SKILL ACTIVITY NO: 1

Date : 20/01/25

(To be filled by the Instructor)

Title : PLC ladder logic program for mixer application and Lamp.

Skills / competencies to be acquired :

1. Ability to design and implement PLC program using ladder logic.
2. Proficiency in controlling pumps level
3. Understanding the integration of sensor &
4. Practical knowledge of sequential and
6. sensor and valves in industrial mixing process.
7. actuators for automation.
8. timing in industrial application.

Duration of activity (hours) : 2Hr.

(To be filled by the Student)

1. What is the purpose of this activity ? (Explain in 3 - 4 lines)

The purpose of this activity is to develop a PLC ladder logic program that automates the mixing of two liquids using pumps level sensors and a discharge valve, ensuring efficient and precise process control.

2. Steps performed in this activity (Explain in 5 - 6 lines)

1) Open TIA 14 Portal.
2) Open New Project.
3) Configure a device and open programming block to program.
4) Implement the ladder logic to solve the problem statement make input and output mapping, reference tags properly.
5) Testing and debugging of program.
6) Observe the automated filling, mixing and discharge process & lamp on.

3. What resources / materials / equipments / tools did you use for this activity ?

1. TIA portal
2. Siemens PLC - 1200 setup.
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

4. What skills did you acquire ?

1. Ability to design & implement PLC program
2. Proficiency in controlling pumps level
3. _____
4. Understanding the integration of sensors
5. using ladder logic.
6. sensors and valves in industrial mixing process.
7. _____
8. & valves in industrial mixing process

5. Time taken to complete the activity ? 2 (hours)

(Signature)
Instructor

(Signature)
Student

*Normally Open:- 'No' contact in ladder logic activates based on the signal state of its associated operant.

- Signal state '1' of its associated state. The contact closes, and output signal makes the input signal state.
- Signal state '0': The contact stays open and output reset to '0'.

Normally close

- A NC contact opens when the associated operand is '1' resetting the output to '0'.
- If the operand is '0' the contact stays closed, allowing input signal to pass to the output.

Timer (Pulse)

The "Generator Pulse" instruction sets output Q for a programmed duration (PT) when input IN changes from '0 to 1' (positive edge).

- Output Q remains high for the entire PT duration, even if another +ve edge occur.
- ET output shows the elapsed time from T#0s until PT is reached.
- Requires an IEC timer (TP type), either as a data block or a local dog.
- Reset during a cold restart, to maintain after a warm restart, initialize in a Startup OB.
- If skipped, ET shows a constant value after the time expires.
- Instruction data only updates when called, not when accessing Q or ET.

Timer ON

"Generate ON delay" instruction delays setting output Q for a programmed time (PP) after a positive edge at the input IN.

- Q is set to "1" after PT, stays "1" while IN is "1" and resets when IN is "0".
- Requires an IEC TON timer to store data.
- Resets on cold restart, initializes in startup OB for warm restarts.

* CTU Counter *

"The Count up instruction increments CV on each positive edge of CP input.

- Stops at the data types high limit.
- Q is "1" if CV ≥ PV, otherwise '0'.
- Resets CV to zero when R is '1'.
- Requires an IEC CPU counter.
- Resets on cold restart, initialize in startup OB for warm restarts.

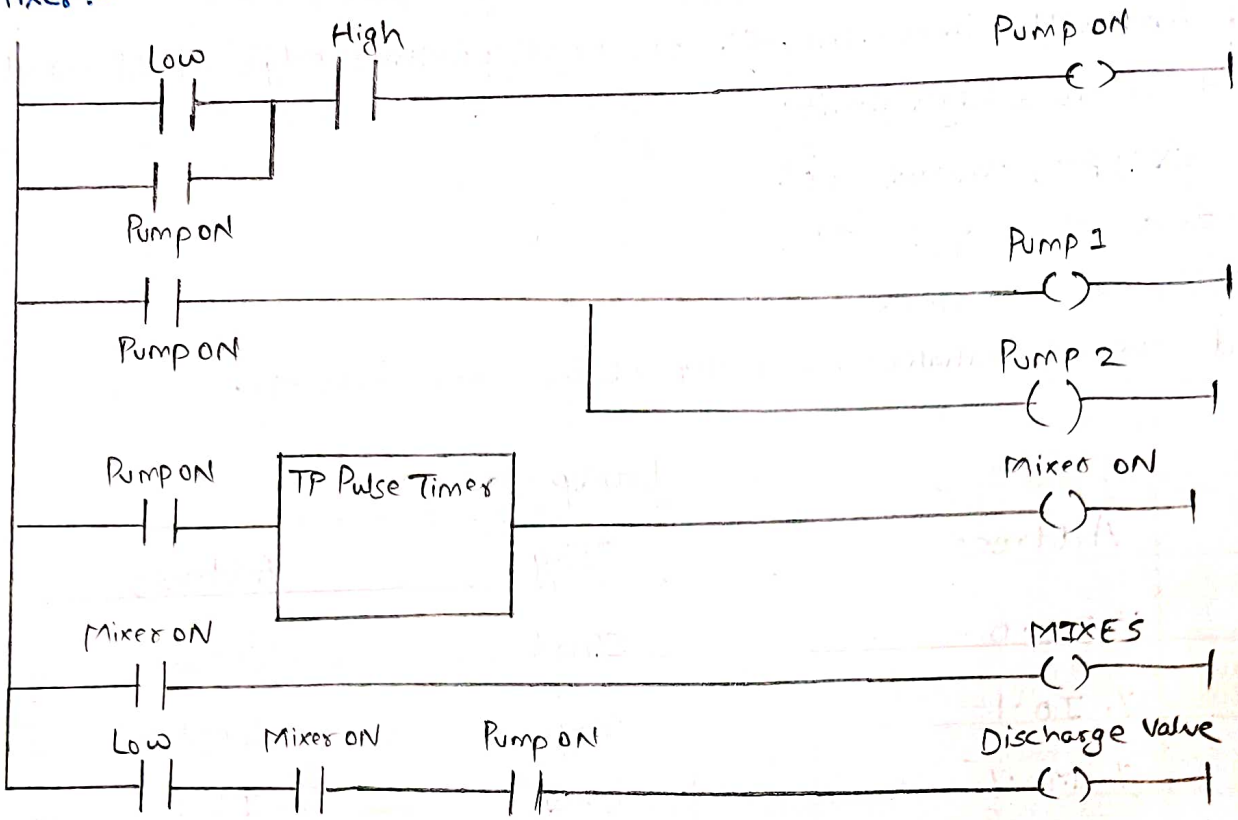
Mixer

Tag	Address
Low	%I0.0
High	%I0.1
Pump ON	%M0.1
Pump-1	%Q0.0
Pump-2	%Q0.1
Mixer on	%M0.0
Mixer	%Q0.2
Discharge Valve	%Q0.3
TP Timer	%DB2

