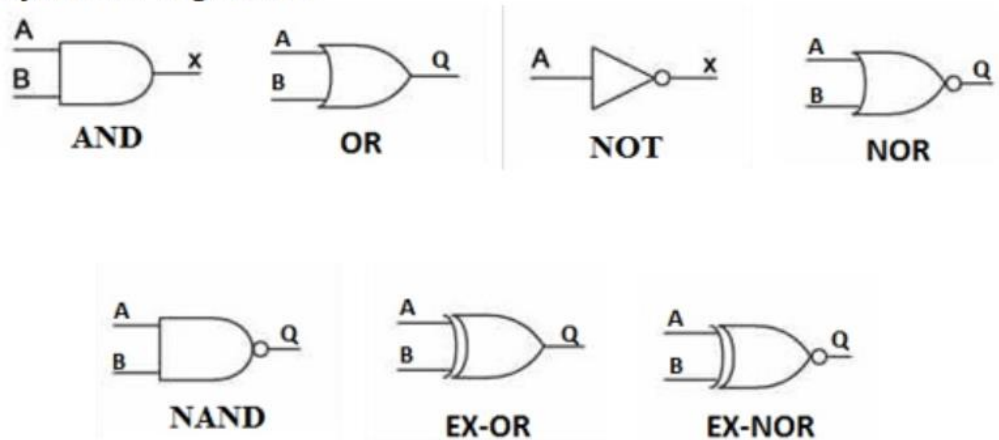


## Implementation of various Logic Gates AND, OR, NOT, NOR, NAND, EX-OR and EX-NOR in PLC using Ladder Diagram programming language.

### Symbol of Logic Gates



### AND



- By connecting Normally Open / XIC contacts in series, AND gate can be implemented.
- When both inputs are set to 1, then and then only output goes high.

### OR



- By connecting Normally Open / XIC contacts in parallel, OR Gate can be implemented.
- When either input is set to high, output goes high.

### NOT



- By using just one Normally Closed / XIO contact, NOT Logic Gate can be implemented.
- Inverted state of input is obtained as an output.

## NOR



- By connecting Normally Closed / XIO contacts in series, NOR Logic Gate can be implemented.
- If both inputs are Reset to 0, output goes High otherwise remains in Low state.
- Or by inverting output of a OR Gate, that is by using output of OR Gate as an input of NOT Gate, NOR Gate can be implemented.

## NAND



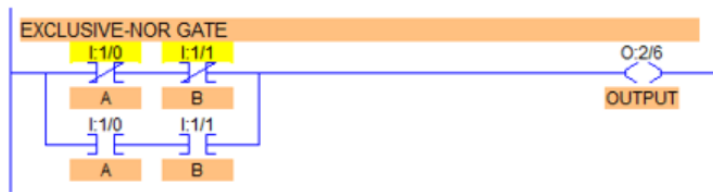
- By connecting Normally Closed contacts in parallel to each other, NAND Gate can be implemented.
- Or by simply inverting output of AND gate, NAND Gate can be implemented.

## EX-OR



- By connecting XIC and XIO in series with parallel to XIO and XIC in series as shown in diagram above, EX-OR Gate can be implemented.
- When both inputs are identical, output is 0. Output is high when  $A \neq B$ .
- Note here that XIC of first series contacts and XIO of second series contacts must be given same address and similarly for the other two.

## EX-NOR



- By connecting two XIO contacts in series with parallel to two XIC contacts in series, EX-NOR gate can be implemented.
- When both inputs are identical  $A=B=0$  or  $A=B=1$ , output goes high.
- It implies same here as in EX-OR gate that address must be given same.
- – By inverting output of EX-OR gate, implementation of EX-NOR can be accomplished.

## Runtime Test Cases

Inputs		Outputs					
A	B	AND	OR	NOR	NAND	EX-OR	EX-NOR
0	0	0	0	1	1	0	1
0	1	0	1	0	1	1	0
1	0	0	1	0	1	1	0
1	1	1	1	0	0	0	1

Inputs	Output
A	NOT
0	1
1	0

## Problem Description

A classroom has a capacity of maximum 120 students. There are two doors, one for Entry and the other for Exit. When number of students in the classroom is less than 120, Entry door has a Green light on it which remains ON. When number of students in the classroom is 120 or more than that, Red light goes ON turning OFF the Green light which indicates that the classroom has reached its maximum capacity and is full.

Ladder Diagram to solve this problem

