

Internal Assessment Test - I

Sub:	PROGRAMMABLE LOGIC CONTROLLERS	Code:	10EE752
Date:	21/09/2017	Duration:	90 mins
		Max Marks:	50
		Sem:	5
		Branch:	EEE
Answer Any FIVE FULL Questions			

		Marks	OBE	
			CO	RBT
1 (a)	Explain internal architecture of PLC, with a neat block diagram.	[07]	CO1	L1
(b)	Explain Nonlinearity and Hysteresis error of a sensor with relevant graphs.	[03]	CO2	L1
2 (a)	Write a note on Absolute and Incremental Encoders with relevant diagrams.	[06]	CO2	L1
(b)	Discuss I/O Addresses of PLC.	[04]	CO3	L4
3 (a)	Write Sequential Function Chart and also the Ladder Diagram for washing cycle of a domestic washing machine where the drum is to be filled with water and then when the drum is full, a heater has to be switched on and remain on until the temperature reaches the required level. Then the drum is to be rotated for a specified time.	[07]	CO6	L6
(b)	Write ladder diagram and function block diagram for NOT logic gate with relevant plots.	[03]	CO6	L6
4 (a)	What is a Ladder diagram? List the conventions to be followed while drawing the ladder diagram.	[06]	CO4	L6
(b)	Write the ladder diagram and as well logic diagram for NAND and NOR logic gates.	[04]	CO4	L6
5 (a)	Explain the LATCH ladder diagram with the help of an example.	[05]	CO4	L6
(b)	Explain multiple outputs with ladder diagrams.	[05]	CO4	L6
6 (a)	For the following Boolean equation, $Y = A + B(A + \overline{CB} + \overline{D}\overline{A}C) + ABCD$	[10]	CO4	L6
	i. Draw the ladder diagram for the unsimplified equation.			
	ii. Simplify the equation.			
	iii. Draw the ladder diagram for the simplified equation.			
7 (a)	Write ladder diagram and as well function block diagram for XOR logic gate.	[05]	CO6	L6
(b)	Write instruction list using both Mitsubishi and Siemens notation for XOR logic gate.	[05]	CO6	L6

8 (a) Write ladder and functional block diagram for a signal lamp that is required to be switched on if a pump is running and the pressure is satisfactory, or if the lamp test switch is closed.

[05]

