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Q#1

①

A) Consider a lubricating oil tank in Industrial Plant having 2 sensors, one is put near to the bottom and one near to top, to fill the tank, motor A will pump oil to tank until the high level sensor turn on, at that point the motor A turn OFF. Motor A is turned ON when the level fall below the low level sensor. Explain the states of PLC operating cycle with help of neat ladder diagrams.

input

low level sensor

High level sensor

output

Motor

internal Utility Relay

1000

Address

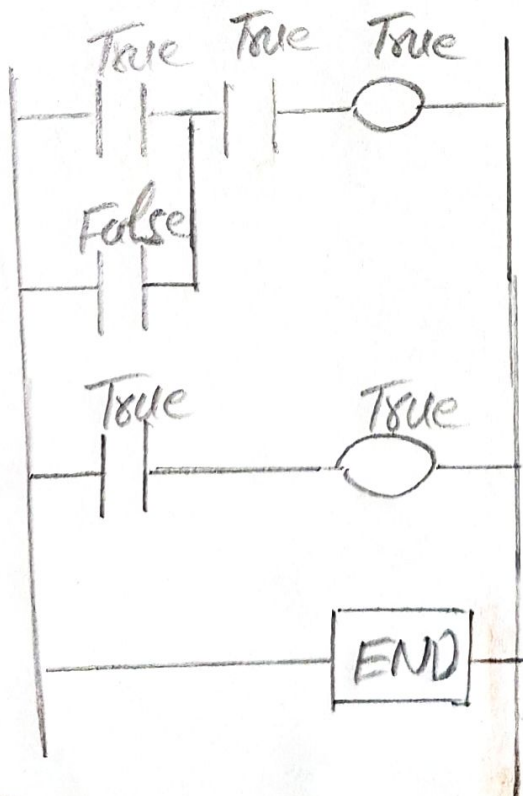
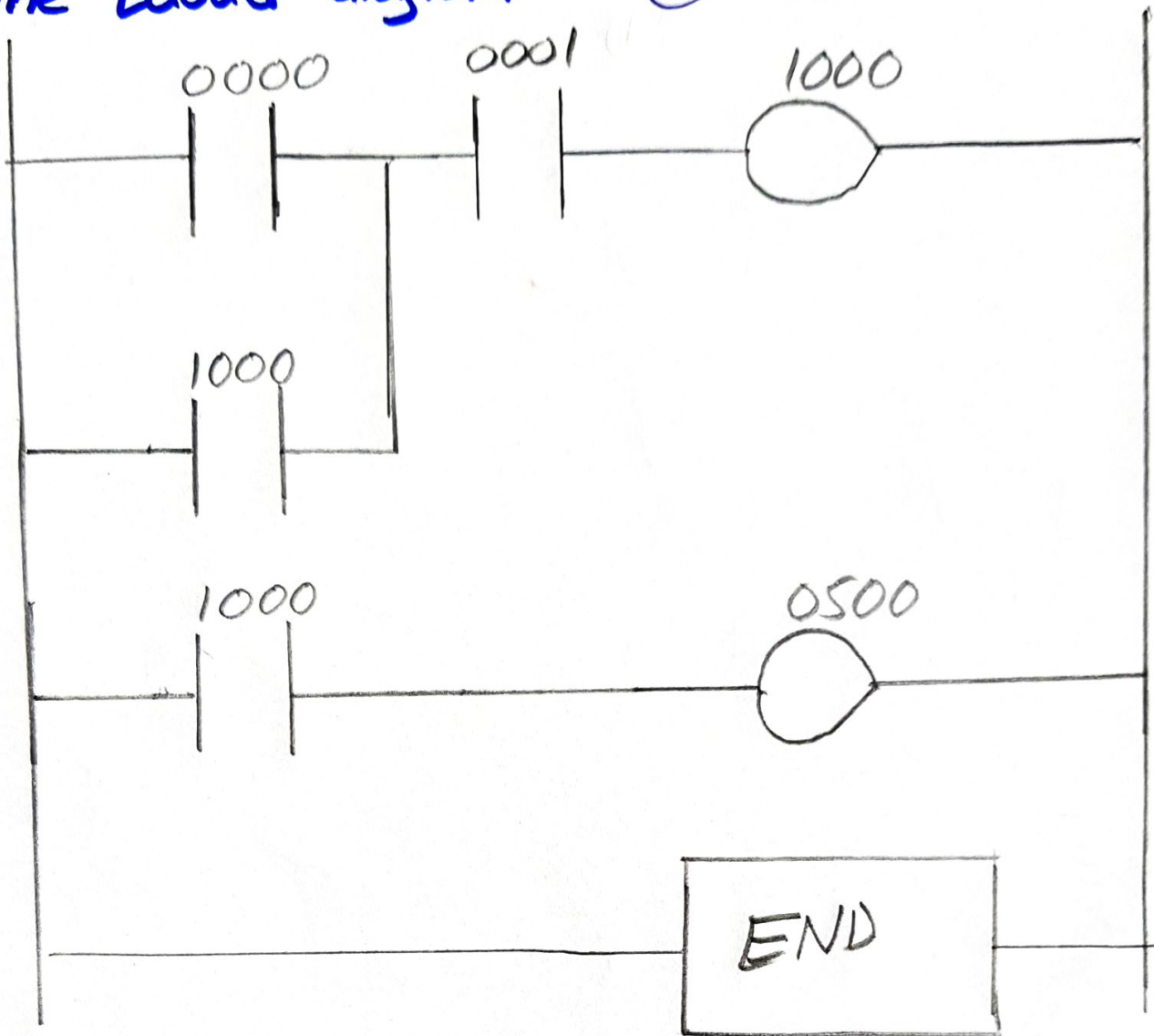
0000

