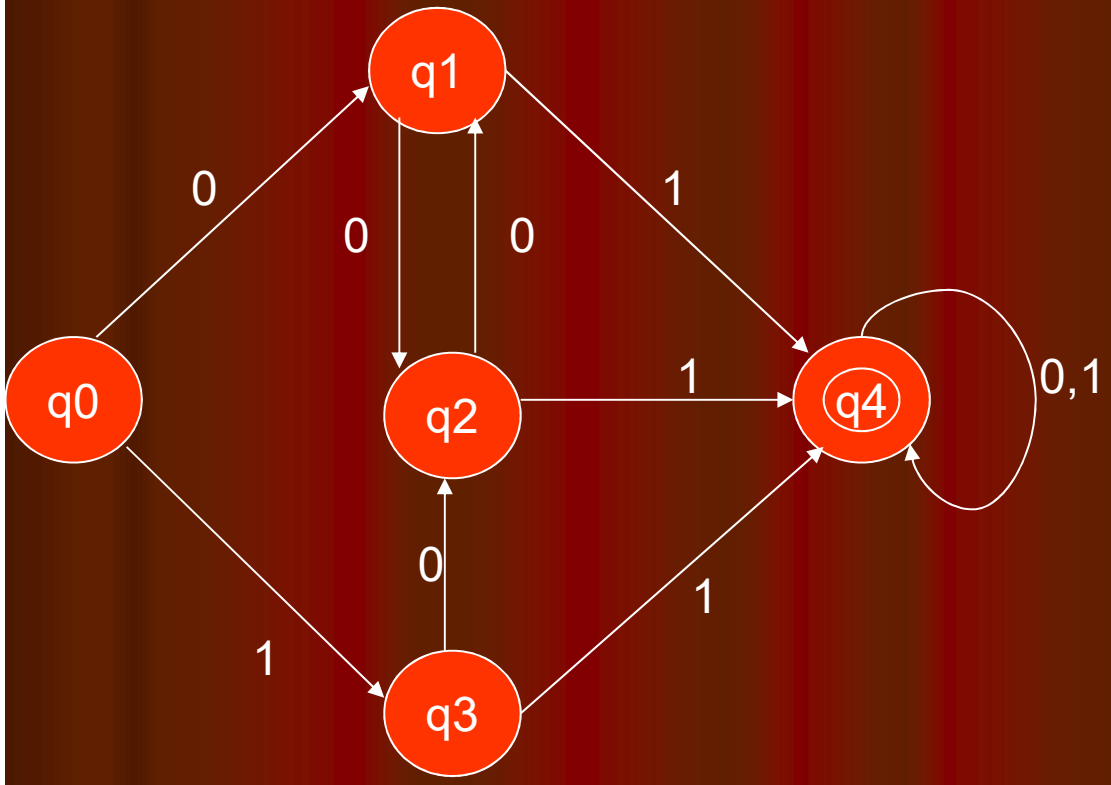
Minimization of Finite Automata

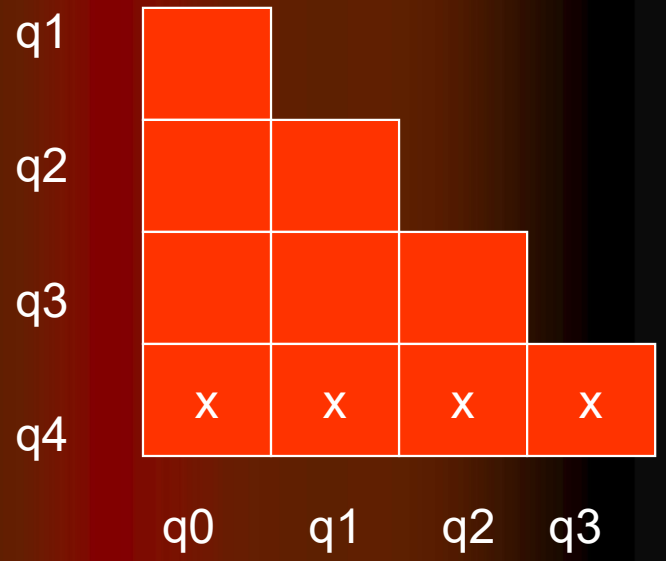


Rule :1 Remove all inaccessible States.

Can We reach to all states from the initial State ?

Minimization of Finite Automata





Rule :2 Consider all pairs of states (p, q).

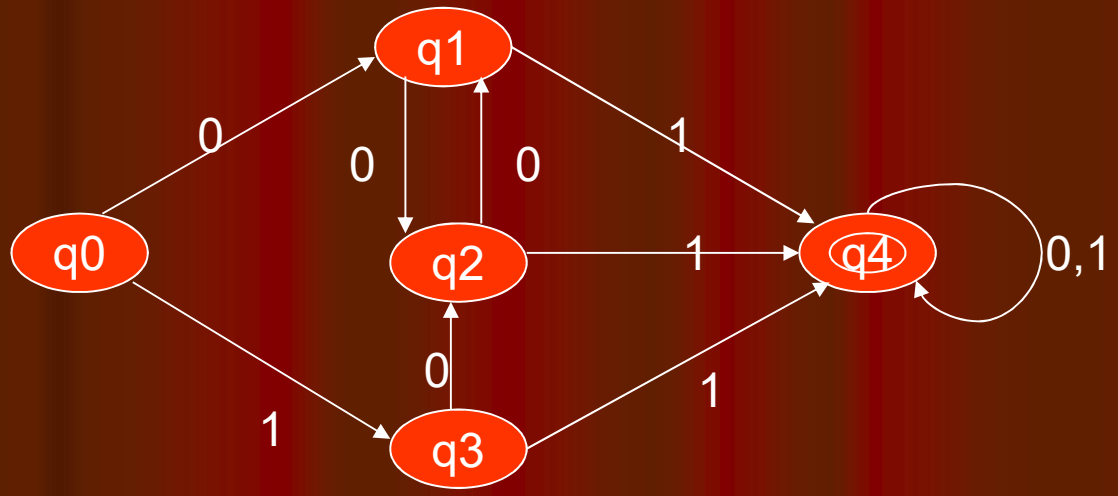
If p belongs to A and q does not belong to A

OR

If p does not belong to A and q belongs to A

} MARK THE PAIR (p, q).