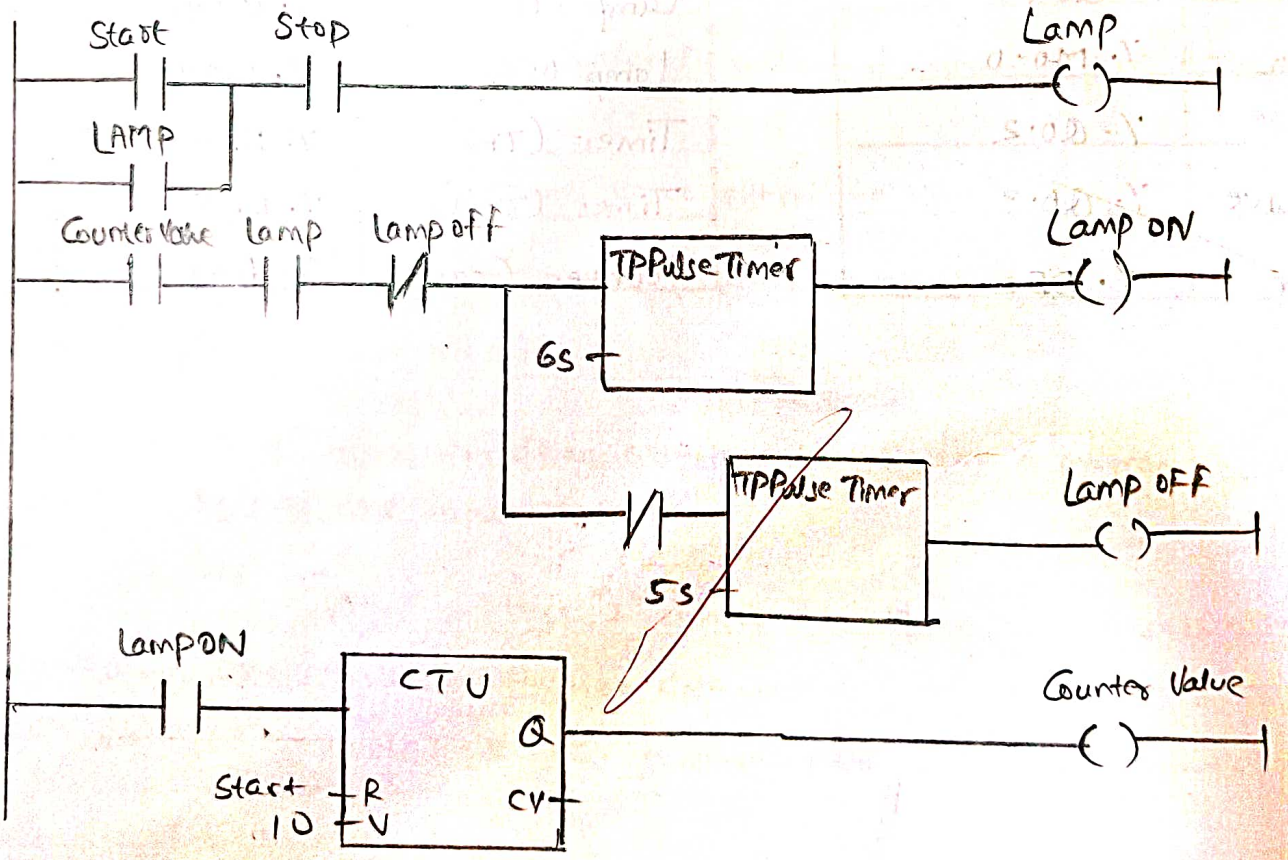
Lamp

Tag	Address
Start	%I0.0
Stop	%I0.1
Lamp	%M0.0
Counter Value	%M0.1
Lamp ON	%Q0.0
Lamp OFF	%M0.0
Timer (TP)	%DB2
Timer (TON)	%DB5
Counter (CTU)	%DB1

a) Mixer :-



b) Lamp:-



SKILL ACTIVITY NO: 2

Date : 10/03/25

(To be filled by the Instructor)

Title : Buffer & monitoring problem statement for universal application simulator.

Skills / competencies to be acquired :

1. Using universal application simulates real 5. world automation process & identify problems.
2. Implementing diagnostics that alert 6. user when buffer limits.
3. Designing buffer logic to manage 7. items.
4. 8.

Duration of activity (hours) : 1

(To be filled by the Student)

1. What is the purpose of this activity ? (Explain in 3 - 4 lines)

The purpose of this activity is to develop buffer logic which is primarly used to temporarily store data or items before they are processed, transferred or stored. It is crucial for managing process that temporarily need storage to avoid system overloads,

2. Steps performed in this activity (Explain in 5 - 6 lines)

1) Ladder logic instructions like set, reset are use to manage the flow items into and out of buffer.
2) Use companion instructions to set upper and lower limit.
3) Simulate system.
4) Diagnose and troubleshoot.

3. What resources / materials / equipments / tools did you use for this activity ?

1. TIA portal
2. PLC
3.
4.
5.
6.
7.
8.

4. What skills did you acquire ?

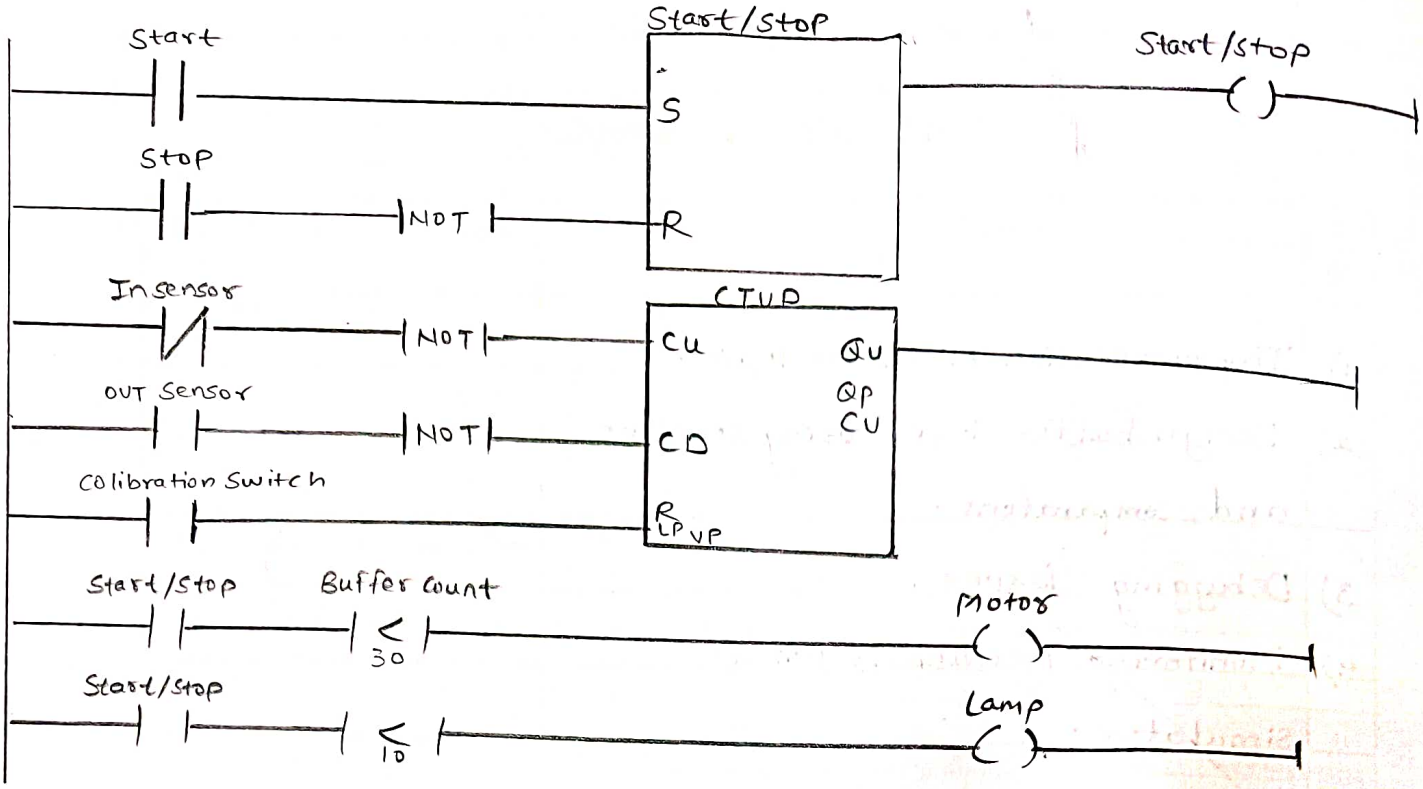
1. Desiging buffer logic
2. Debugging issues.
3. Monitoring mechanisms within
4.
5.
6.
7. simulator to track performance.
8.

