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Bengaluru

Mid Term Examinations - October 2026

Date: 06/10/2026 **Time:** 09:30 AM - 11:00 AM

Course Code: EEE3102 **Course Name:** Fundamentals of industrial automation

Semester: Seventh Semester **Max. Marks:** 50 **Weightage:** 50%

CO - Levels	CO1	CO2	CO3
Marks	24	22	44

PART A: Answer Following Questions. 10 M

Q.N.	Questions	M	CO	BT
1	Apply the PLC processor scan cycle to explain the operation of a PLC system.	2	CO1	BT3
2	Use the concept of a logical rack to determine the I/O address of a PLC module.	2	CO1	BT3
3	Demonstrate the use of XIC and XIO instructions in a Ladder Diagram program.	2	CO2	BT3
4	Apply the Preset and Accumulated time values to determine the operating status of a PLC timer.	2	CO3	BT3
5	Use an internal bit (B3 file) to implement intermediate control logic in a PLC program.	2	CO3	BT3

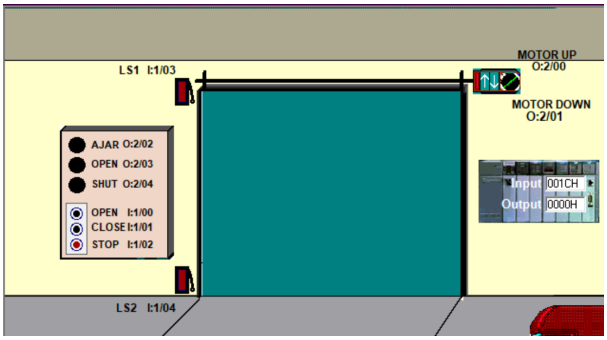
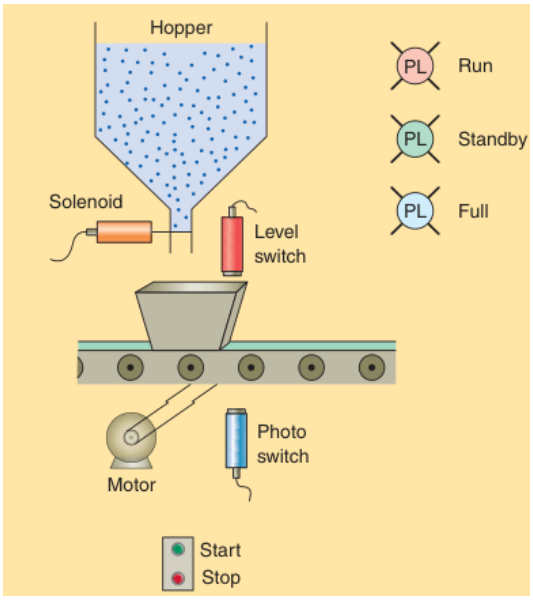
PART B : Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT
6	An automated conveyor system is controlled using a PLC. Apply the principles of PLC operation to explain how the scan cycle reads input signals, executes the control program, and updates the outputs to achieve the desired conveyor operation.	10	CO1	BT3
7	An industrial sorting system incorporates push buttons, limit switches, indicator lamps, and solenoid valves interfaced with a PLC. Apply the operating principles of discrete input and output modules to illustrate suitable interfacing circuits for connecting these field devices to the PLC and enabling reliable system operation.	10	CO1	BT3

PART C: Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT

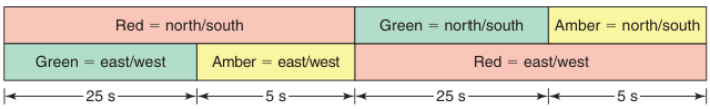
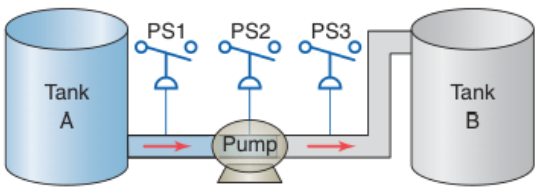
PTO (Please Turn Over)