Minimization of Finite Automata



	0	1
(q0,q1)	(q1,q2)	(q3,q4)
(q0,q2)	(q1,q1)	(q3,q4)
(q0,q3)	(q1,q2)	(q3,q4)
(q0,q4)	(q1,q4)	(q3,q4)
(q1,q2)	(q2,q1)	(q4,q4)
(q1,q3)	(q2,q2)	(q4,q4)
(q2,q3)	(q1,q2)	(q4,q4)

Rule :3

Repeat step until no previously unmarked pairs are marked

For all pairs (p, q) and all a belongs to ∑.
Compute δ (p, a) = m and δ (q, a) = n

If pair (m, n) is already marked then MARK THE PAIR (p, q).

Here, (q0,q1) is one pair. Input alphabet is '0' and '1'

Calculating δ (q0, 0) = q1 and δ (q1, 0) = q2 . New pair is (q1,q2) which is not marked so we can't mark (q0,q1)

Calculating δ (q0, 1) = q3 and δ (q1, 1) = q4 . New pair is (q3,q4) which is marked so we can mark (q0,q1)

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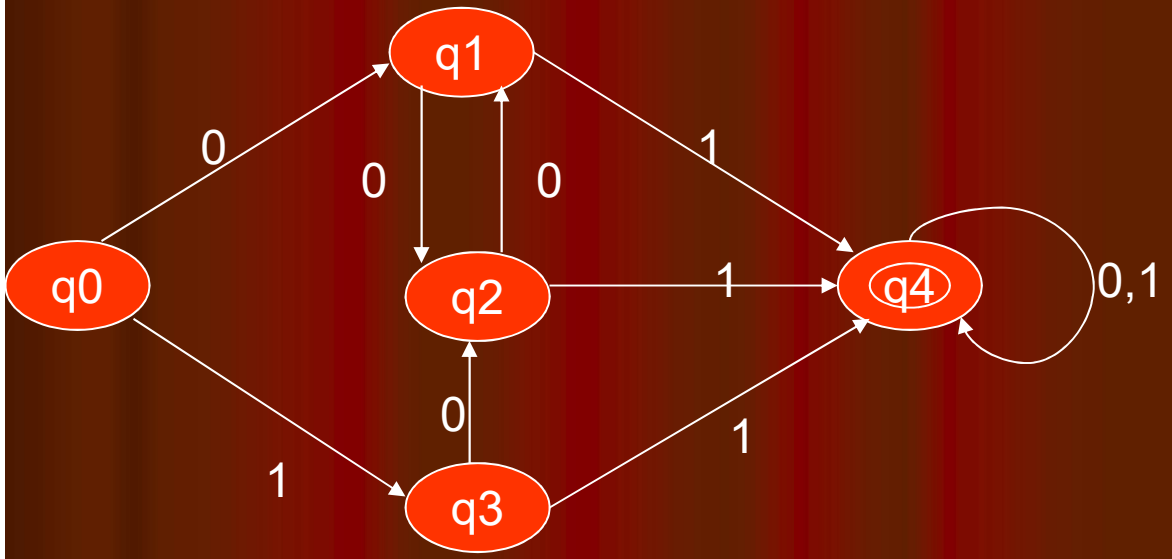
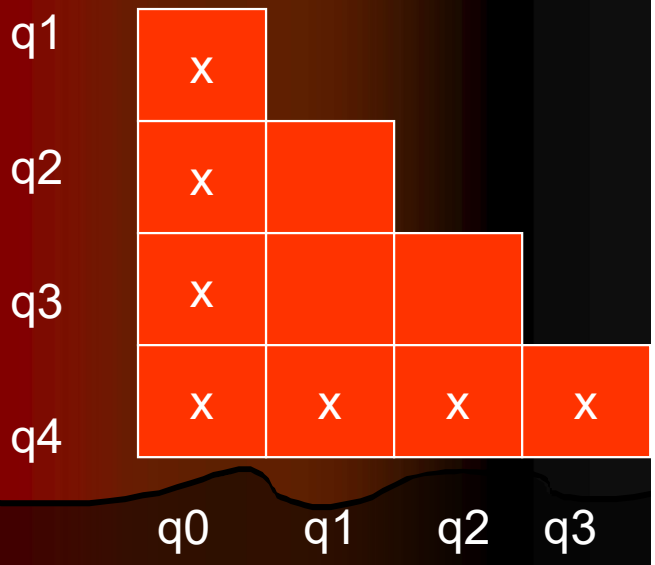


	0	1
(q0,q1)	(q1,q2)	(q3,q4)
(q0,q2)	(q1,q1)	(q3,q4)
(q0,q3)	(q1,q2)	(q3,q4)
(q0,q4)	(q1,q4)	(q3,q4)
(q1,q2)	(q2,q1)	(q4,q4)
(q1,q3)	(q2,q2)	(q4,q4)
(q2,q3)	(q1,q2)	(q4,q4)



