

FAAIQ SHAH

ID: 12930

Industrial Electronics

Submitted To:

Sir Sanaullah

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# Question # 01

Answer:-

<u>Inputs</u>	<u>Address</u>
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low level sensor	0000
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High level sensor	0001
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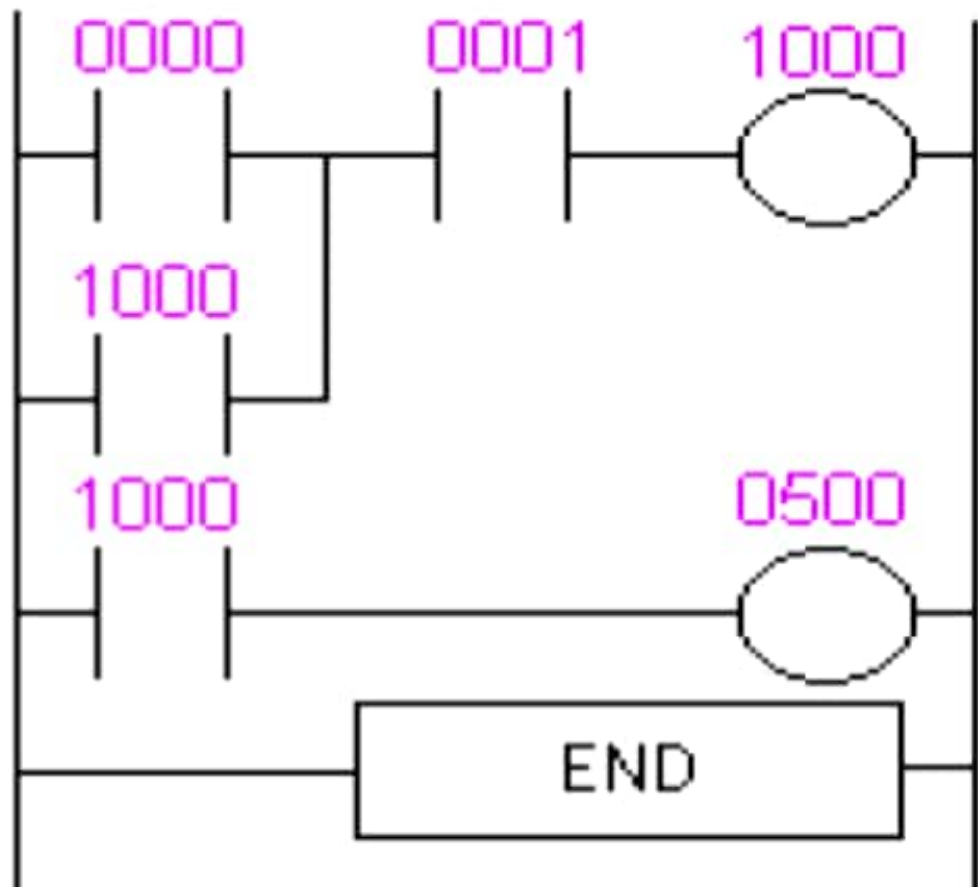
<u>Output</u>	<u>Address</u>
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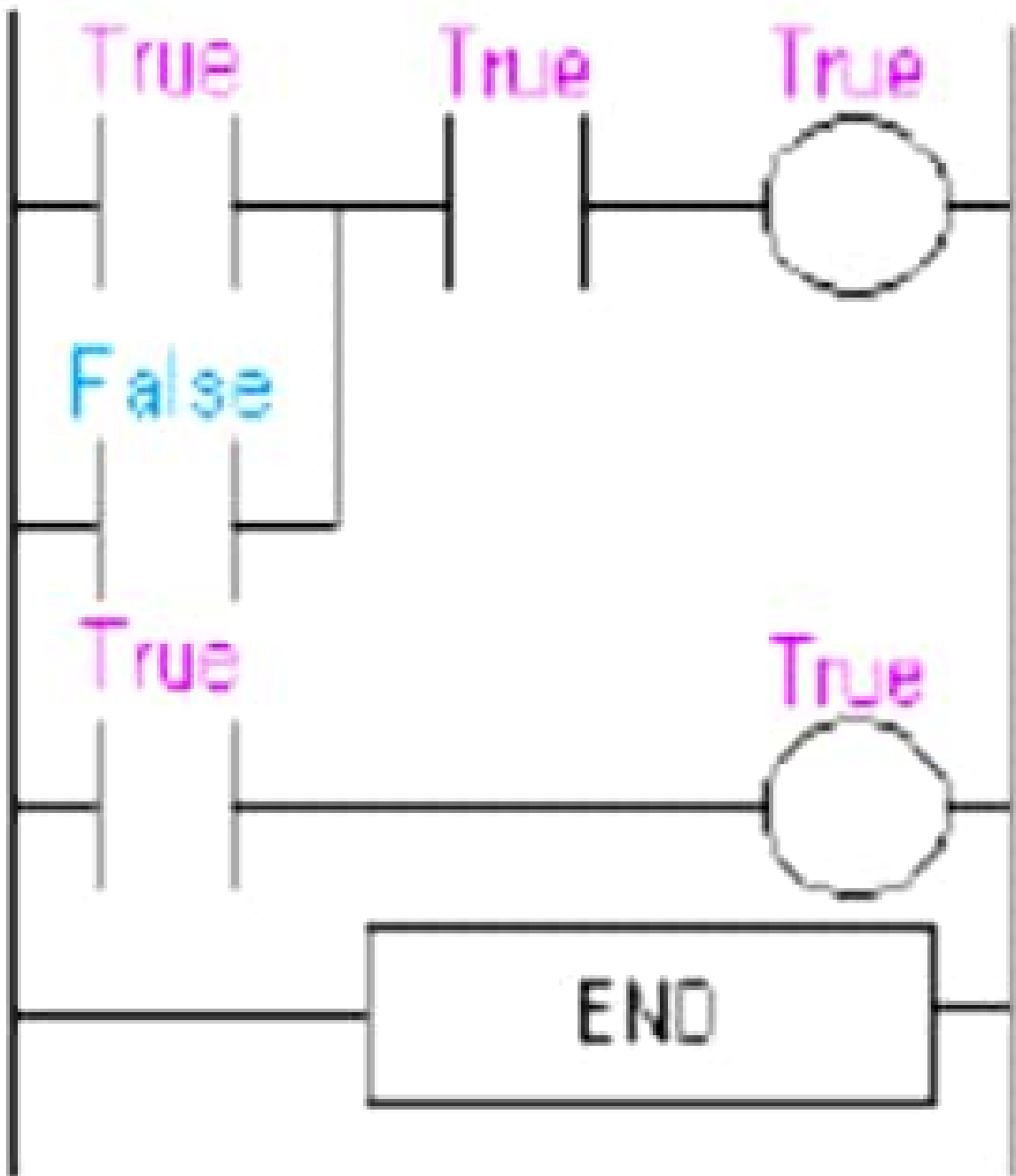
Motor	0500
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<u>Internal utility</u>	<u>Relay</u>
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1000	
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# The Ladder Diagram