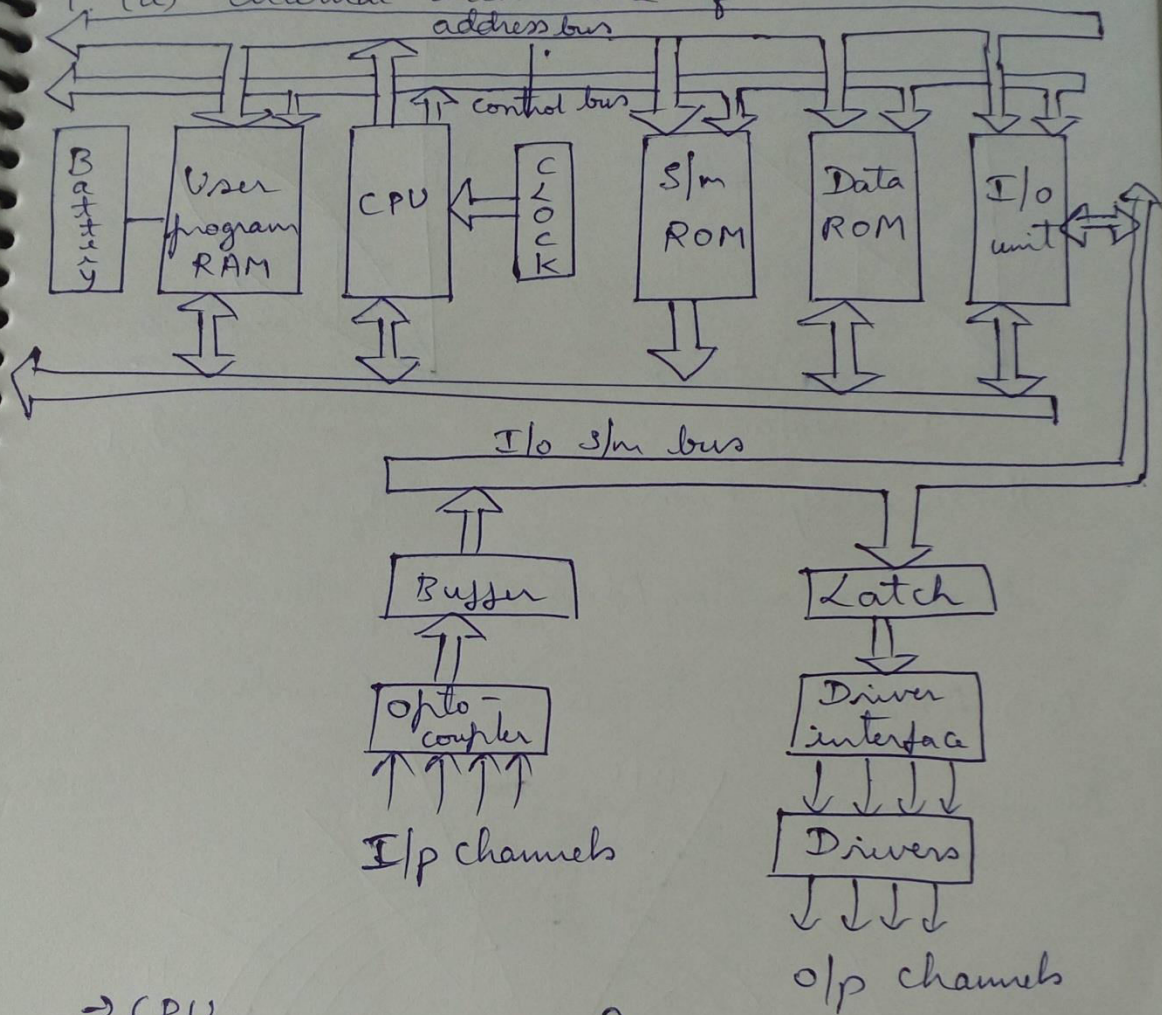
(b) Write ladder and functional block diagram for a system where there has to be no output when any one of four sensors gives an output, otherwise there is to be an output.

[05]

CO5	L6
CO5	L6

Scheme of Evaluation

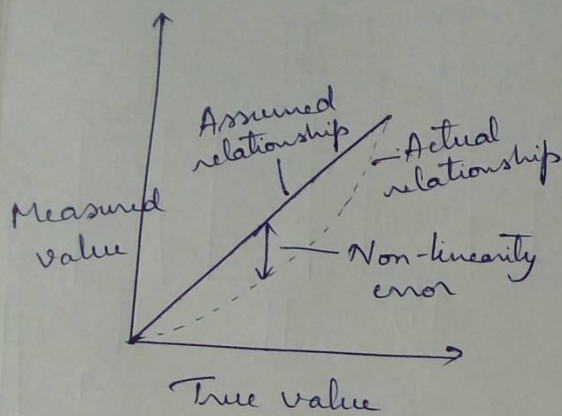
(a) Internal architecture of PLC.



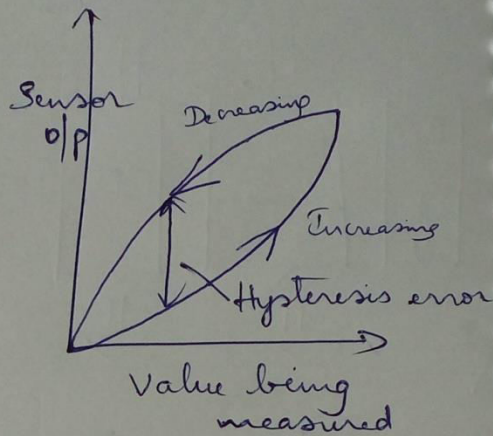
- CPU
- Buses
- Memory
- I/O Unit
- Sourcing & Sinking

Brief out on these.

