

Name M. Yasir Shah

ID 13172

Subject Industrial Electronics

Final

Submitted to:

Engr. Sanaullah Ahmad

Q1: Inputs

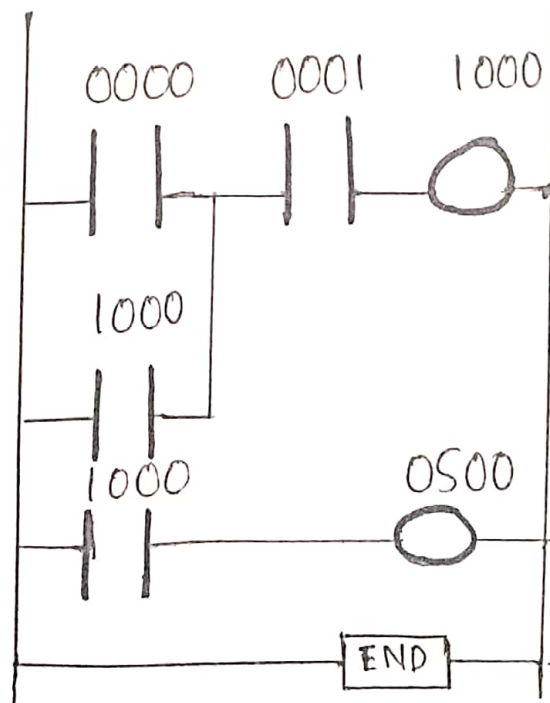
Input	Address
Low level sensor	0000
High level sensor	0001

Output

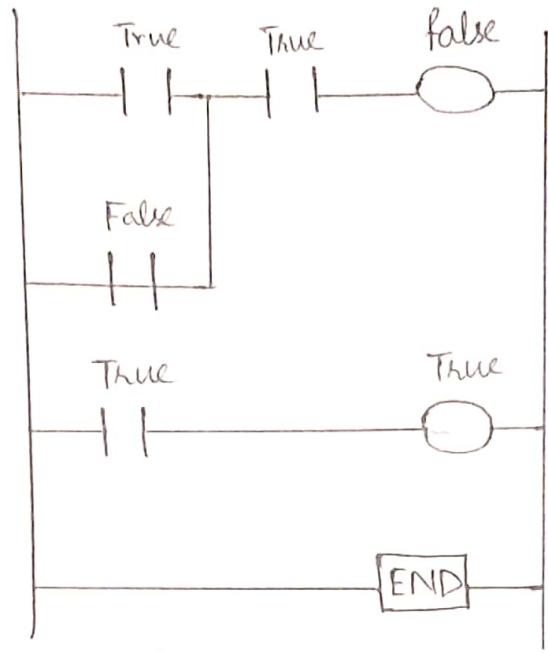
Output	Address
Motor	0500

Internal Utility Relay
1000.

The ladder diagram

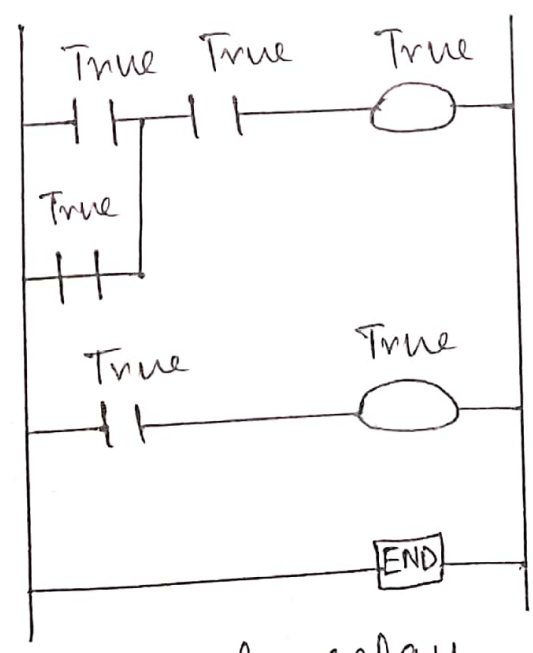


Scan 1: (Page 2)