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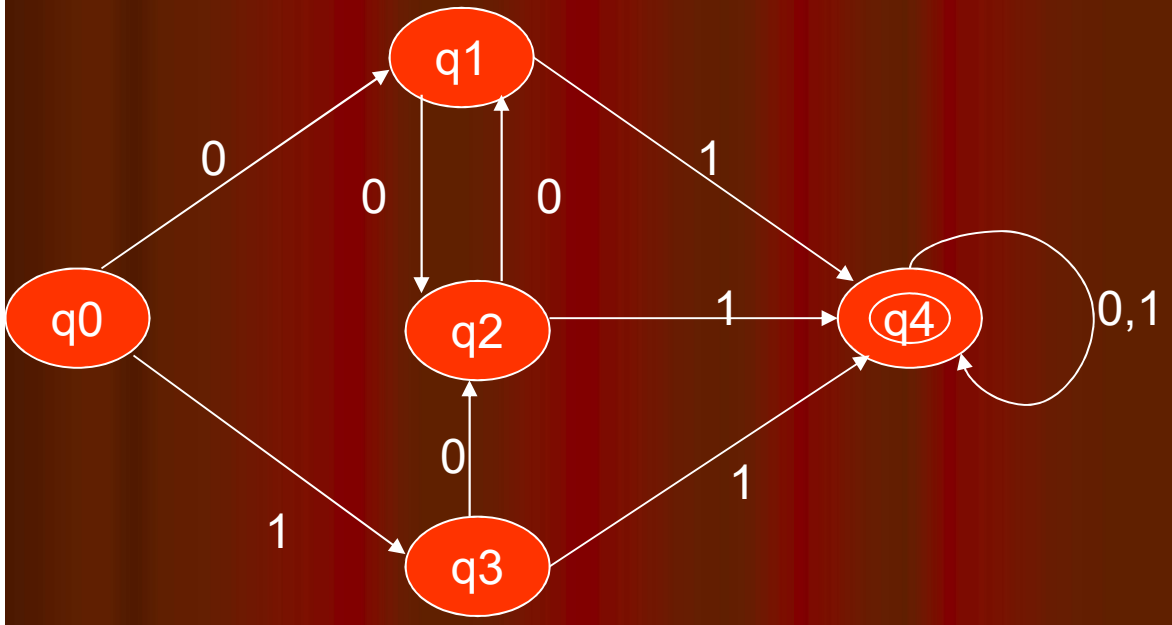
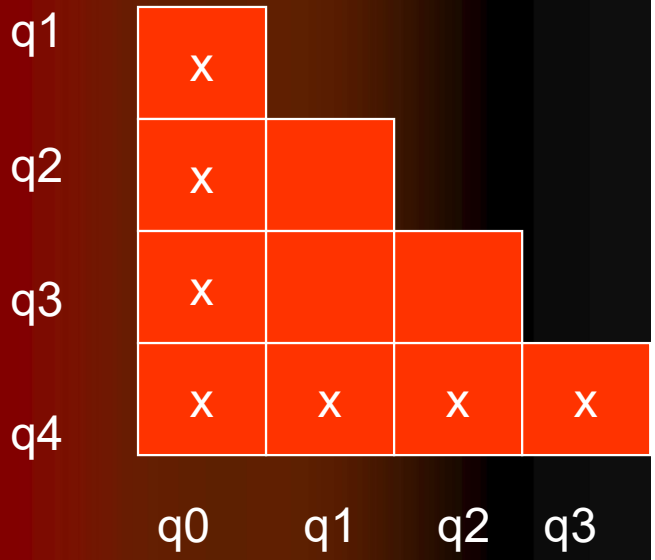


	0	1
(q1,q2)	(q2,q1)	(q4,q4)
(q1,q3)	(q2,q2)	(q4,q4)
(q2,q3)	(q1,q2)	(q4,q4)