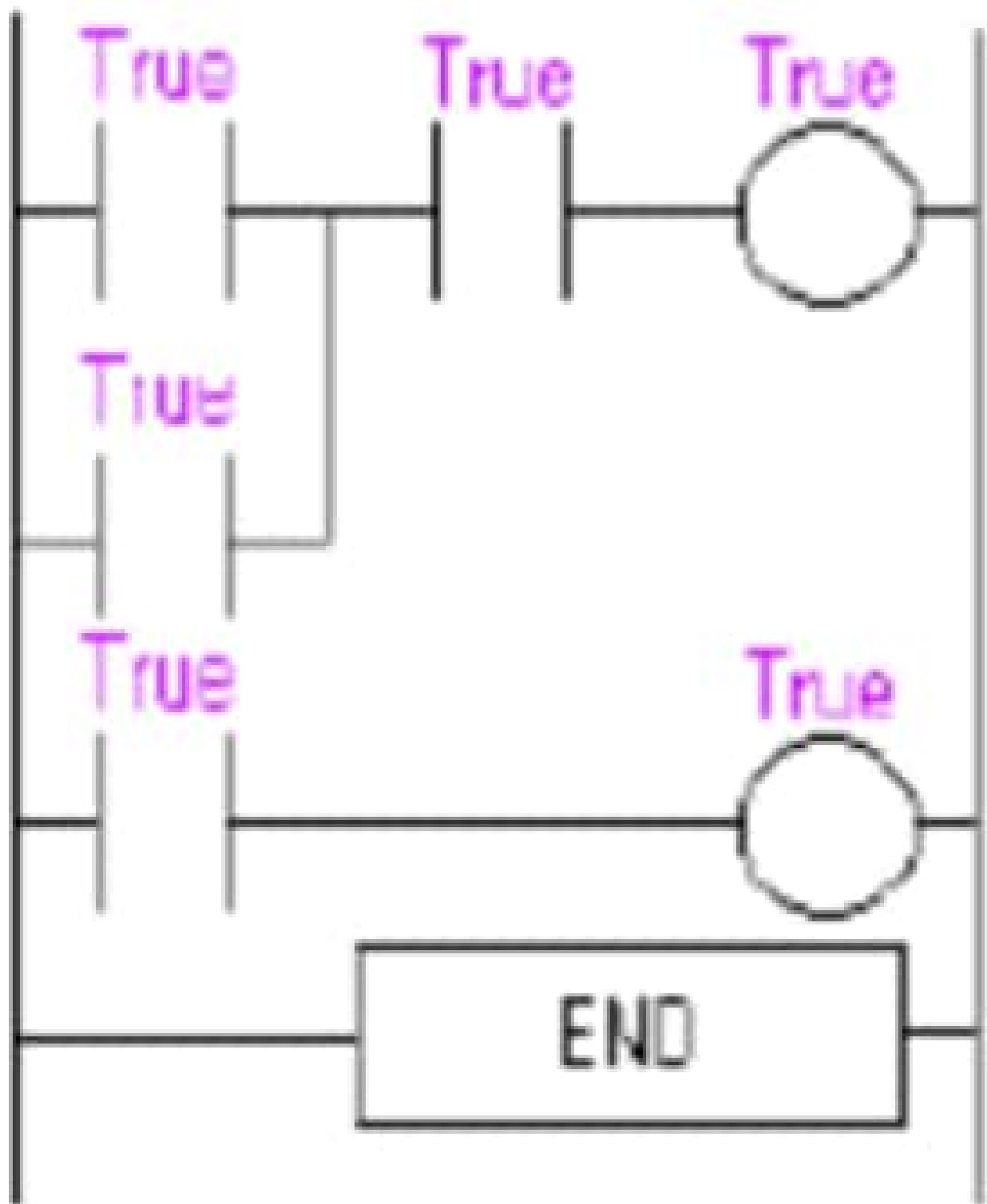




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Scan 1