0001

Address

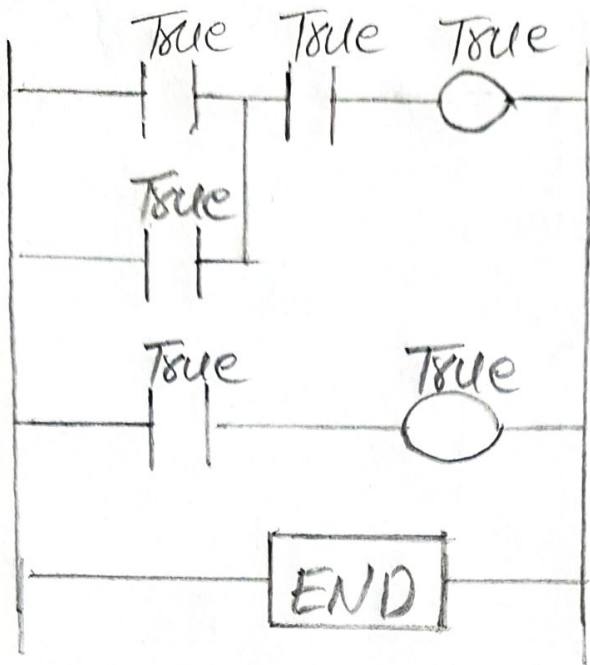
0500

The Ladder diagram (2)



Scan (1)

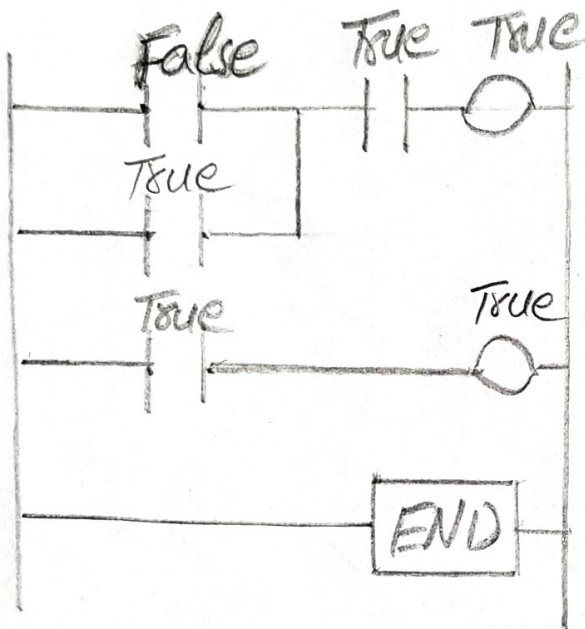
Initially the tank is empty. Therefore input 0000 is true and input 0001 is also true