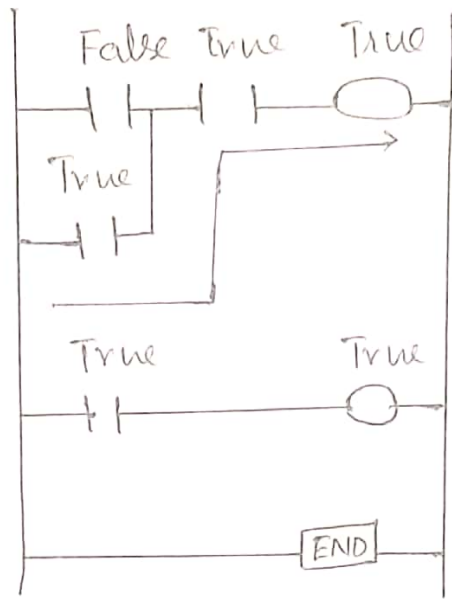
Initially the tank is empty. Therefore input 0000 is true and input 0001 is also true.

Scan 2:



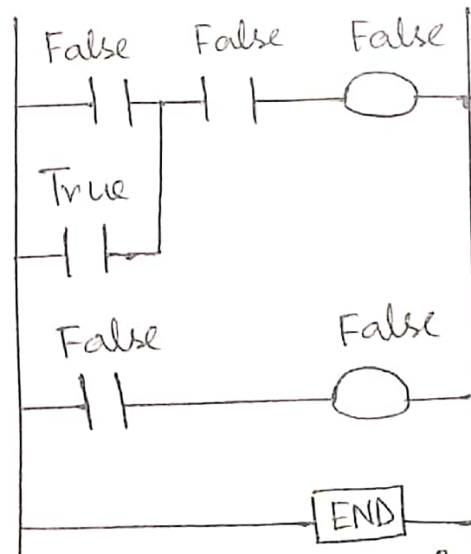
The internal relay is turned on as the water level rises.

Scan 3 :



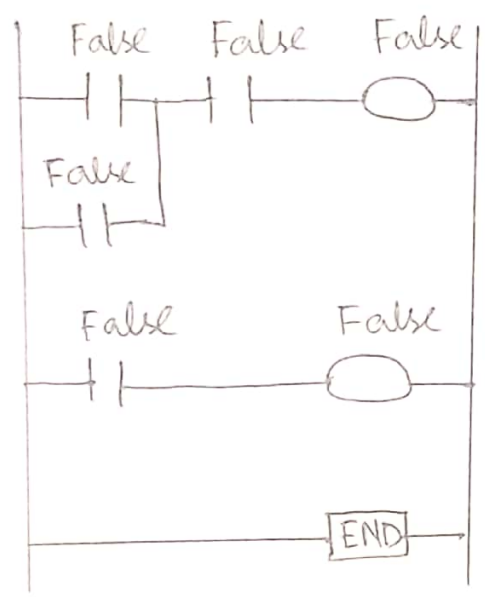
After Scan 2 the oil level rises above the low level sensor and it becomes open (i-e False)

Scan 4 :



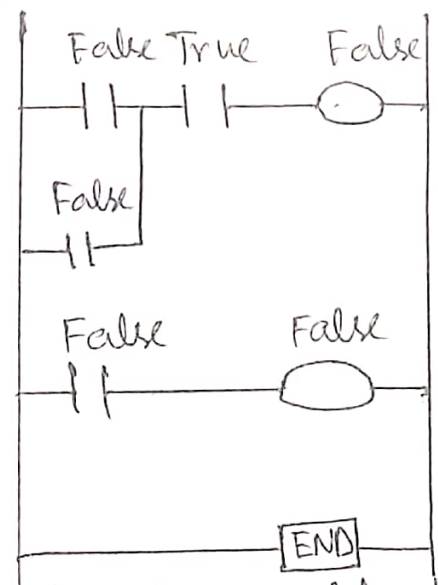
After Scan 4 the oil level rises above the high level sensor at it also become open (i-e False)

Scan 5:



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

Scan 6:



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

Q 2 (a) :- Benefits of Industrial Automation:

- > Increasing Productivity
 - Increased productivity = more units/day = more money.
- > Products produced more consistently
 - Increased consistency = higher quality = increased consumer satisfaction.
 - Example: A bottled soft drink such as a 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 reduced the amount of people needed to produce the goods.
- > Increasing safety in working conditions.