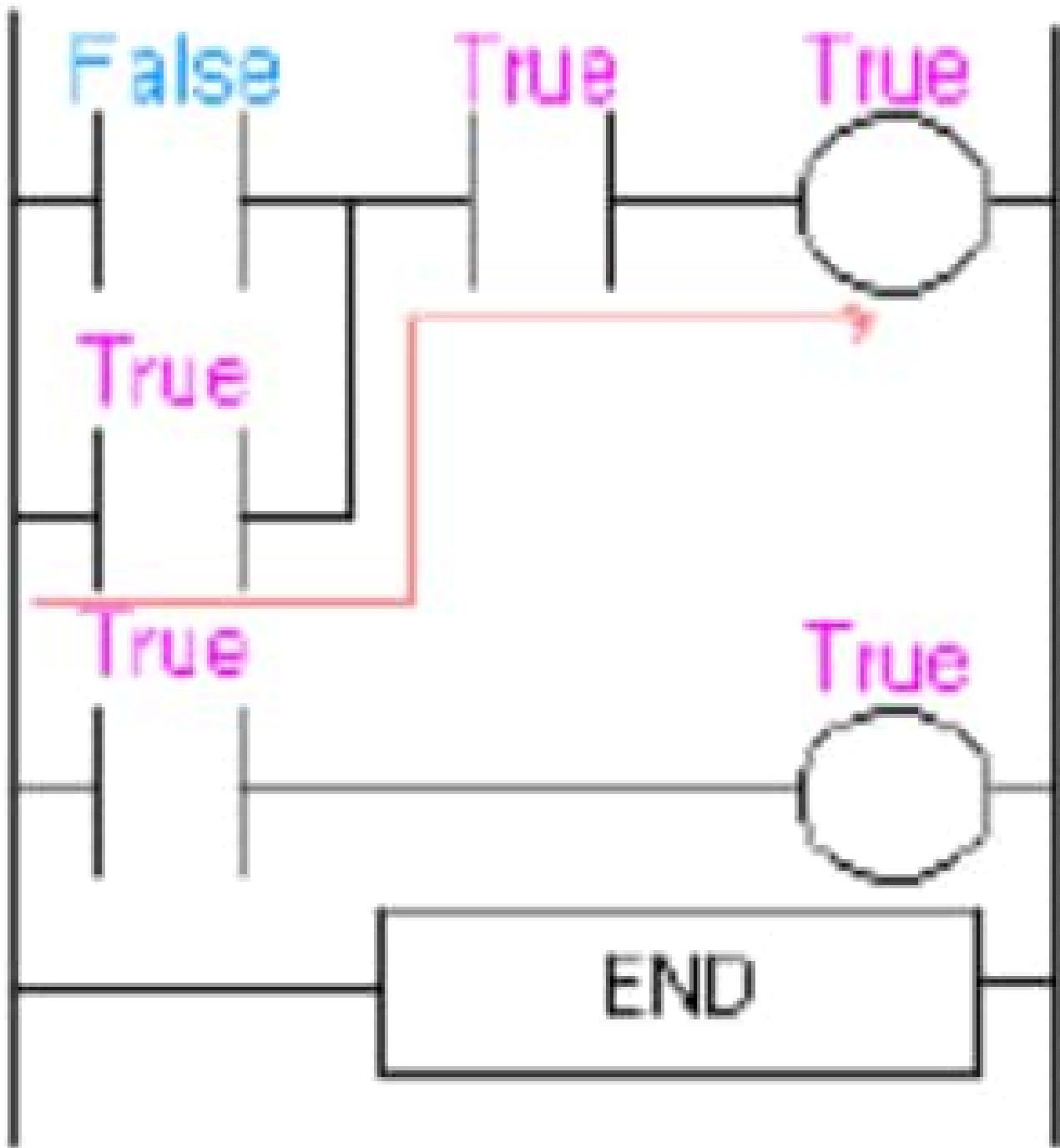
Initially the tank is empty. Therefore, input 0000 is TRUE and input 0001 is also TRUE