③

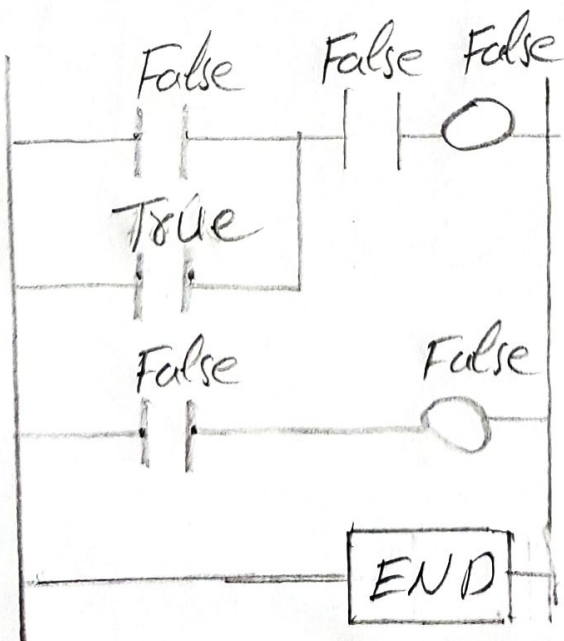
Scan (2)

The internal relay is turned on as the water level rises



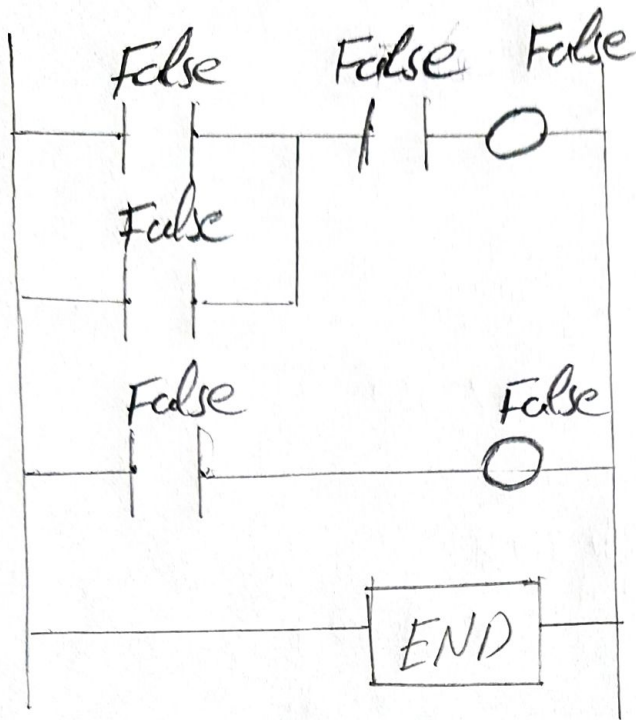
Scan (3)

After scan 2 the oil level ~~is~~ rises above the low, level sensor and it become open (i.e) false



Scan (4)