5. Time taken to complete the activity ? _____ | _____ (hours)

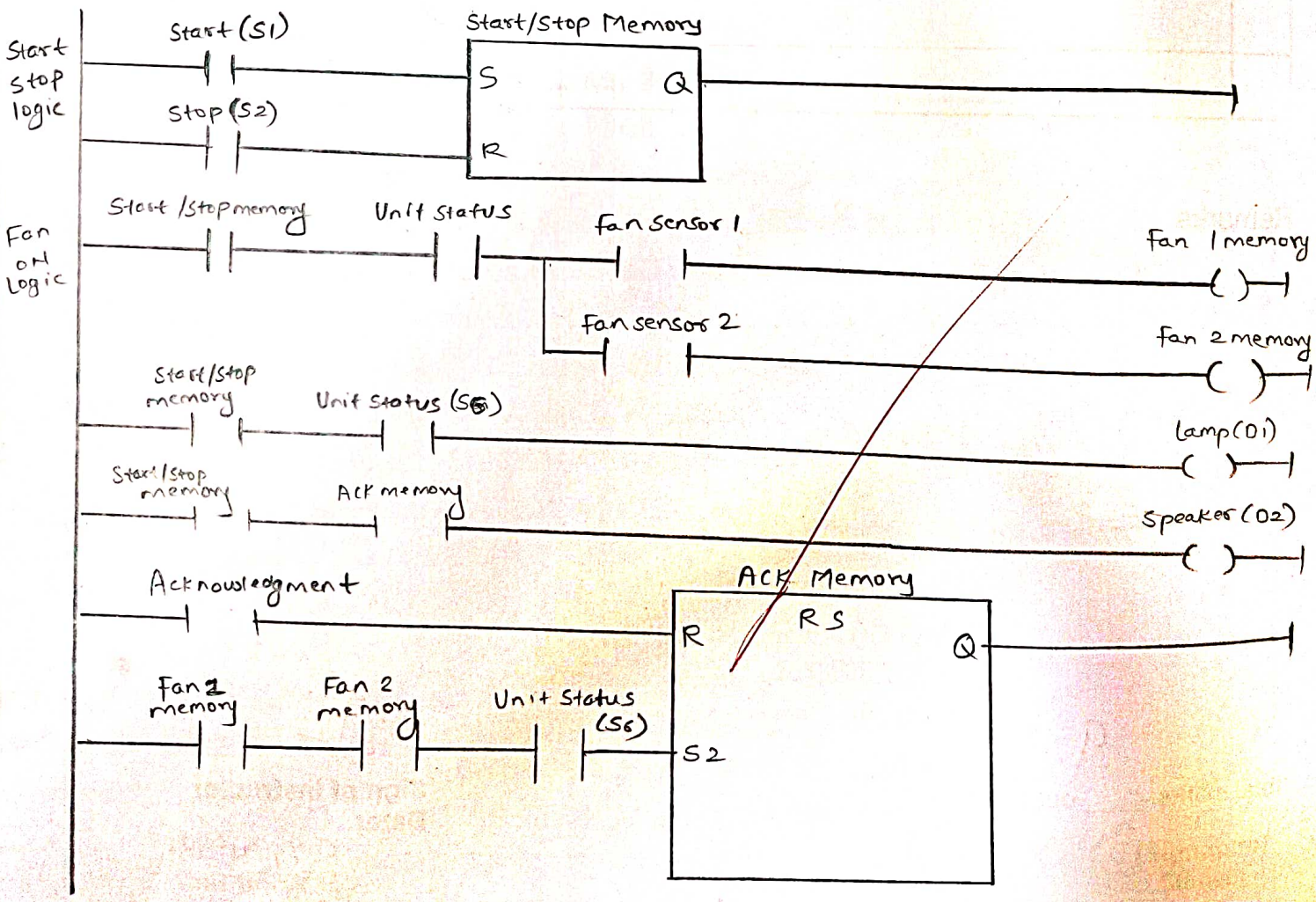
(Signature)

(Signature)

a) Buffer:-



b) Monitoring :-



Buffer

Tag	Address
Start	%I2.0
Stop	%I2.1
Start/Stop	%M0.1
In sensor	%I2.2
Out sensor	%I2.3
Callibration switch	%I2.4
Motor	%Q2.0
Lamp	%Q2.1
Buffer count	%DB2

Monitoring

Tag	Address
Start	%I2.0
Stop	%I2.1
Start/Stop memory	%M0.0
Unit status	%I2.5
Fan Sensor 1	%I2.2
Fan Sensor 2	%I2.3
Fan 1 memory	%M0.1
Fan 2 memory	%M0.2
Lamp	%Q2.0
Speaker	%Q2.1
Ack. memory	%M0.3
Acknowledgment	%I2.4

SKILL ACTIVITY NO: 4

Date : 25/05/25

(To be filled by the Instructor)

Title : Simulation of integration of HMI with conveyer operation.

Skills / competencies to be acquired :

1. Industrial Automation knowledge
2. HMI Development & configuration.
3. PLC programming.
4. Communication protocols.
5. SCADA & data logging.
6.
7.
8.

Duration of activity (hours) : 2Hr.