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Scan 2

The initial relay is  
turned on as the  
water level rises

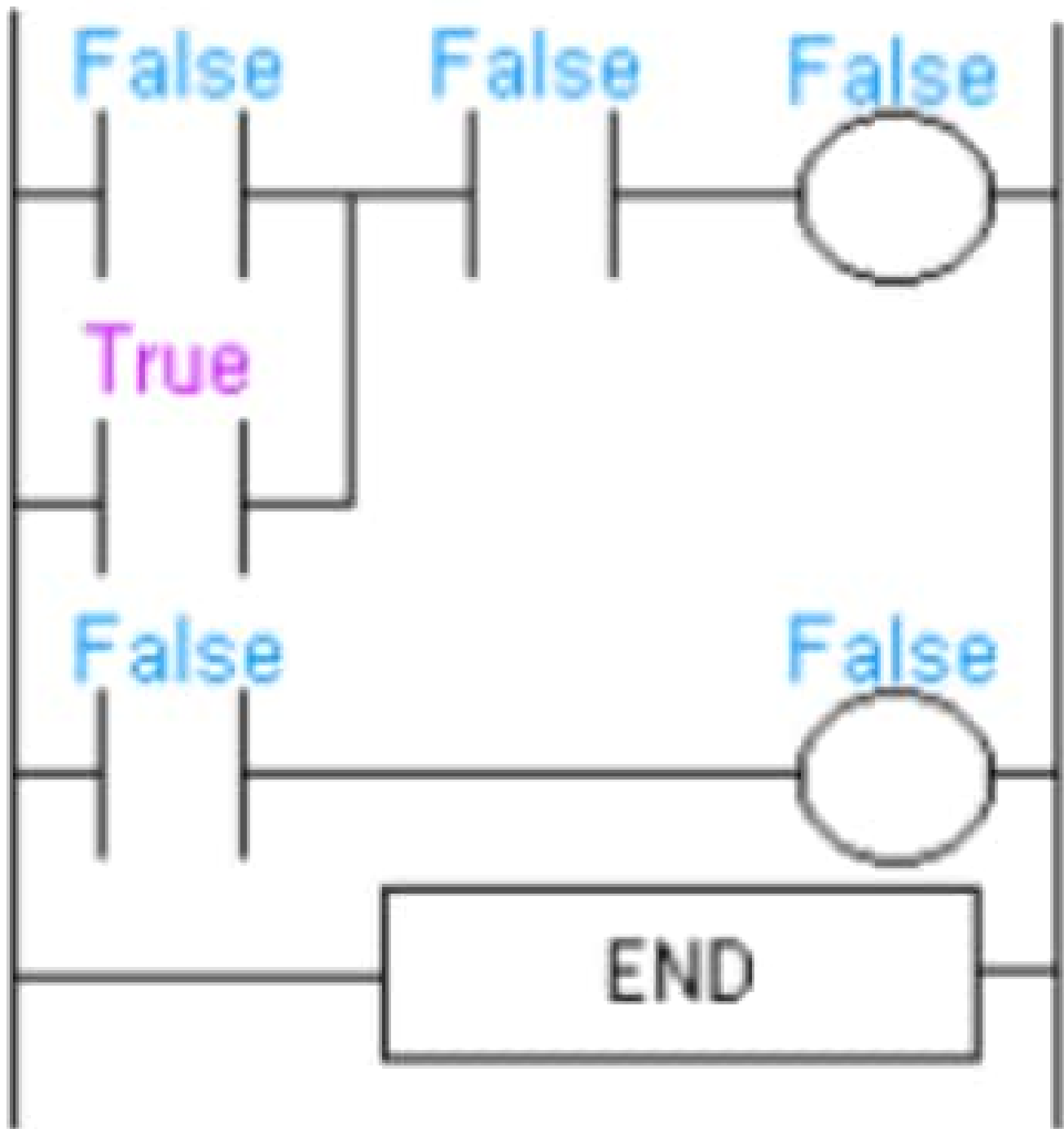