(b) Nonlinearity & Hysteresis Error of a Sensor



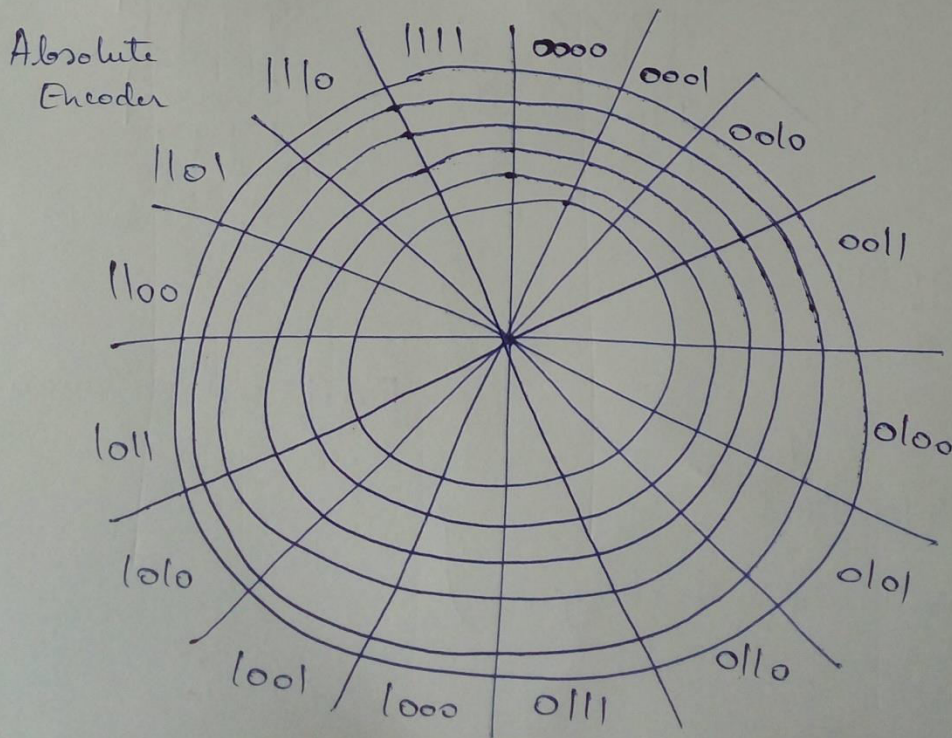
Nonlinearity Error



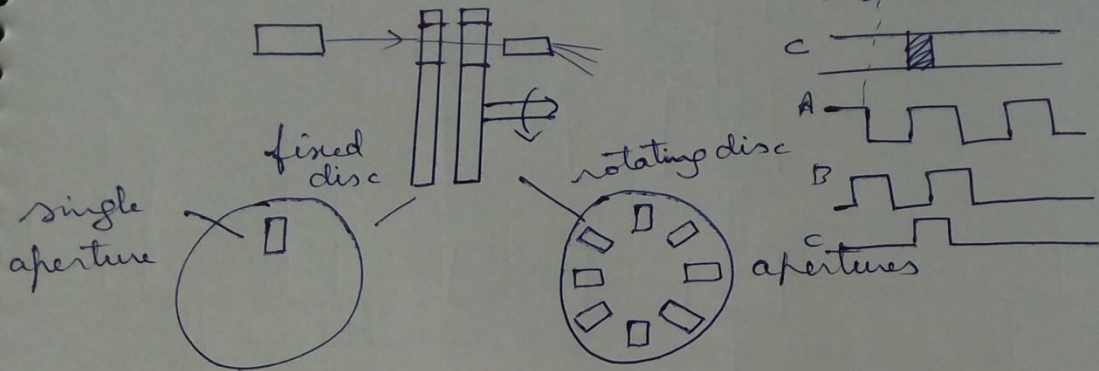
Hysteresis Error

Brief explanation/description of these two.

2. (a) Absolute & Incremental Encoders.