(To be filled by the Student)

1. What is the purpose of this activity ? (Explain in 3 - 4 lines)

The purpose is to learn industrial automation, apply PLC-HMI integration develop Industry 4.0 skills enhance safety & efficiency and prepare for automation carrers.

2. Steps performed in this activity (Explain in 5 - 6 lines)

1) Create a New project.
2) Configure PLC Hardware & Network.
3) Develop PLC program for Conveyor control.
4) Design HMI screens.
5) Establish Communication between HMI & PLC.
6) Add safety & alarm functions.
7) Simulate & test the system.
8) Debug & optimize.

3. What resources / materials / equipments / tools did you use for this activit

1. TIA V14 Software
2. Computers
3. PLC
4.
5.
6.
7.
8.

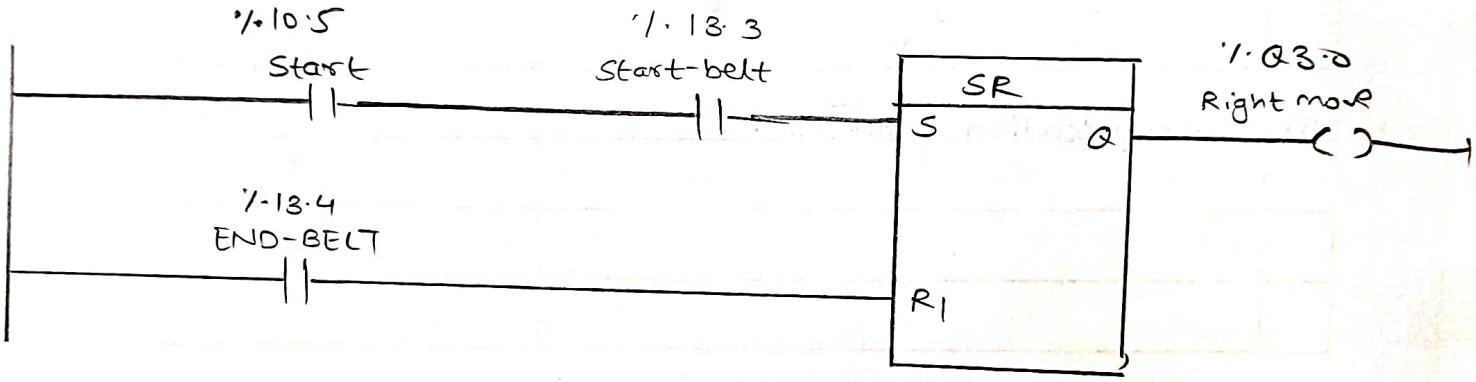
4. What skills did you acquire ?

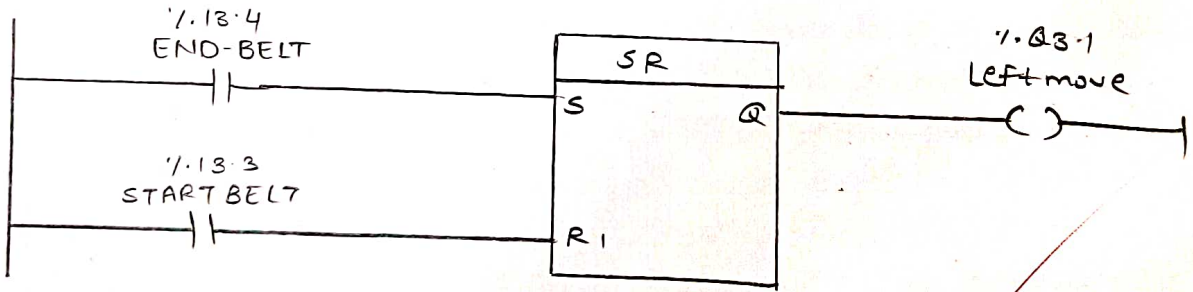
1. Industrial Automation Knowledge
2. HMI Development & configuration
3. PLC programming
4. Communication protocols.
5.
6.
7.
8.

5. Time taken to complete the activity ? 2

PLC Tag Table:

Name	Data Type	Address
Start	BOOL	%I0.5
Start-belt	BOOL	%I3.3
end-belt	BOOL	%I3.4
left move	BOOL	%Q3.1
right move	BOOL	%Q3.0
Store	BOOL	%M0.0
Store-1	BOOL	%M0.1