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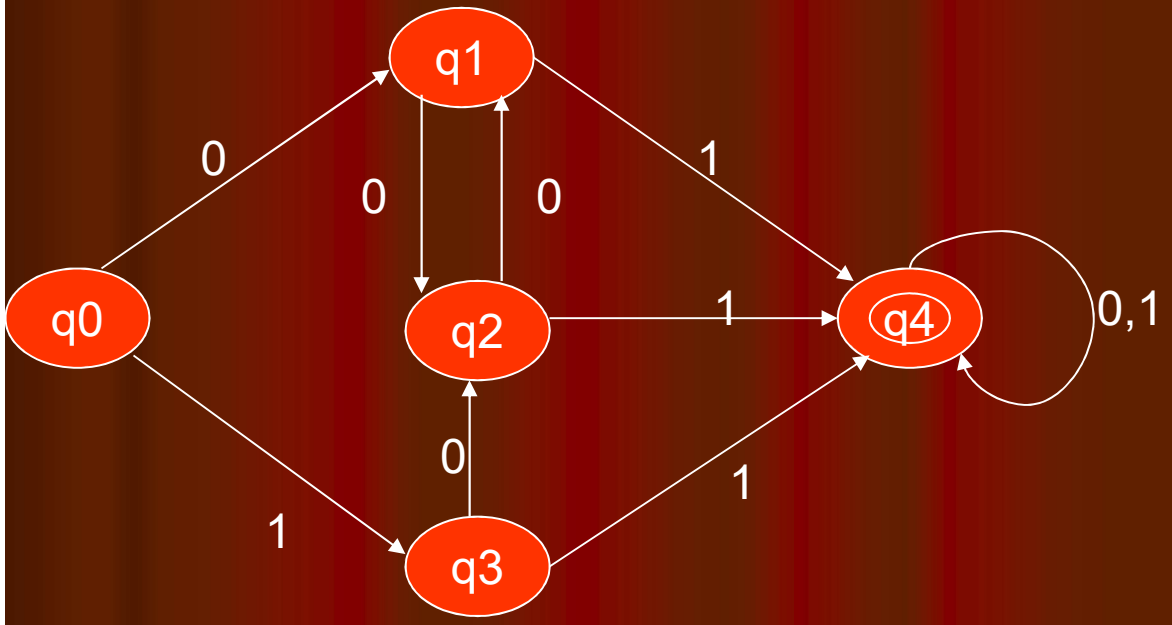
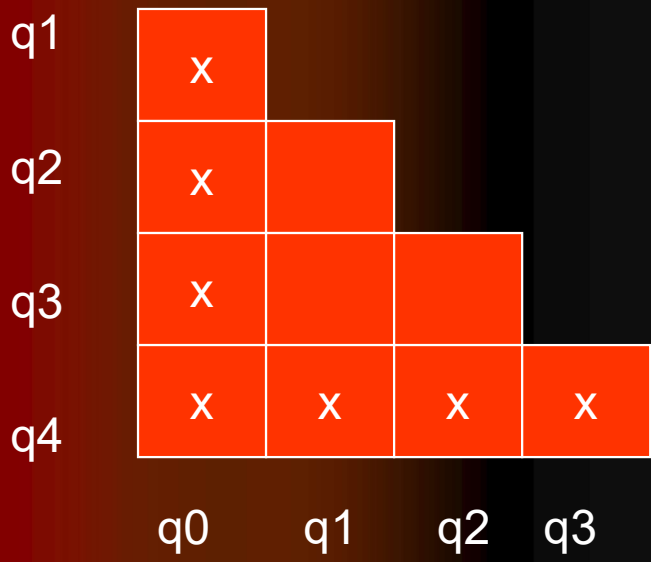


	0	1
(q1,q2)	(q2,q1)	(q4,q4)
(q1,q3)	(q2,q2)	(q4,q4)
(q2,q3)	(q1,q2)	(q4,q4)



New pairs can not be marked after 2nd iteration.

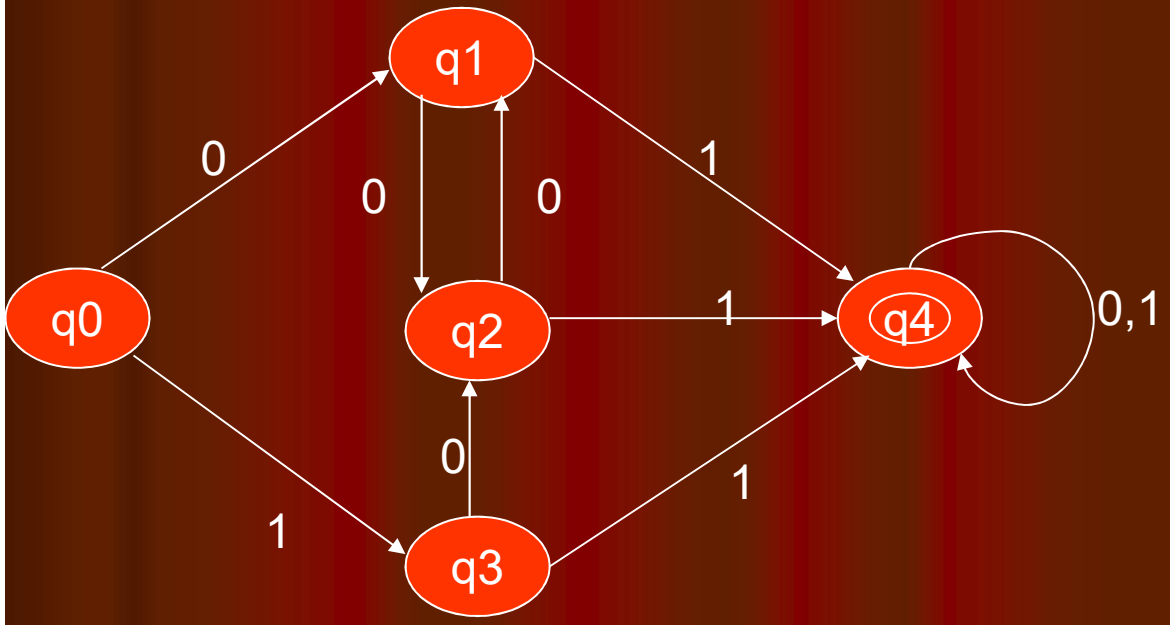
Unmarked Pairs are:

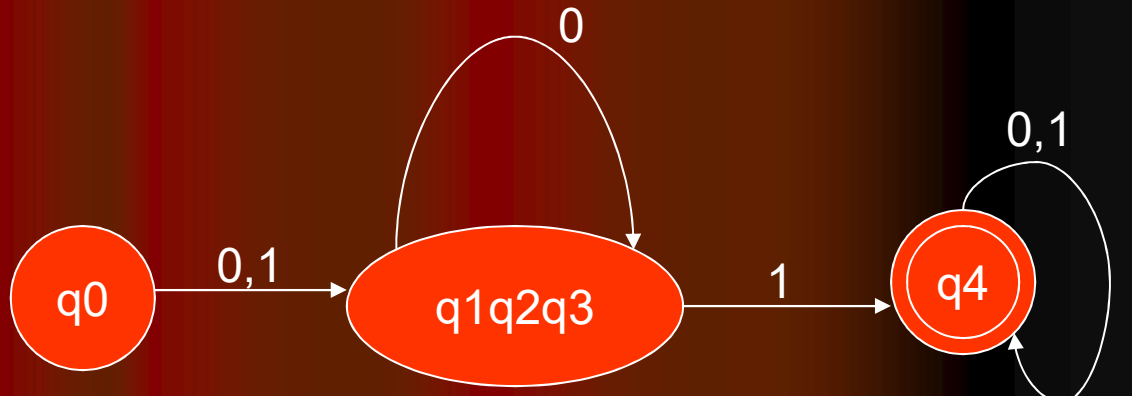
(q1,q2), (q2,q3) and (q1,q3)