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Scan 3

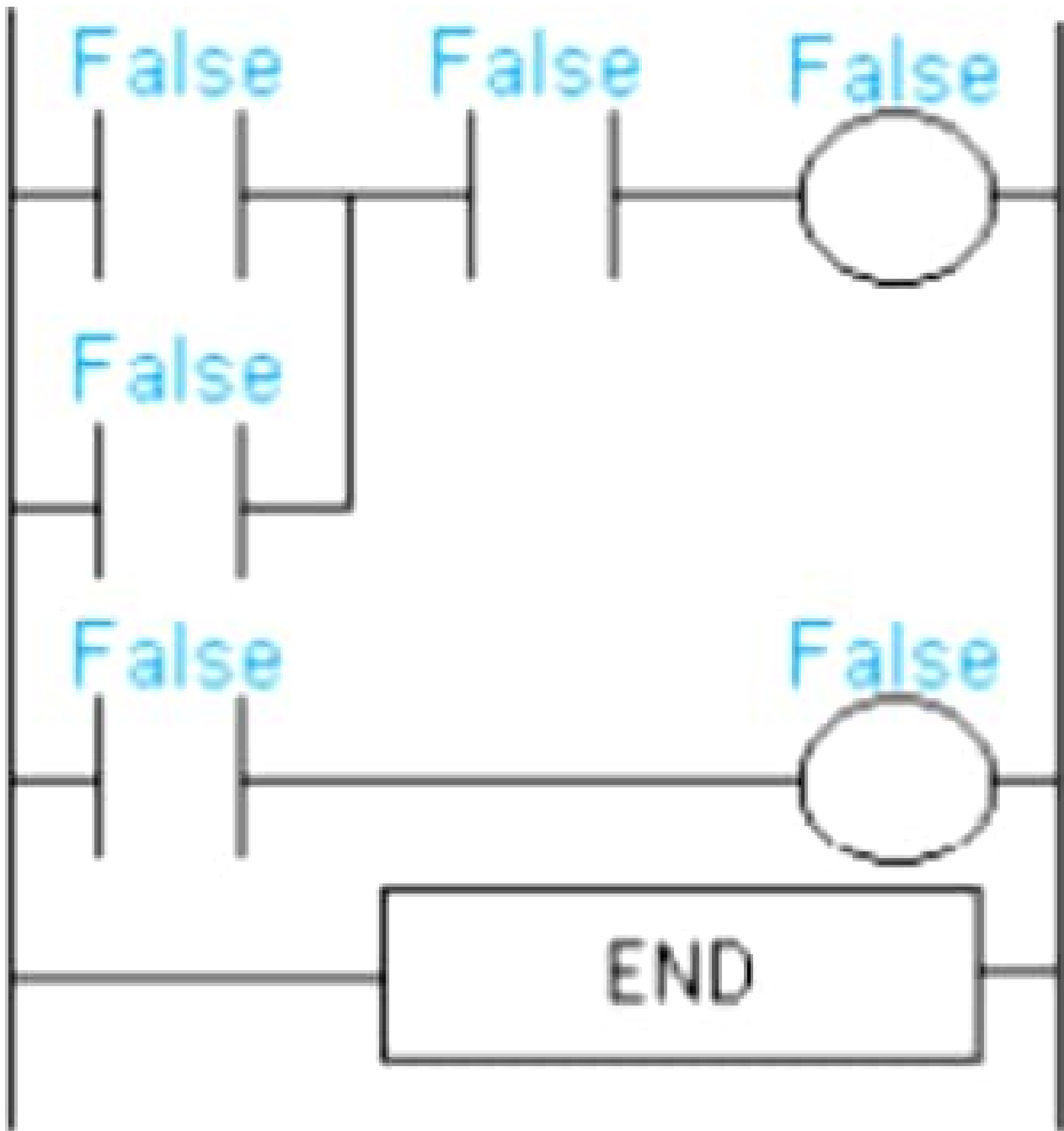
After scan 2 the oil level rises above the low level sensor and it becomes open i.e. FALSE.