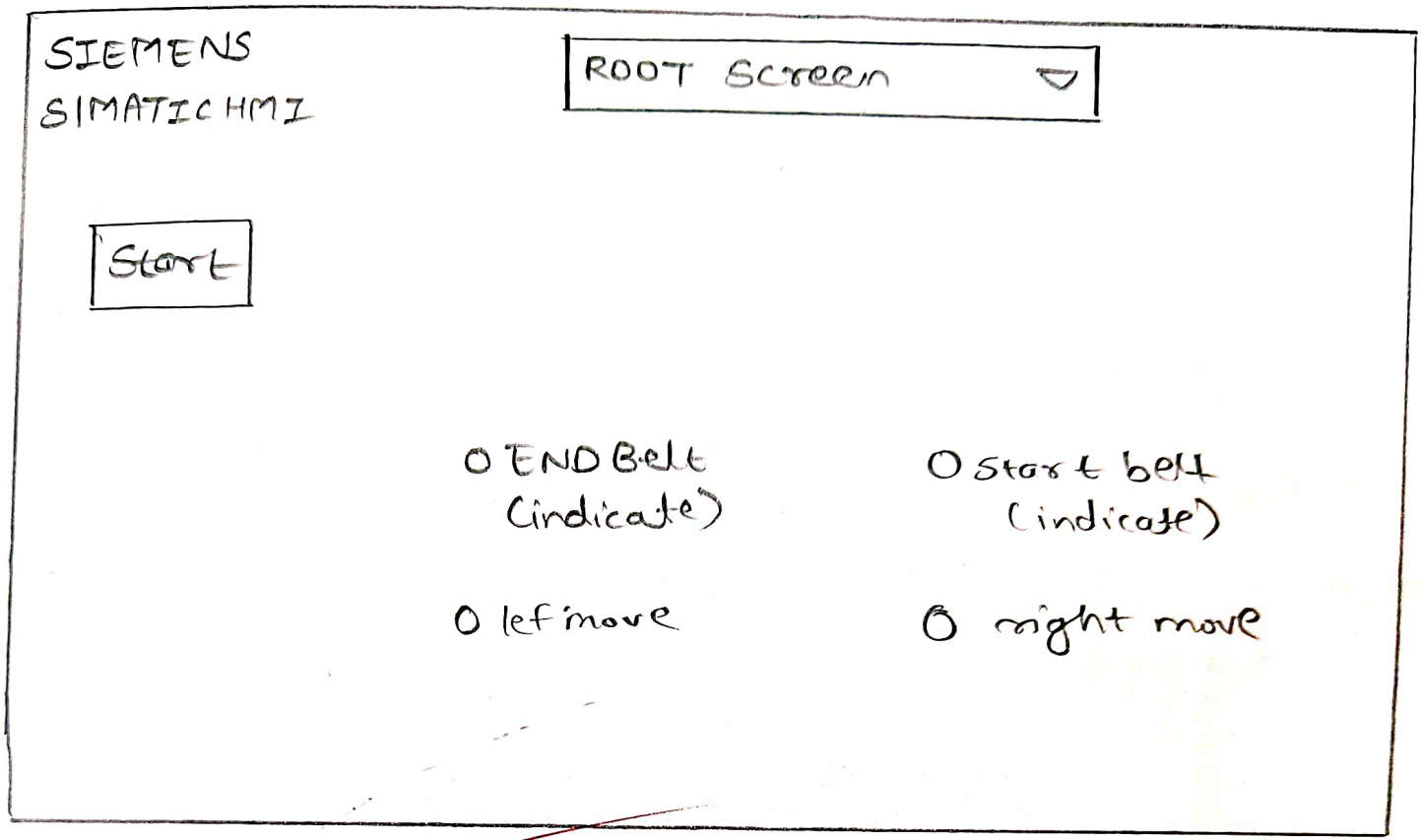




HMI Tag Table:

Name	Data Type	Connection	PLC-name	Address
HMI Start	BOOL	HMI-Connection	Start	%M0.0
HMI-left	BOOL	HMI-Connection	left-limit	%I3.3
HMI-right	BOOL	HMI-Connection	right limit	%I3.4
HMI-1move	BOOL	HMI-Connection	move left	%Q3.1
HMI-1move	BOOL	HMI connection	move right	%Q3.0

HMI Interface:-



SKILL ACTIVITY NO: 5

Date : 10/03/25

(To be filled by the Instructor)

Title : Water level controller with HMI for observing water level and receving set points for control.

Skills / competencies to be acquired :

1. HMI Development :- Designed and
2. interface for real time water
3. Automation and PLC Programming :-
4. PLC for automated water level
5. implemented a human machine
6. monitoring & control.
7. Configured and programmed
8. management

Duration of activity (hours) : 2 Hr

(To be filled by the Student)

1. What is the purpose of this activity ? (Explain in 3 - 4 lines)

The purpose of this activity is to design and implement an automated water level controller with a Human Machine Interface for real time monitoring and control. The system automatically turns ON the pump when water level reaches at lower limit and turns off when it reaches upper limit to prevent overflow.

2. Steps performed in this activity (Explain in 5 - 6 lines)

1) Open TIA V14 and create project.
2) Define input %I0.1 to start pump and connect pump to PLC output Q0.1.
3) Write a ladder program where pump turns ON when low level sensor is active and turns off when high level sensor is active.
4) Code & compile the program, upload program to PLC.

3. What resources / materials / equipments / tools did you use for this activity ?

1. TIA portal
2. PLC S7-1200
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

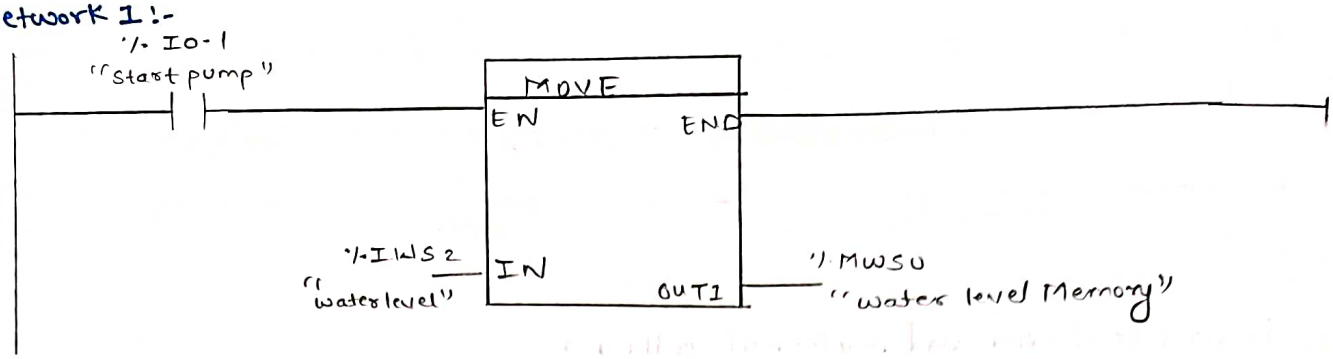
4. What skills did you acquire ?

1. Learnt to design & implement a Human-
2. monitoring of water levels.
3. Integrated PLC with sensor and
4. level control.
5. Machine Interface for real time
6. _____
7. actuator for automated water
8. _____

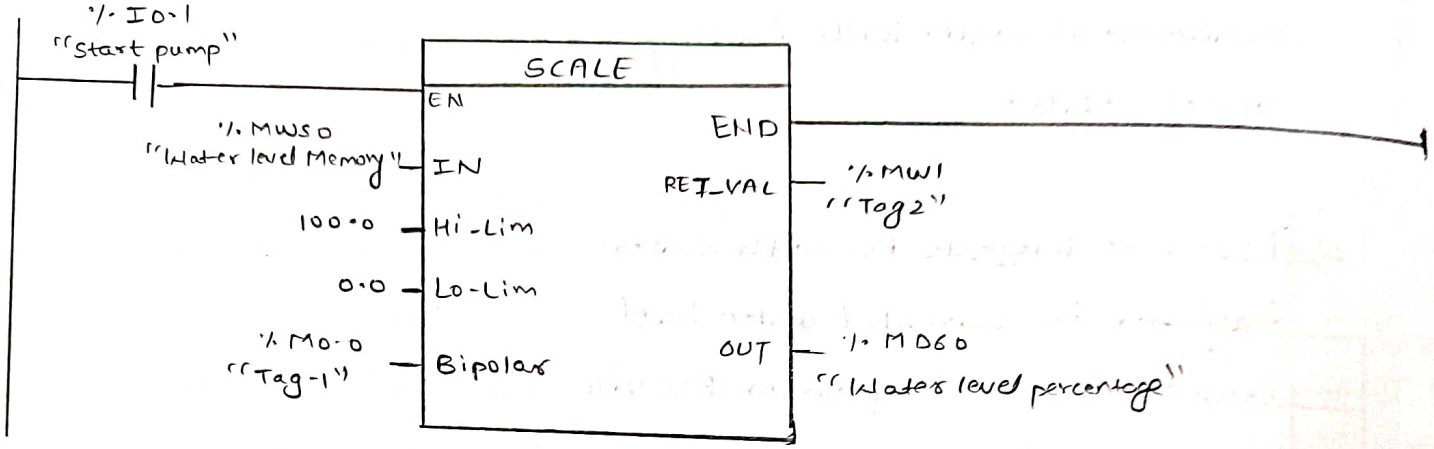
5. Time taken to complete the activity ? 2 (hours)

(Signature)