8	A motorized overhead garage door is controlled using a PLC. The system consists of a reversing motor contactor for UP and DOWN directions, a normally closed UP limit switch, a normally closed DOWN limit switch, normally open UP and DOWN pushbuttons, a normally closed STOP pushbutton, a red DOOR AJAR indicator lamp, a green DOOR OPEN indicator lamp, and a yellow DOOR CLOSED indicator lamp. The door shall travel upward when the UP pushbutton is pressed and stop automatically when the UP limit switch is actuated. Similarly, the door shall travel downward when the DOWN pushbutton is pressed and stop automatically when the DOWN limit switch is actuated. Pressing the STOP pushbutton shall stop the motor, and the motor must be stopped before changing the direction of travel. Construct the PLC ladder logic program for the garage door control system and assign suitable PLC I/O addresses for all field devices. 	10	CO2	BT3
9	A continuous filling system consists of a conveyor, START and STOP pushbuttons, a photosensor, a level sensor, a solenoid filling valve, a RUN status lamp, a STANDBY status lamp, and a FULL indicator lamp. The conveyor shall start when the START pushbutton is momentarily pressed and stop when the STOP pushbutton is momentarily pressed. The RUN lamp shall be energized when the process is operating, and the STANDBY lamp shall be energized when the process is stopped. When the right edge of a box is detected by the photosensor, the conveyor shall stop automatically. With the box in position, the solenoid valve shall open to fill the box. Filling shall continue until the level sensor detects the required level, after which the solenoid valve shall close. The FULL indicator lamp shall energize when the box is full and remain energized until the box moves clear of the photosensor. Construct a PLC ladder logic program and assign suitable PLC I/O addresses to implement the required sequence of operation. 	10	CO2	BT3

PART D: Answer Any 1 Following Questions. 10 M				
Q.N.	**Questions**	**M**	**CO**	**BT**

10	A PLC-controlled system uses ON-delay timers to perform sequential operations. Two timers are cascaded such that the output of timer T4:1 controls the input of timer T4:2. In addition, two interconnected timers form an oscillator circuit that generates periodic output pulses for flashing alarm indication lamps. The flasher output is enabled only when an alarm condition (such as temperature, pressure, or limit-switch fault) occurs. The system also requires a total time delay of 42,000 s, achieved by cascading multiple timers, where timer T4:1 is preset to 30,000 s and initiates the subsequent timer sequence when the input switch is activated. Construct a PLC ladder logic program using cascaded ON-delay timers and oscillator logic to implement the required sequential timing, alarm flashing, and extended time-delay functions. Assign suitable PLC I/O addresses for all inputs and outputs.	10	CO3	BT3
11	A PLC-based motor control system is used to start a lube-oil pump motor, a main drive motor, and a feed motor in sequence. The lube-oil pump motor shall start when the START pushbutton is momentarily pressed and stop when the STOP pushbutton is pressed. When sufficient oil pressure is developed, a lube-oil pressure switch (PS1) shall close to start the main drive motor and initiate a 15 s time-delay period. After the preset time delay expires, the feed motor shall start automatically. Using appropriate sealing, timer, and control logic, construct a PLC ladder logic program and assign suitable PLC I/O addresses to implement the required sequence of operation.	10	CO3	BT3

PART E: Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT
12	A PLC-controlled traffic intersection consists of two sets of signal lights to regulate traffic flow in two directions. The system operates using ON-delay (TON) timer instructions. For Direction 1, the RED light remains ON for 30 s, followed by the GREEN light for 25 s and the AMBER light for 5 s. The sequence is coordinated with the signal lights of Direction 2 to ensure safe traffic movement. After completing one cycle, the sequence repeats continuously. Construct a PLC ladder logic program and assign suitable PLC I/O addresses to control the traffic lights for both directions according to the specified timing sequence. 	10	CO3	BT3
13	A PLC-controlled liquid transfer system is used to pump fluid from Tank A to Tank B. The system consists of a START pushbutton, a STOP pushbutton, a pump motor, and three pressure switches PS1, PS2, and PS3. Before the process can start, PS1 must be closed. When the START pushbutton is pressed, the pump shall start and continue operating after the pushbutton is released. When the STOP pushbutton is pressed, the pump shall stop. Five seconds after the pump starts, pressure switches PS2 and PS3 must remain closed; if either PS2 or PS3 opens, the pump shall shut down immediately and shall not be permitted to restart for 14 seconds. Construct a PLC ladder logic program using appropriate ON-delay and OFF-delay timer instructions and assign suitable PLC I/O addresses to implement the required sequence of operation 	10	CO3	BT3