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Scan 4

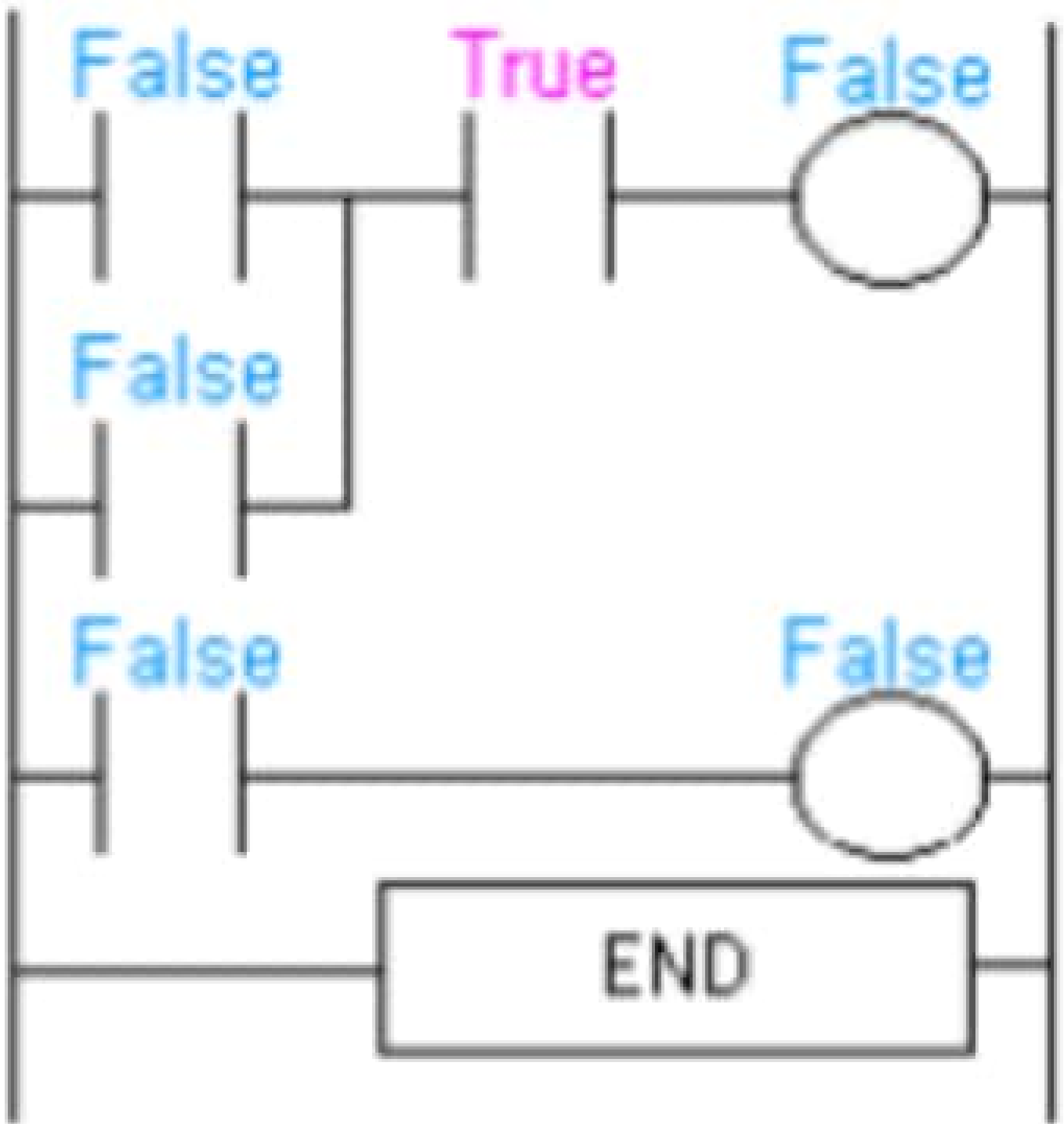
After scan 4 the oil level rises above the high level sensor as it also becomes open ie FALSE -