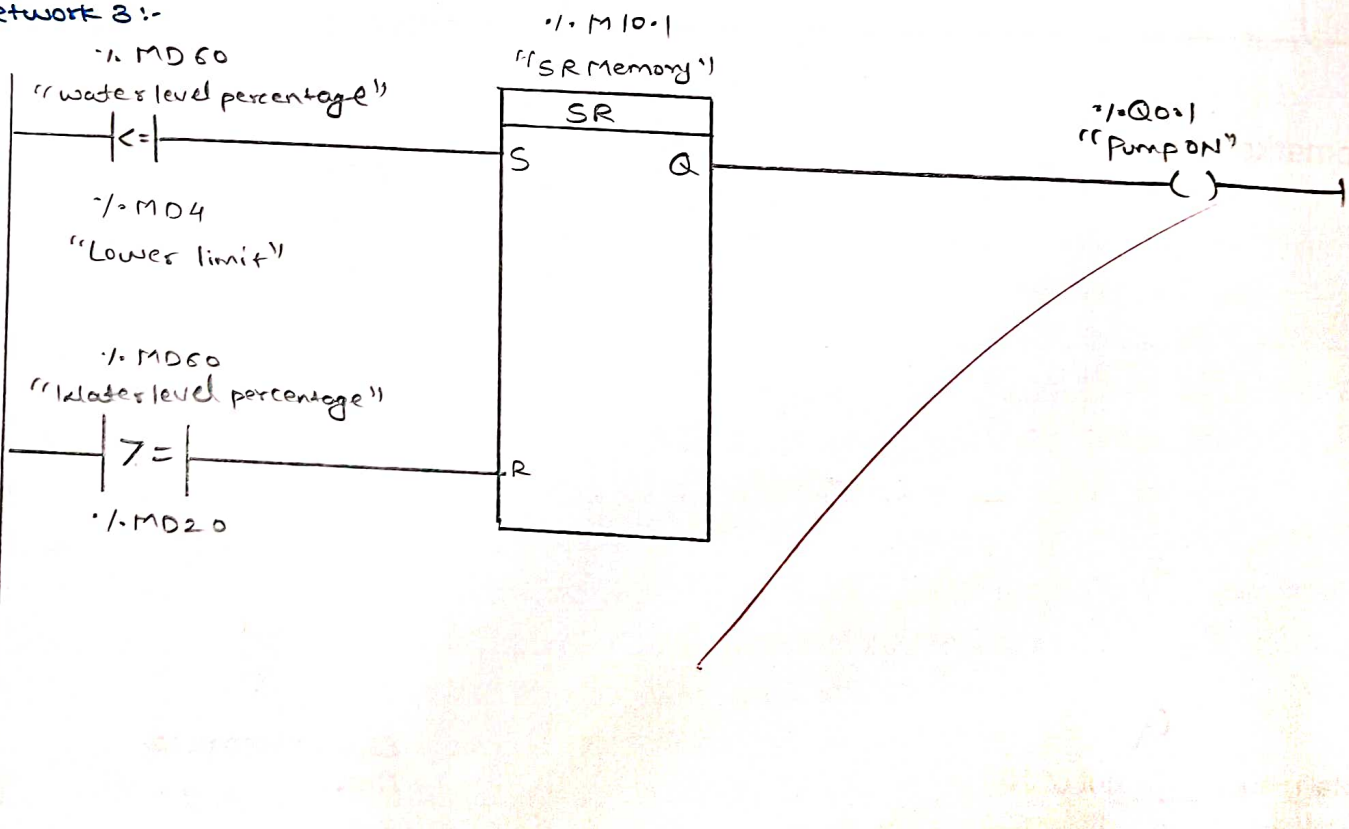
Network 1:-



Network 2:-



Network 3:-



PLC Tags :-

Name	Data Type	Address
START	BOOL	%M10.2
Pump ON	BOOL	%Q0.1
Water level	Int	%IW62
Water level Memory	Int	%MW50
Start pump	BOOL	%I0.1
Tag-1	BOOL	%M10.0
Tag-2	Word	%MW1
Water level percentage	Real	%MD60
SR Memory	BOOL	%M10.1
Upper limit	Real	%MD20
lower limit	Real	%MD4
Reset	Real	%I0.2

HMI Tags :-

Name	Tag Table	Data Type	PLC Tag	Address
HMI lower limit		Real	"Lowerlimit"	%MD4
HMI-Start	Default	BOOL	START	%MI0.2
HMI-Upperlimit	Tag Table	Real	"Upper limit"	%MD20
HMI Water %		Real	"Water level"	%MD60

SKILL ACTIVITY NO: 6

Date : 25/05/25

(To be filled by the Instructor)

Title : Profibus communication with S7-300 and S7-1500 logic to skip the 3 pulses from the proximity sensor for forward & reversing the conveyer moment.

Skills / competencies to be acquired :

1. Profibus communication between S7-300
2. Pulse skip logic using proximity sensor
3. Conveyor control (forward/reverse)
4. Cross-PLC data exchange.
5. & S7-1500.
6.
7.
8.

Duration of activity (hours) : 2 Hrs

(To be filled by the Student)

1. What is the purpose of this activity ? (Explain in 3 - 4 lines)

The purpose of this skill activity is to enable communication between S7-300 and S7-1500 via profibus and to control conveyor direction by skipping initial pulses from a proximity sensor for precise movement.

2. Steps performed in this activity (Explain in 5 - 6 lines)

1) Create a new project in TIA portal.
2) Add S7-300 and S7-1500 CPUs.
3) Configure profibus network between PLCs.
4) Setup I/O tags (sensor, counter, conveyor control).
5) Write pulse counting and skip logic.
6) Add conveyor forward/reverse control.
7) Establish data exchange (DBC or PUT/GET)
8) Download, test & monitor the system.

3. What resources / materials / equipments / tools did you use for this activity ?

1. Computer
2. PLC
3. Tia V14 Software
4.
5.
6.
7.
8.

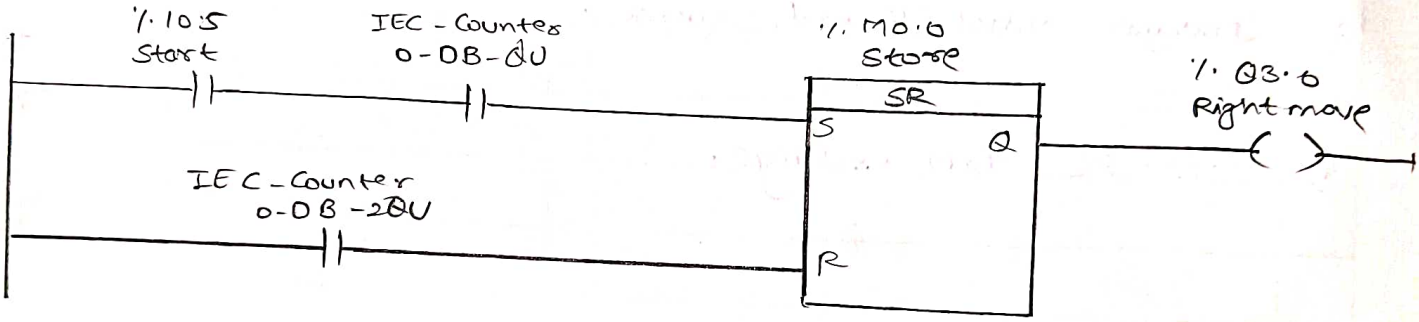
4. What skills did you acquire ?