Here,

Transitivity property holds. I can combine 3 states together

Minimization of Finite Automata





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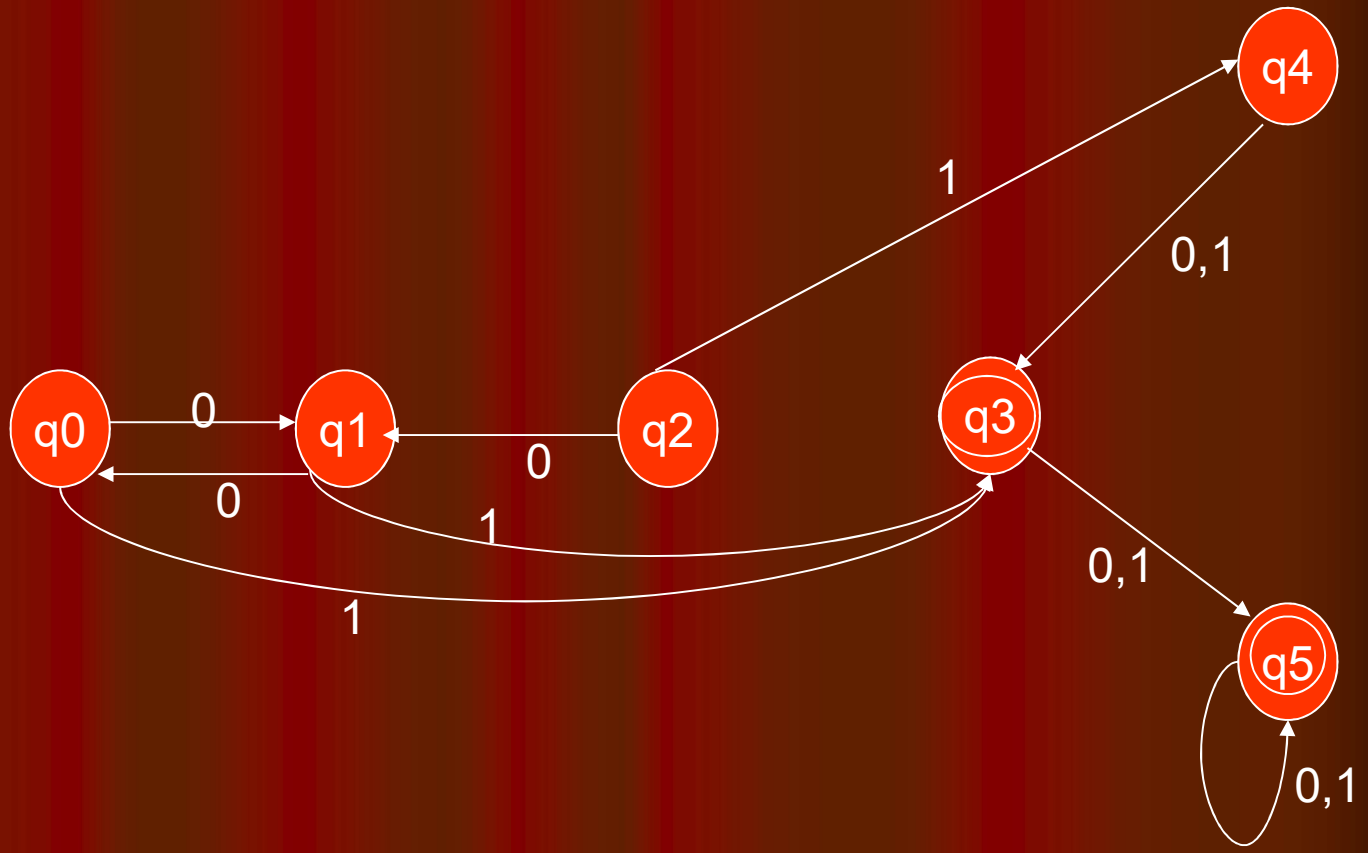

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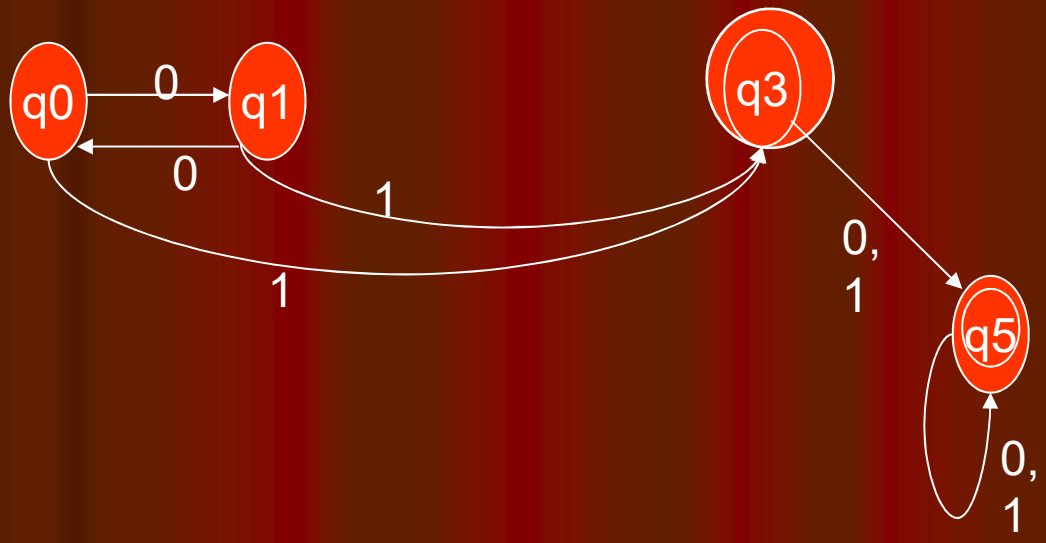