Incremental Encoder



Brief description on both

(b) I/O Addresses

$I = \text{Input}$
 $O = \text{output}$

$X : \text{xxx} / \text{xx}$
 (xxx) = rack no.
 (xx) = terminal no.

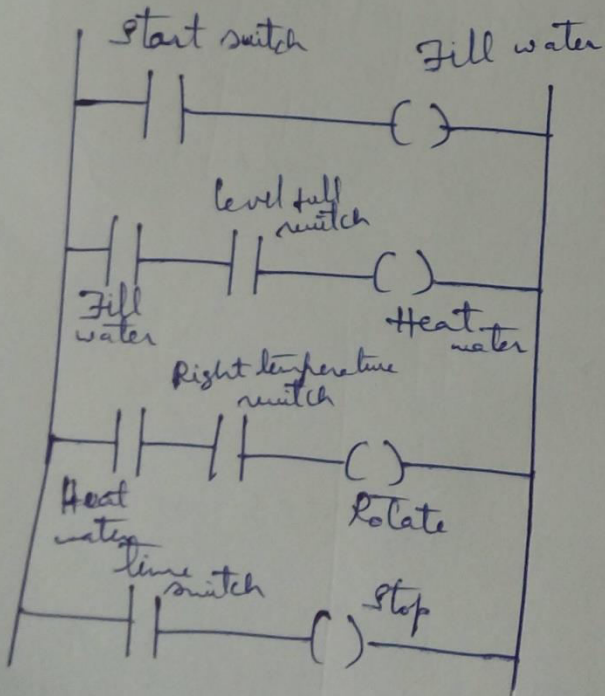
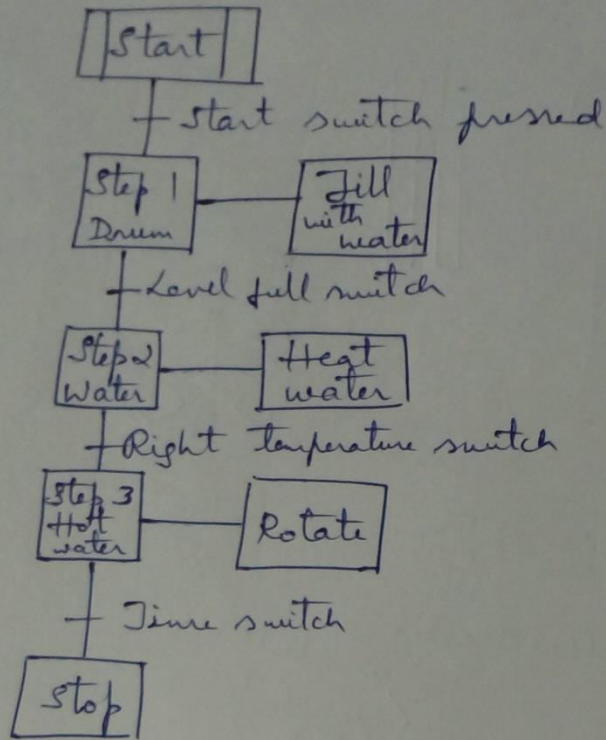
Allen Bradley PLC-5 addressing

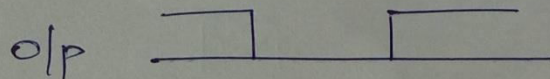
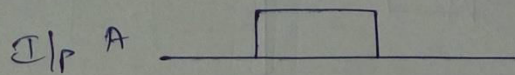
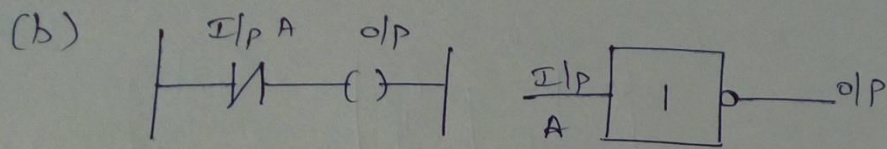
$I = \text{i/p}$
 $Q = \text{o/p}$

$\text{xxx} . \text{x}$
 (xxx) = byte no.
 (x) = bit no.