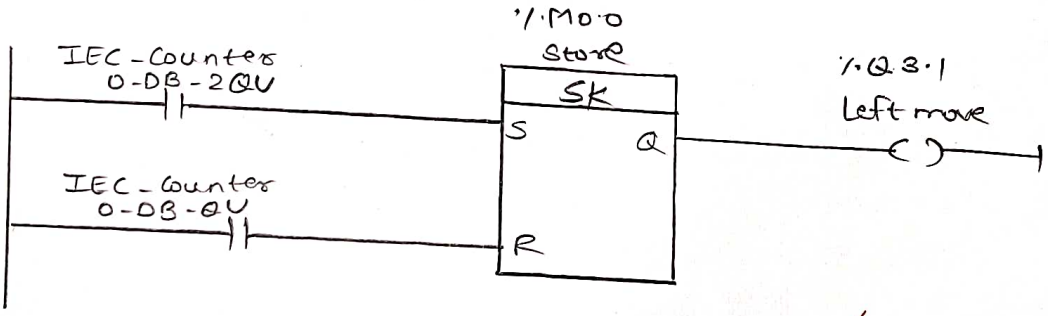
1. Profibus communication between S7-300 & S7-1500.
2. Pulse skip logic using proximity sensor.
3. Conveyor control (forward / reverse).
4. Cross-PLC data exchange.
5.
6.
7.
8.

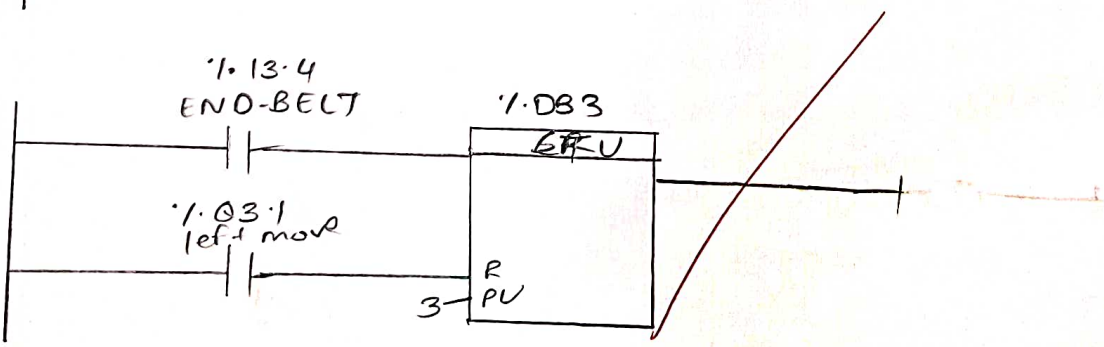
5. Time taken to complete the activity ? 2 (h

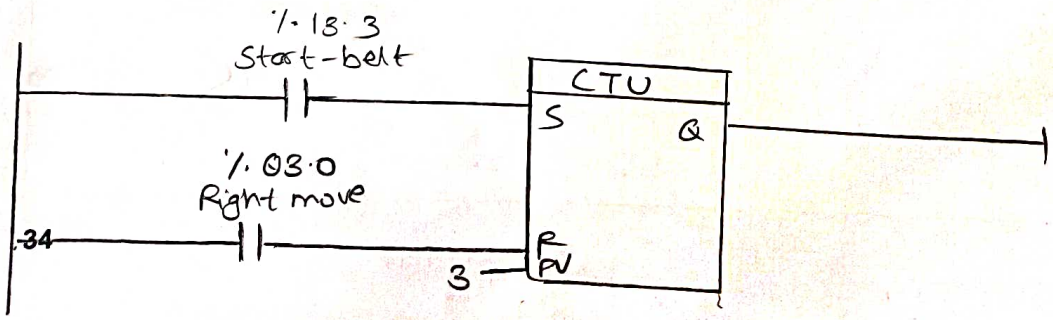
Name	Data Type	Address
Start-belt	BOOL	%I14.3
end-belt	BOOL	%I14.4
right-mov	BOOL	%Q3.0
left-mov	BOOL	%Q3.1
Start	BOOL	%I10.5
Store	BOOL	%M0.0
Store1	BOOL	%M0.1

Name	Data Type	Address
Start-belt	BOOL	%I13.3
end-belt	BOOL	%I13.4
right-mov	BOOL	%Q3.0
left-mov	BOOL	%Q3.1
Start	BOOL	%I10.5
Store	BOOL	%M0.0
Store1	BOOL	%M0.1









SKILL ACTIVITY NO: 7

Date : 30/04/25

(To be filled by the Instructor)

Title : HMI Project [Water level Monitoring].

Skills / competencies to be acquired :

1. Able to configure HMI
2. HMI development and PLC Programming
3. Knowledge of Industrial Automation
4. Understanding the integration of level sensor
5.
6.
7.
8.

Duration of activity (hours) : 2Hr.

(To be filled by the Student)

1. What is the purpose of this activity ? (Explain in 3 - 4 lines)

The purpose of this skill activity is to develop and configure the HMI screen for the water level filling of the tank and to develop ladder logic for it.

2. Steps performed in this activity (Explain in 5 - 6 lines)

1) Add PLC 1200 into the project.
2) Add tank filling model into it.
3) Develop a ladder logic for it.
4) Debug and compile the ladder logic.
5) Download the logics
6) Observe the filling of the water in three tank.

3. What resources / materials / equipments / tools did you use for this activity ?

1. Siemens PLC 1200
2. TIA Portal V14
3.
4.
5.
6.
7.
8.

4. What skills did you acquire ?

1. Able to configure HMI.
2. HMI development & PLC programming.
3. Knowledge of industrial automation.
4. Understanding the implementation of level sensor.
5.
6.
7.
8.