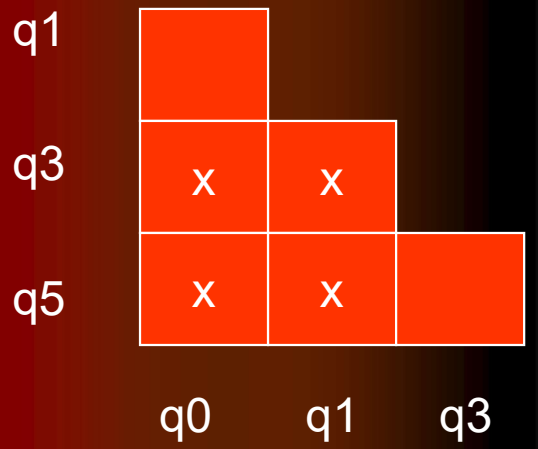

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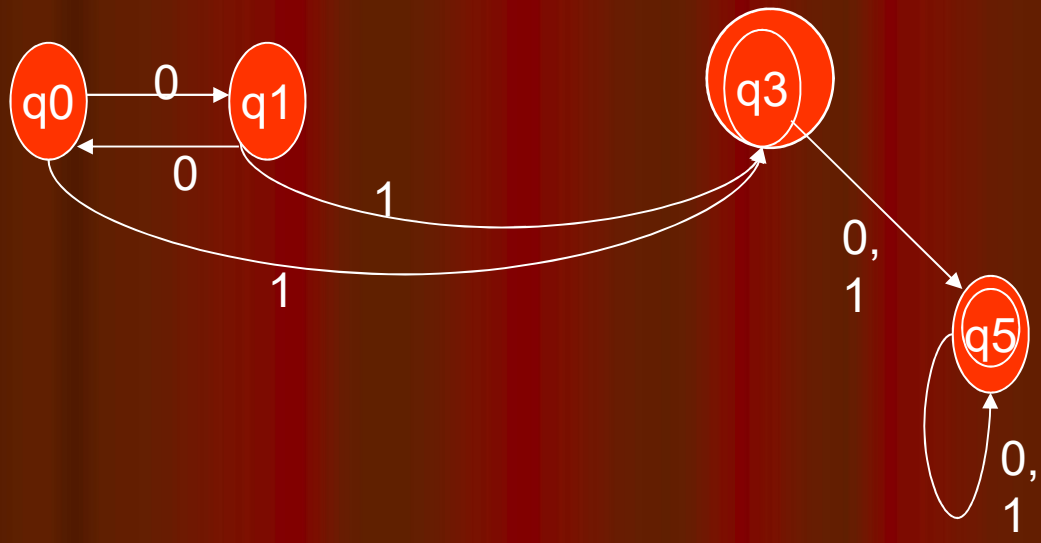


	0	1
(q0,q1)	(q1,q0)	(q3,q3)
(q3,q5)	(q5,q5)	(q5,q5)

New pairs can not be marked after applying rule -3.

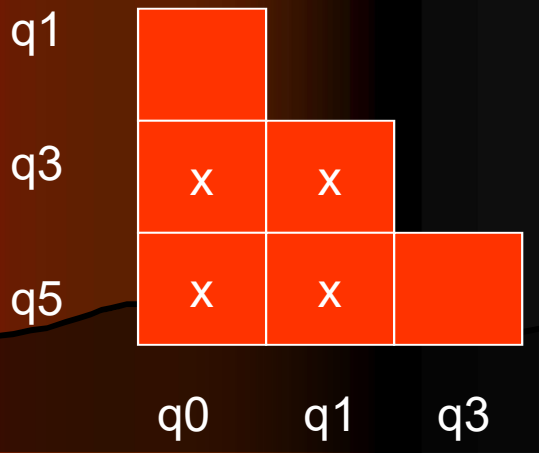
Unmarked Pairs are:

(q0,q1) and (q3,q5)

Here,

Transitivity property does not hold.