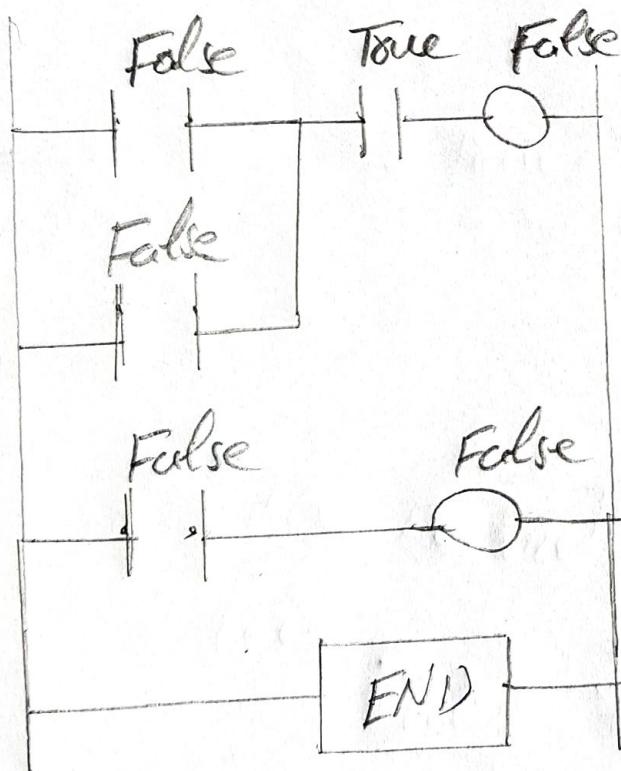
After scan 4 the oil level rises above the high level sensor at it also become open (i.e) False.



(4)

Scan (5)

Since there is no more true logic path output 500 is no longer energized (true) and therefore the motor turn off



Scan (6)

After scan 6 the oil level falls below the high level sensor and it will become true again.

Q#2

(5)

A) Write some benefits of Industrial Automation

Benefits of Industrial Automation:-

* Increase Productivity:

→ Increased productivity = more units/day = more money

* Products produce more consistently:

→ Increased consistency = higher quality = increased consumer satisfaction

Example - A bottled soft drink such as a coke or pepsi always tastes the same no matter where or when you purchase it. Consumer count on this

* Products produced more reliably:

→ robots can run 24 hours/day without getting tired or bored

* Decreased labor expenses:

→ Automated systems reduce the amount of people needed to produce the goods

• Increase safety in working conditions.

Q.2

(6)

B) Briefly explain the components and function of SCADA system

Components of the SCADA System:-

- * Human Machine interface
- * Supervisory System
- * Remote terminal Units
- * Programmable logic Controller (PLCs)
- * Communication infrastructure
- * SCADA programming

Function of SCADA:-

- * Centrally monitor and controls thousands of industrial equipment such as Motor, valves, pumps, relays, sensor etc
- * Display current state of the remote process (visualization)
- * Display alarm / Events log.

Q. 3#(A)

⑦

Differentiate between hardwired control systems and PLC system

Hardwired control system	PLC systems
1) The function are determined by the physical wiring.	The functions are determined by a program stored in memory
2) Changing the function means the wiring.	The control function can be changed simply by changing the program
3) Can be contact-making type (relays, contactors) or electronic type (Logic circuit)	Consist of a control device, to which all the sensor and actuators are connected

(8)

Q.3

B) What are function of SCADA?

- centrally monitors and controls thousands of industrial equipment, such as
• Motors, valves, pumps, Relays, sensors etc
- Displays current state of remote process (Visualization)
- Display alarms/Events log.

Example:-

A large scale application of SCADA system is a nuclear power plant which thousand of sensor monitor mission critical and safety critical system. The computer system collect data from the sensors, processes update and make computer controlled adjustment, to equipment as required to maintain operational & safety parameters. In addition to the automatic control employee staff a large control room where they monitor the entire system around clock.

(9)
These functions are performed by four kinds of the SCADA components.

→ **Sensors**: either "digital or analog" with control relays that directly interface with the managed system

→ **Remote teleterminal Unit (RTUs)**

These are small computerized units deployed in the field at specific sites & locations, RTUs serve as local collection points for gathering reports from sensors & delivering commands to control relays

→ **SCADA Master Unit (MTUs)**

These are larger computer consoles that serve as the central processor for SCADA systems. Master units provide a human interface to the system and automatically regulate the managed system in response to sensor input.

→ **The Communication Network:-**

That connects the SCADA master unit to the RTUs in the field.