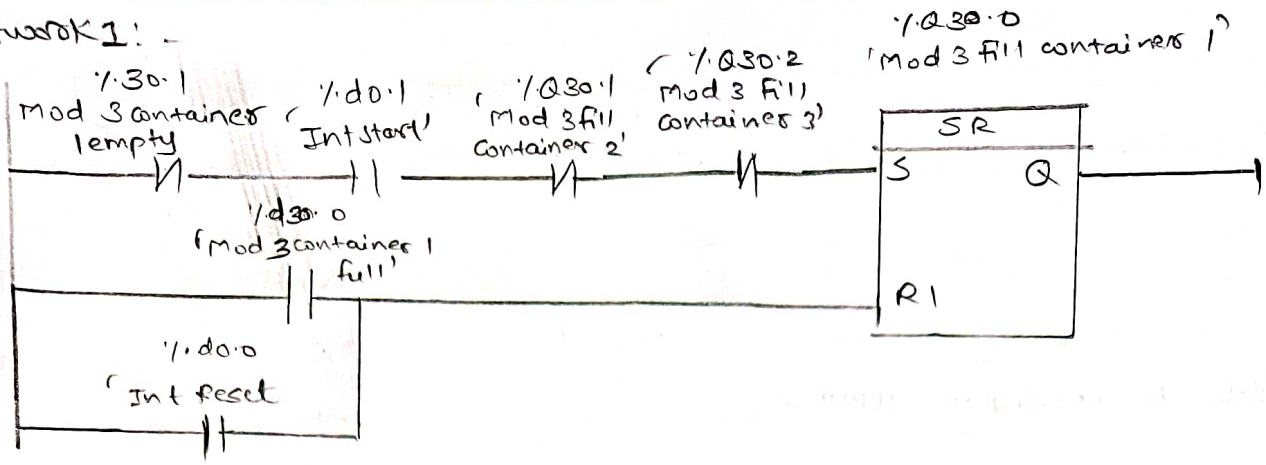
5. Time taken to complete the activity ? 2 (hours)

(To be filled by Instructor)

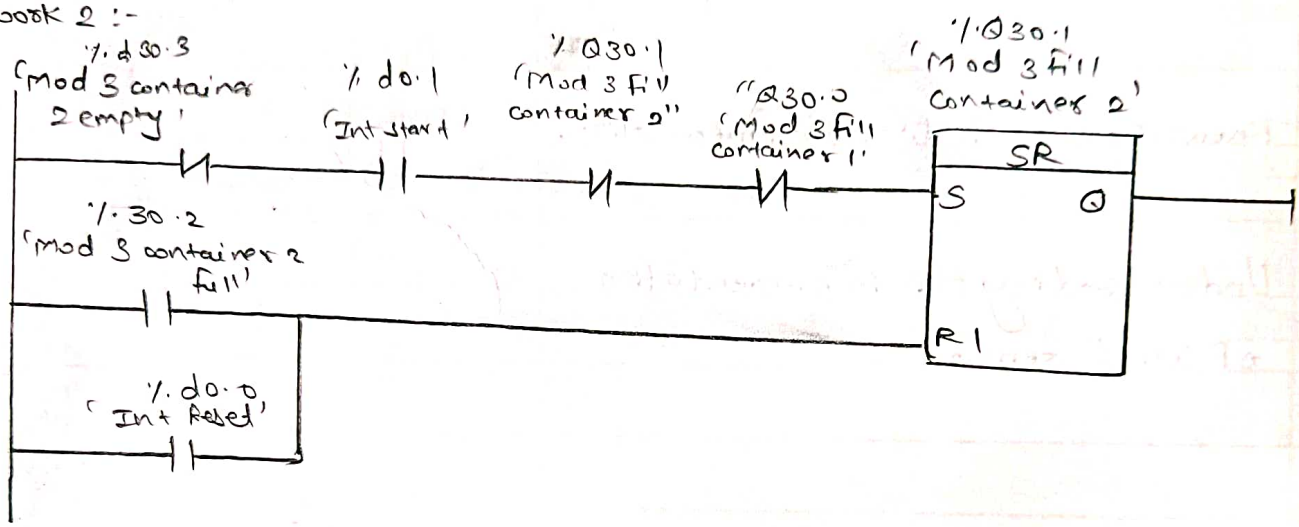
Sr. No.	Skills / Competencies	Achieved / Not Ach (YES / NO)
1)	Able to configure HMI.	
2)	HMI development & PLC programming.	
3)	Knowledge of industrial automation.	
4)	Understanding the implementation of level sensor.	

Remarks

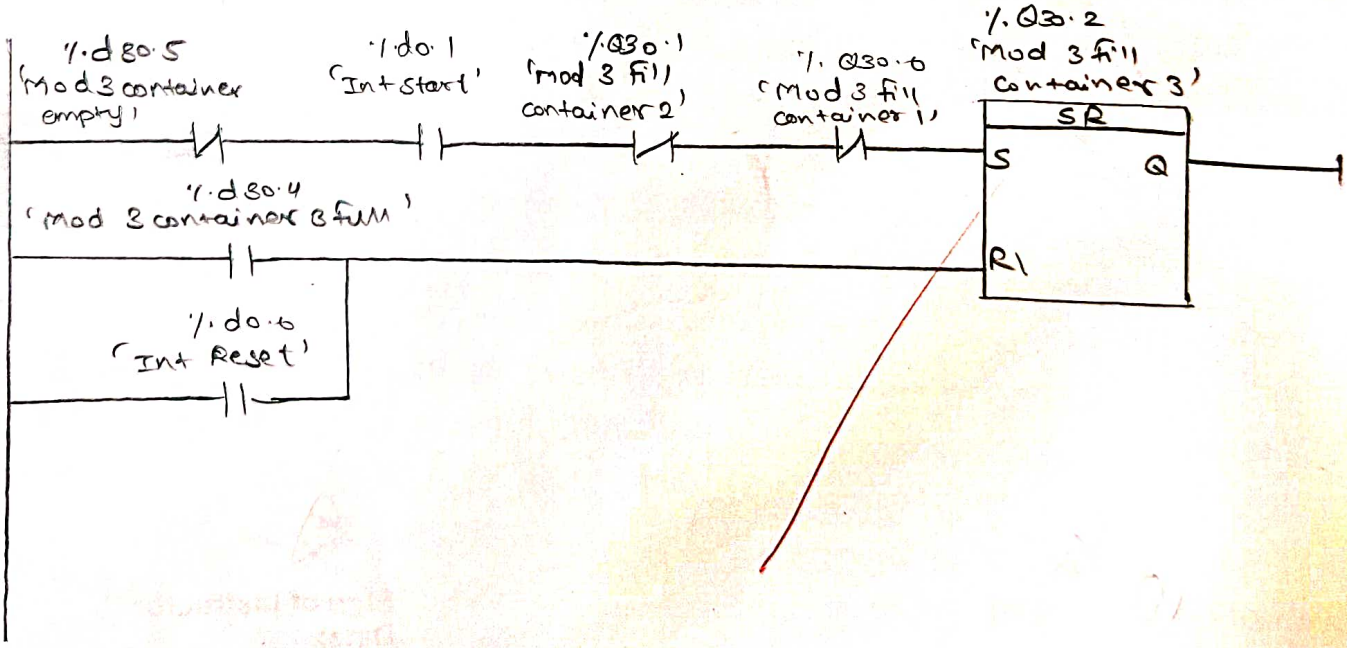
Network 1: -



Network 2 :-



Network 3 :-



Name	Datatype	Address
Int start	BOOL	%I0.1
Mod3Cont-1	BOOL	%IB0.1
Fill Mod Cont-2	BOOL	%Q30.1
Fill Container 3	BOOL	%Q30.2
Container Full	BOOL	%I30.0
Int-Reset	BOOL	%I0.0
Fill Container 1	BOOL	%Q30.0