Siemens SIMATIC SS addressing

3. (a)





4. (a) Ladder diagram is one of the programming techniques used in PLCs. It consists of two vertical lines representing the power rails. Circuits are connected as horizontal lines, that is, the rungs of the ladder, b/w these two verticals.

conventions: ① Power flows from left to right.

② Each rung \Rightarrow one operation.

③ A ladder diagram is read from left to right & from top to bottom.

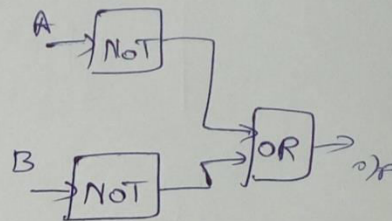
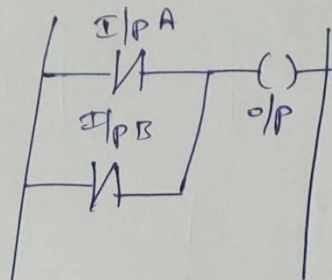
④ Each rung = one/multiple i/ps & atleast one o/p.

⑤ Switches are in normal condition.

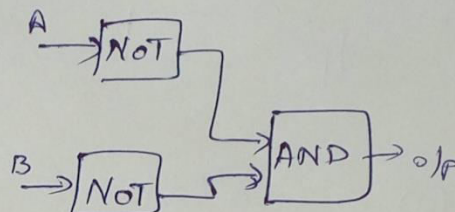
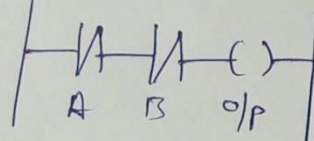
⑥ A particular device can appear more than once.

⑦ I/p & o/ps are identified by addresses.

