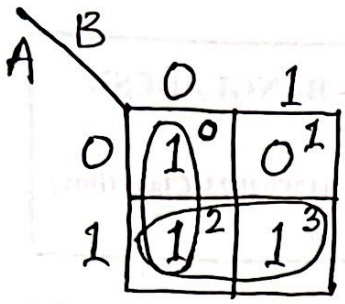
1. Design a system that can be used in a safety push button lock device. There will be two switches. If the value of A is greater than B or A is equal to B, lock mechanism opens. In any other case the lock mechanism remains closed. Let's say X is the lock mechanism, construct a truth table of the system and design the logic circuit for the system using magnitude comparator block diagram and necessary gate/s. [10]

Solution: In question it is given that, there will be two switches, which are A & B. Normal switches are only capable of being on or off at one time, never both at the same time. Because of this, we represent A & B as 1 bit numbers.

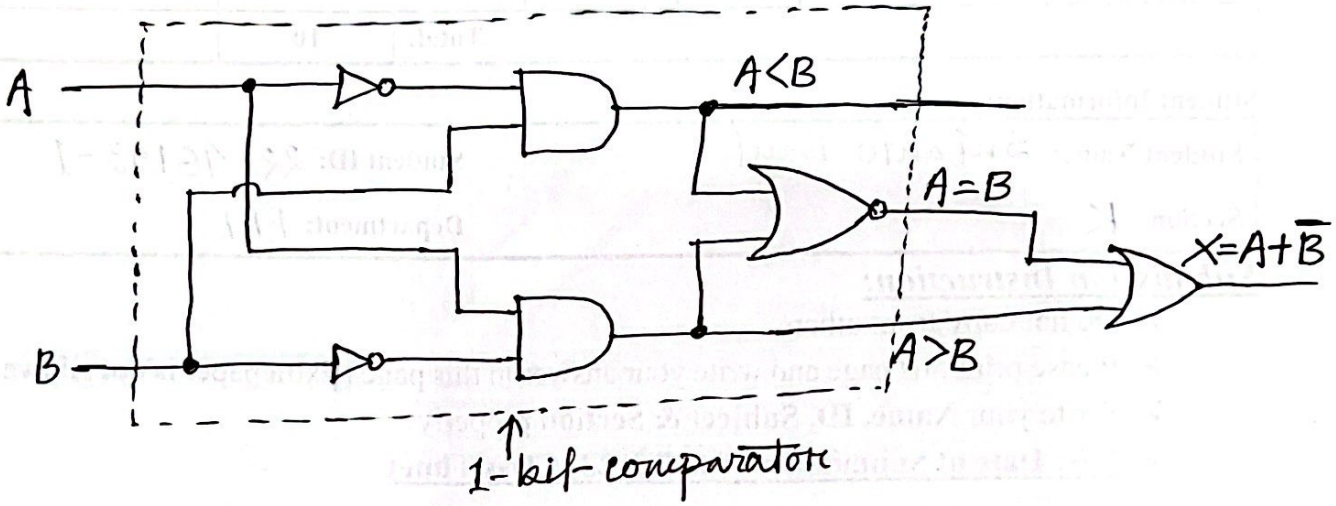
A	B	Condition	lock mechanism(X) logic output
0	0	A=B (lock opens)	1
0	1	A<B (lock closed)	0
1	0	A>B (lock opens)	1
1	1	A=B (lock opens)	1

Truth table (Ans)

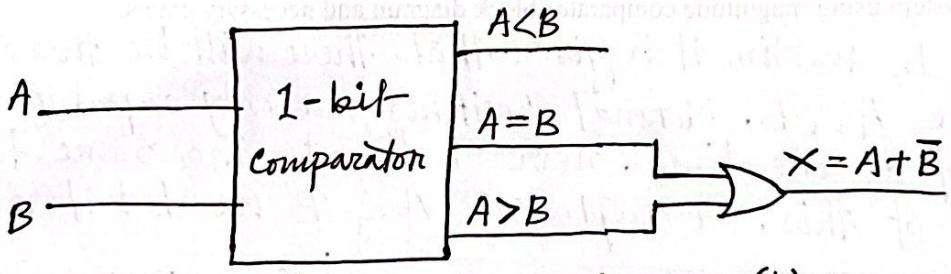


K-map

So, $X = A + \bar{B}$

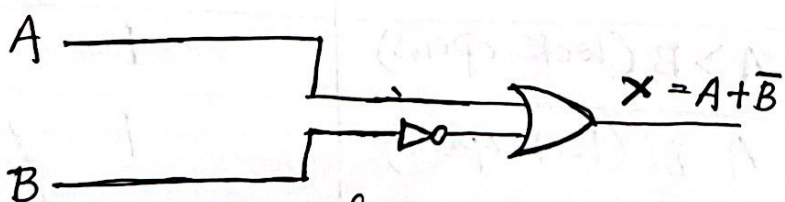


Now using block diagram ⟶



Design of the lock mechanism (X) logic circuit using 1-bit magnitude comparator block diagram (Ans)

Now using gates ⟶



Design of the lock mechanism (X) using only gates. (Ans)