Q 2 (b) :- Components of SCADA:

There are many components of SCADA System, which include hardware (input and output), controllers, network, user interface, communications equipment and software.

→ Sensors (either digital or analog) and control relays that directly interface with the managed system.

→ Remote terminal units (RTUs): These are small computerized units deployed in the field at specific sites and locations.

RTUs serve as local collection points for gathering reports from sensors and delivering commands to control relays.

→ SCADA master units (MTUs): These are larger computer consoles that serve as the central processor for the SCADA system.

Master unit provide a human interface to the system and automatically regulate the managed system in response to sensor inputs.

→ The communications network that connects the SCADA master unit to the RTUs in the field.

Function of SCADA :

SCADA systems perform several functions. The three basic functions are the monitoring, control and user interface functions.

The monitoring function collects data and sends it back to the central computer. The control function gathers data from monitoring sensors, processes it and send control signals back to the equipment according to a prescribed software program. The user interface is often a large control room where individuals can monitor SCADA input and output responses in real time.

It has graphical user interface which displays critical control and process flow at centralized control room.

Q 3 (a) :-

Hardwired Control System:

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

PLC System:

- The functions are determined by a program stored in the memory.
- The control functions can be changed simply by changing the program.
- Consist of a control device, to which all the sensors and actuators are connected.

Q 3 (b) :

Function of SCADA system:

→ Centrally monitors and controls thousands of industrial equipment, such as: Motors, valves, Pumps, Relays, Sensors etc.

→ Display current state of remote process (visualization).

→ Display alarms / Events log.

Function of SCADA in Power system:

→ Fault location, isolation and service restoration:

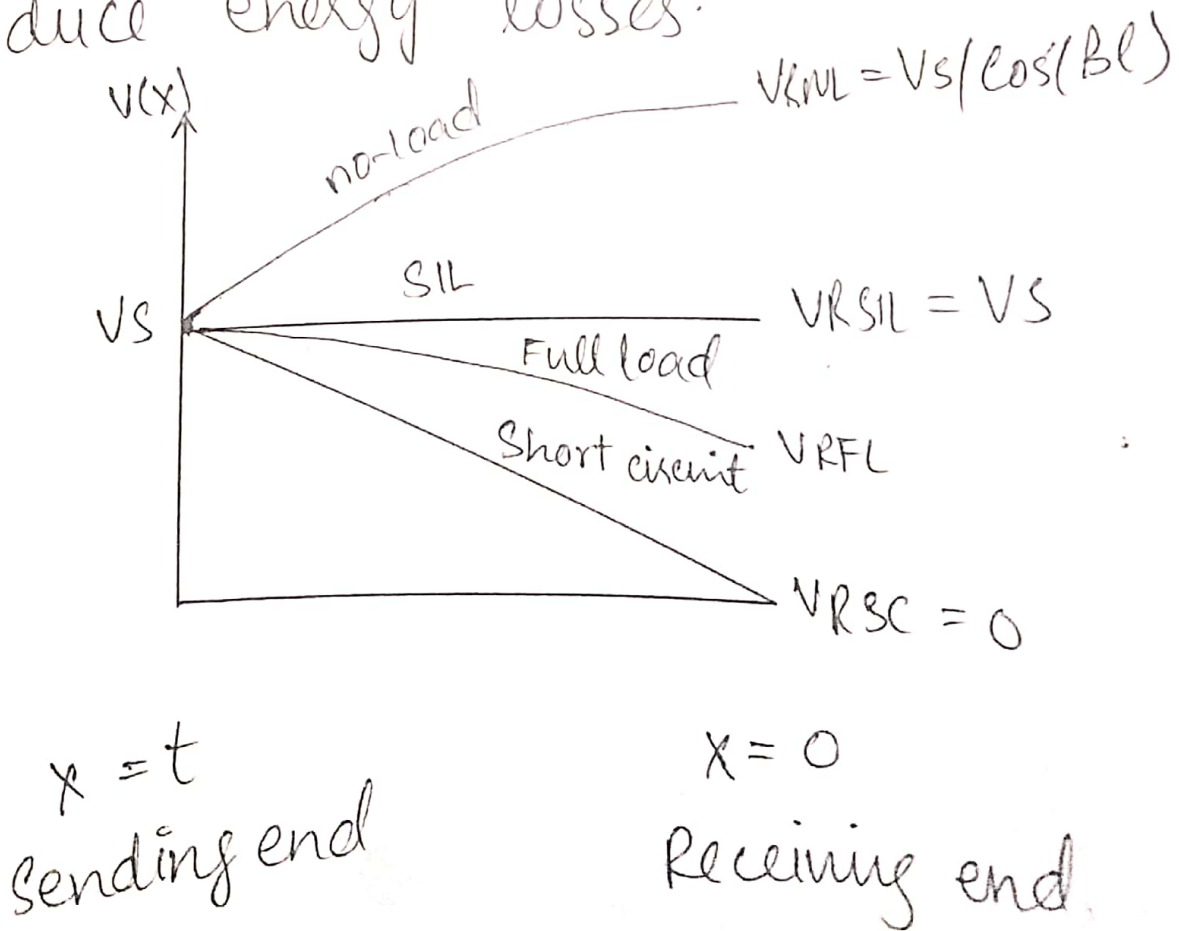
→ Determining fault and its restoration is difficult task in current grid system

→ With SCADA system old switches are replaced with advanced remotely controllable switches.

→ RTUs installed will send real time data which help to heal the system more efficiently and quickly manner.

Maintaining good voltage Profile:

An appropriate schedule for switching on/off of a capacitor banks and raise/lower voltage regulator taps will be based on the feeders reactive load curves in order to get good voltage profiles and reduce energy losses.



Load Balancing:

→ This function will enable the system to calculate total load and distribute or balance equal load among the available transformers and the feeders in proportion to their capacities.

Load Control:

→ During peak hours loads need to be shed for long durations.

A restriction and control schedule is worked out based on which of the loads at different substations are shed on a rotation basis. This function will automatically shed the loads according to the schedule.

→ Frequency based automatic Load shedding is carried out by software using this function. Appropriate loads are shed by the RTUs, based

On priorities and actual amount of load whenever the system frequency cross the pre-set values. This is done as a closed loop function in the RTU.

Energy Accounting:

- This function helps to predict load patterns at the system, which helps in planning expansion.
 - It also helps in detecting abnormal energy consumptions patterns of the consumers and identifying high-loss areas.
- Processing the data obtained by the remote metering function and the data obtained from the substation does this.

Improved Operations meet demands:

- Modern SCADA systems provide powerful tools that gives operators a real-time view into operations in order to optimize the power distribution system for maximum efficiency. Trending tools arrange data in various ways, and graphical interfaces simplify analysis.
- Analyzing trends and historical data helps maintain desired power factors, and voltage levels at a desired levels.

****** These functions are performed by four kinds of SCADA components.

- Sensors (either digital or analog) and control relays that directly interface with the managed system.
- Remote terminal units (RTUs): These are small computerized units deployed in the field at specific sites and locations. RTUs serve as local collection points

for gathering reports from sensors and delivering commands to control relays.

→ SCADA master units (MTUs): These are large computer consoles that serve as the central processor for the SCADA system. Master units provide a human interface to the system and automatically regulate the managed system in response to sensor inputs.

→ The communications network that connects the SCADA master unit to the RTUs in the field.