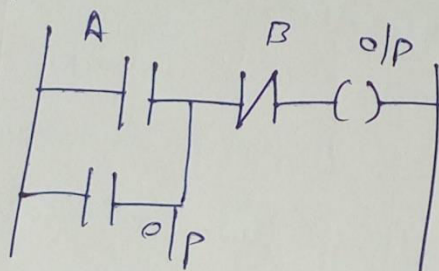
(b) NAND



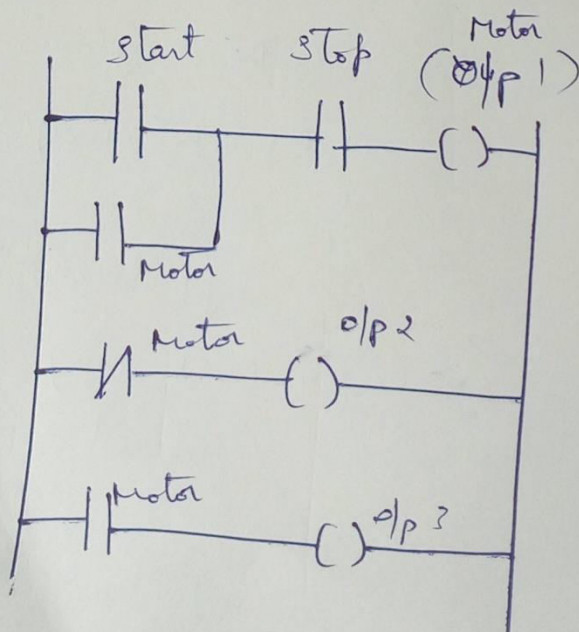
NOR

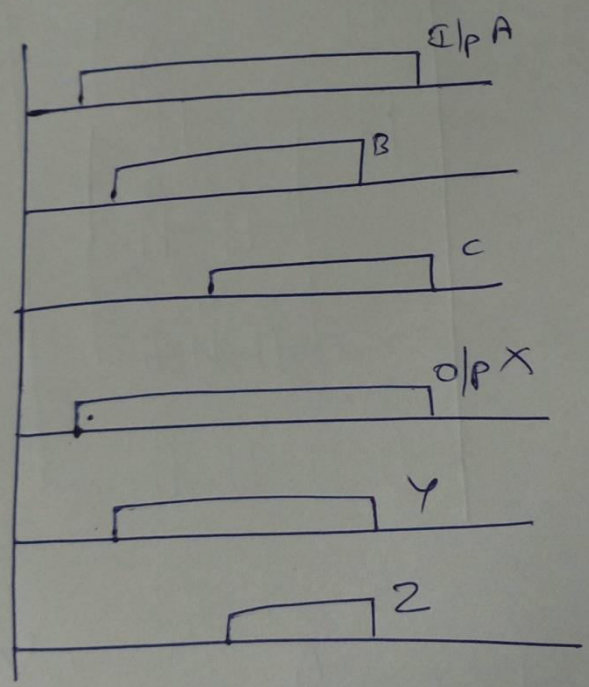
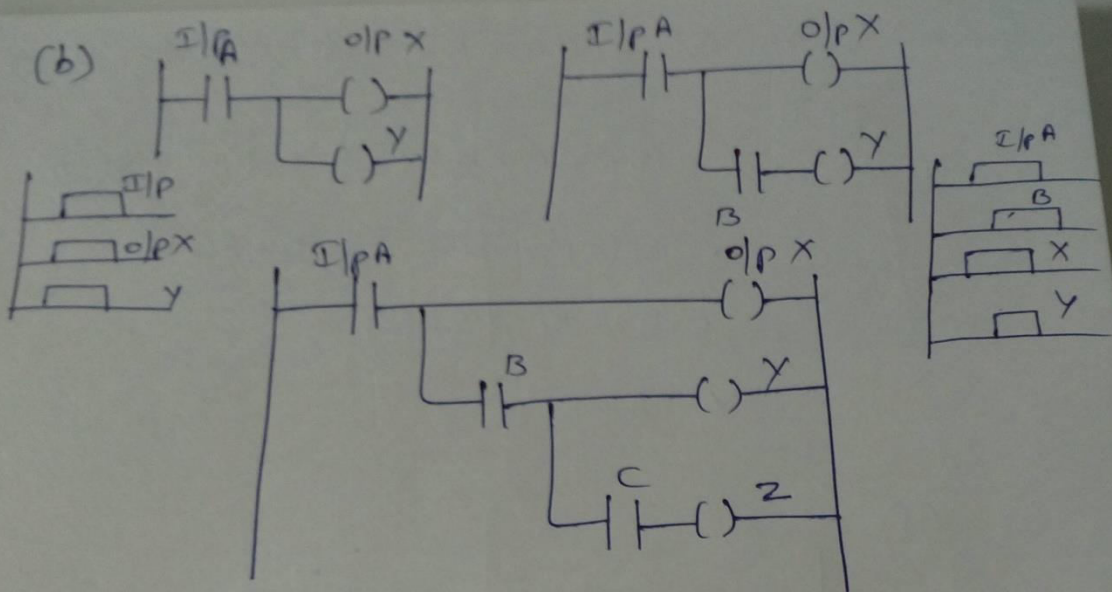


5. (a) Latch



Example





$$6. (a) \quad Y = A + B(A + C\bar{B} + D\bar{A}C) + ABCD$$

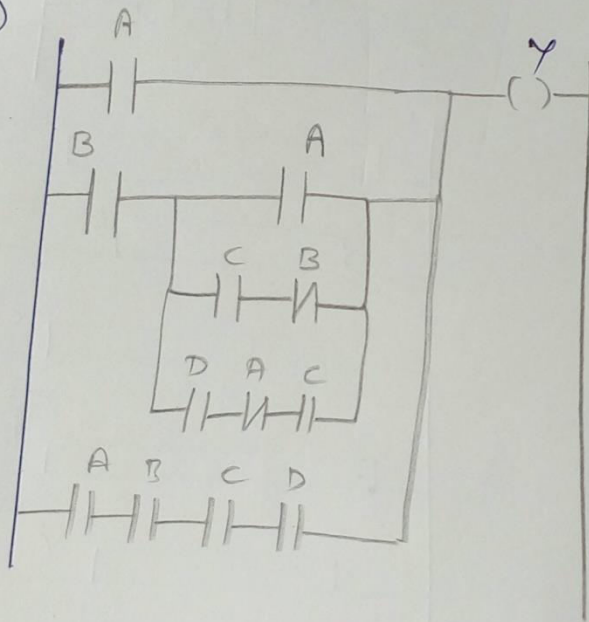
$$(ii) \quad Y = A + AB + B \cdot C\bar{B} + B \cdot D\bar{A}C + ABCD$$