I can combine only 2 states together



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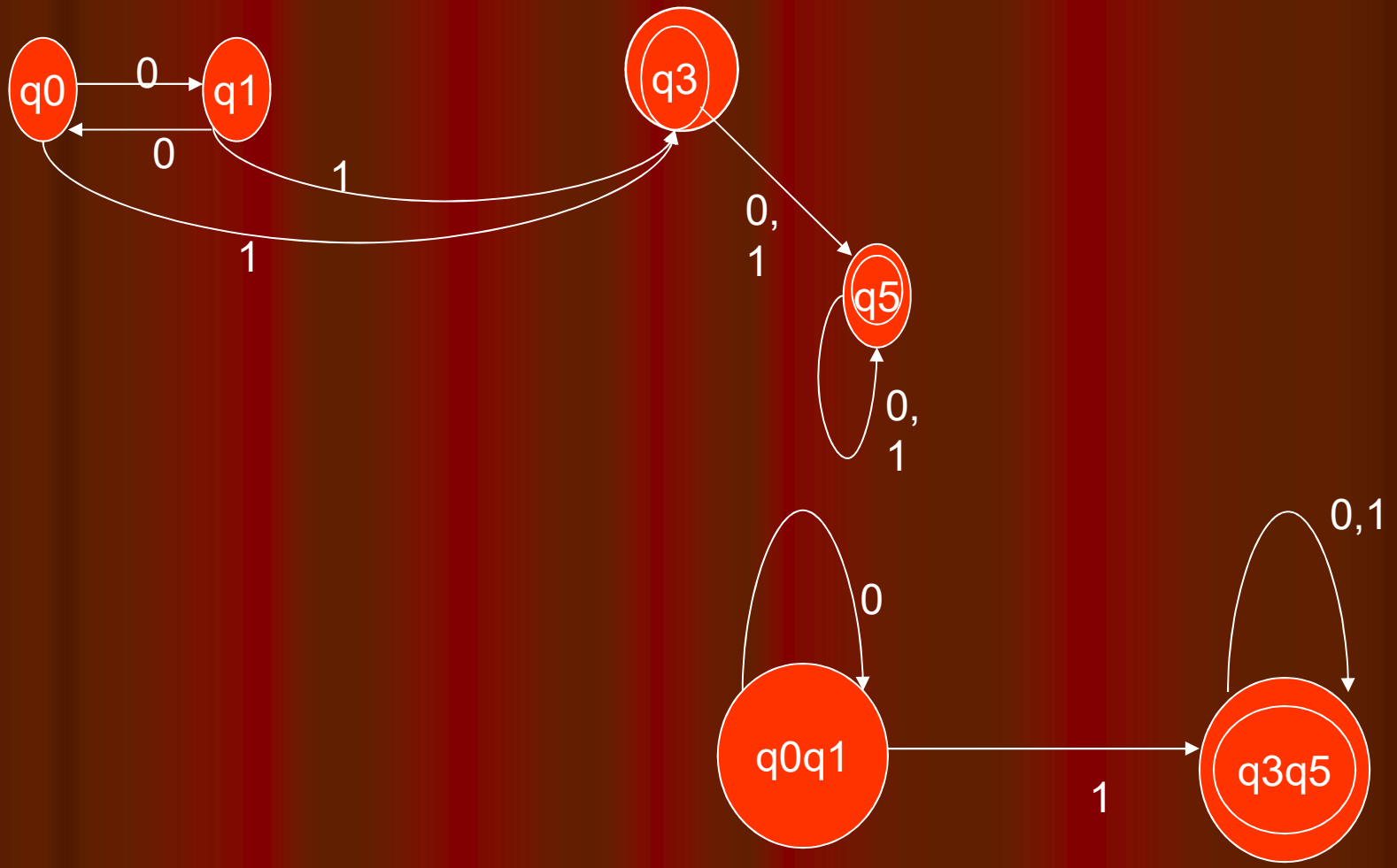
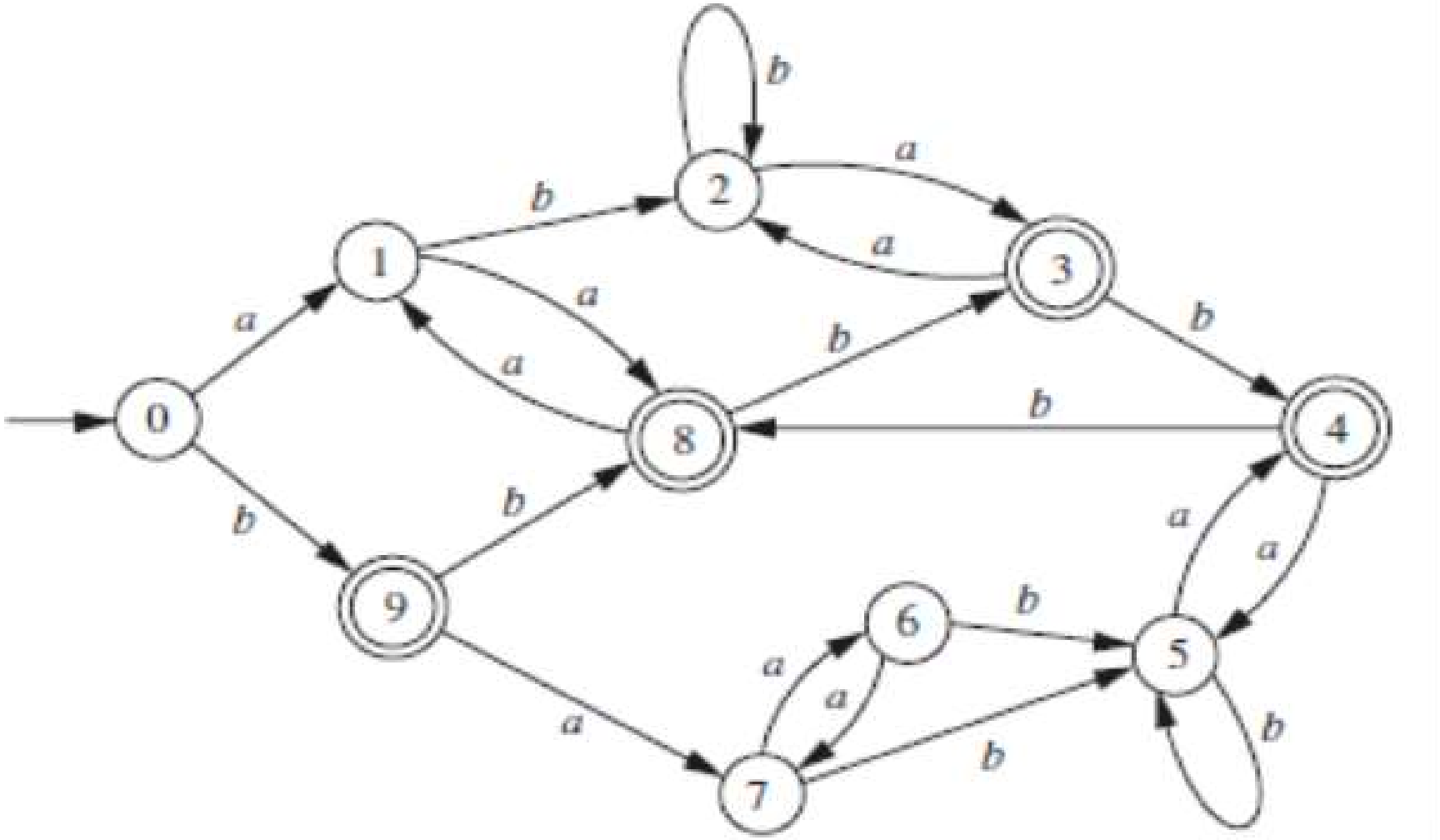