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SCAN 5

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



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Scan 6

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

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## Question # 02

### A. Industrial Automation:-

Automation is basically the allocation of human control function to technical equipment to automate the systems that produce their goods or services in the most efficient manner possible.

### Benefits of Industrial Automation:-

- Increasing Productivity  
- Increased productivity = more units/day = more money
- Products produced more consistently.  
- Increased consistency = higher quality = increased consumer satisfaction.



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Example: A bottled soft drink such as coke or a pepsi always tastes the same no matter where or when you purchase it.

Consumers 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.
- Increasing safety in working conditions.

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Q<sup>2</sup>B. Basic components of SCADA System.

① Human Machine Interface:

It is an I/O device that allows a human operator to control the process data. This is achieved by linking SCADA's database and software programmes for providing management information like detailed schematics, scheduled maintenance, data diagnostics and logistic information. The operating personal can also see the graphical representation of data.

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② Supervisory System:-

This system acts as a communication server between the HMI software in control room workstations and its equipment like PLCs, RTUs and sensors etc.

③ Remote Terminal Units:-

This system contains physical objects that are interfaced with remote terminal units (RTUs). These electronic devices are controlled by microprocessors and are used for transmitting recorded data to the supervisory system. They also receive data from the master

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system in order to  
control the connected  
objects.

#### ④ Programmable Logic Controllers.

PLCs find their  
use in the supervisory  
control and data acquisition  
system through sensors. They  
are attached to the  
sensors in order to  
convert the sensor output  
signal into digital data.

They are preferred  
over RTUs because of  
their configuration, flexibility,  
affordability and versatility.

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### ⑤ Communication Infrastructure:

Generally, a combination of direct wired connection and radio is used in supervisory controlled and data acquisition systems. However SDH/SONET can also be used for larger systems like railways and power stations.

### ⑥ SCADA Programming

SCADA programming in HMI or master station is used for creating diagrams and maps to provide vital information during process or event failure. Most of the commercial

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Supervisory control and data acquisition system used standardized interfaces in programming.

### Functions of SCADA systems-

SCADA systems are used to control and monitor physical processes, examples of which are transmission of electricity, transportation of gas and oil in pipelines, water distribution, traffic lights and other systems used as the basic of modern society.

SCADA systems can collect data from sensors as well as send control signals back to the equipment.

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being monitored. SCADA systems perform several functions. The three basic functions are the

Monitoring  
Control

User Interface functions.

The monitoring function collects data and sends it back to the central computer.

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## Questions #03

A.

### Comparison

#### Hardwired Control Systems:-

- > The functions are determined by the physical wiring.
- > Changing the functions means changing the wire.
- > Can be contact - making type (relays, contactors) or electronic type (logic circuit)

#### PLC systems:-

- > The functions are determined by a programme stored in the memory.
- > The control functions can be changed simply by changing the programme.
- > Consist of a control



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device, to which all the sensors and actuators are connected.

### B. Functions of SCADA system.

SCADA systems are used in a variety of industries such as traffic systems, electric power utilities and mass transit systems where equipment functions must be closely monitored and controlled automatically. SCADA systems can collect data from sensors as well as send control system signals back to the equipment being monitored.

SCADA centrally monitors and controls thousands of industrial

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equipments, such as

- Motors
- Valves
- Pumps
- Relays
- Sensors etc.

It displays current state of remote process (visualization).

It displays alarms, Events log.

SCADA system can also indicate fault location, isolation and service restoration in electric power systems