$$= A(1+B) + 0 + \bar{A}BCD + ABCD$$

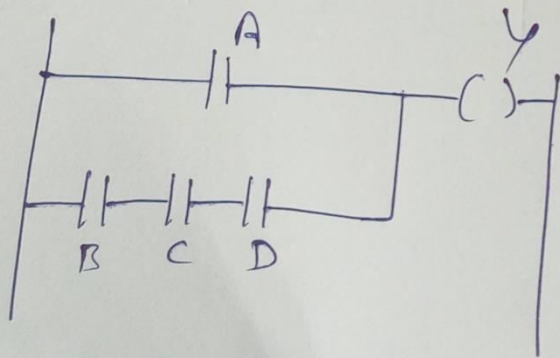
$$= A + BCD(A + \bar{A})$$

$$Y = A + BCD$$

(i)

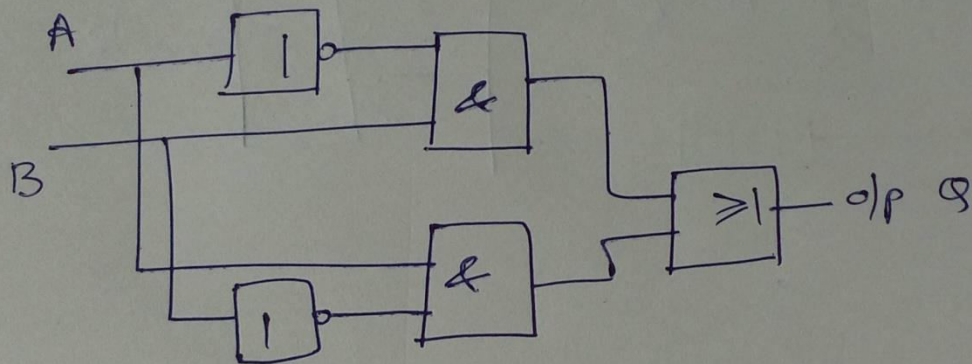
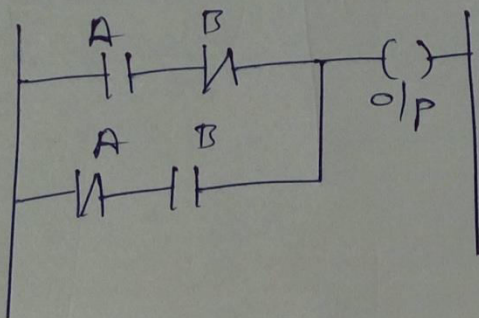


(ii)



7. (a) XOR

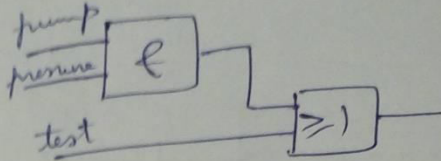
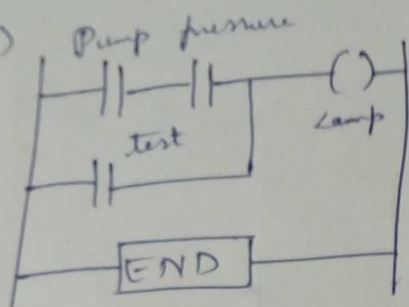
ladder diagram



(b) $\angle D$ X400
 ANI X401
 $\angle DI$ X400
 AND X401
 ORB
 OUT Y430

~~AC~~
 A IO.0
 AN IO.1
)
 O()
 AN IO.0
 A IO.1
)
 = O2.0

8. (a)



(b)