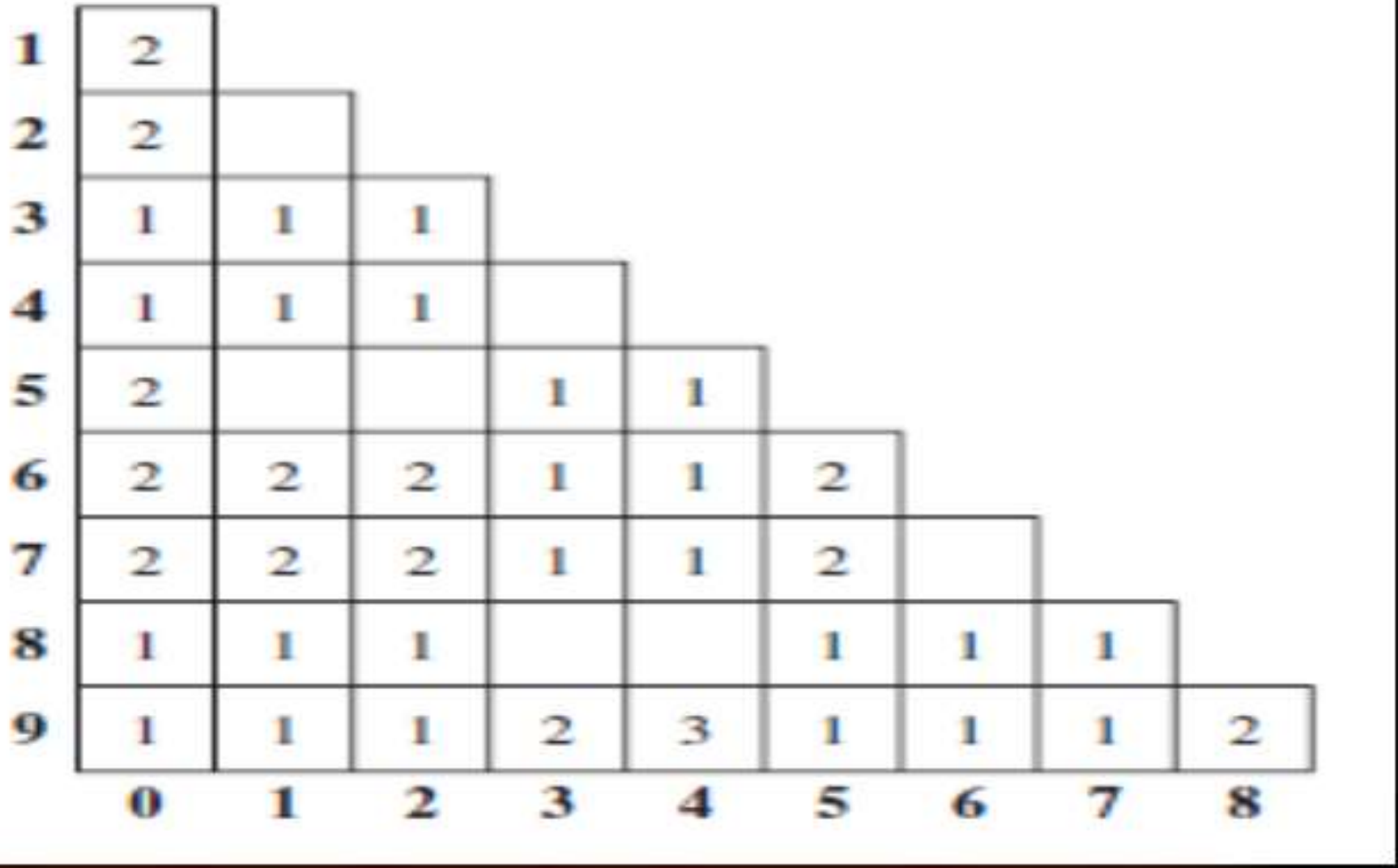


Example -3



Example -3


1 2
2 2
3 1 1 1
4 1 1 1
5 2 1 1
6 2 2 2 1 1 2
7 2 2 2 1 1 2
8 1 1 1 1 1 1
9 1 1 1 2 3 1 1 1 2
0 1 2 3 4 5 6 7 8

Example -3