Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2021

Subject Code:2161709 Date:06/08/2021

Subject Name:Programmable Logic Controller

Time:02:30 PM TO 05:00 PM Total Marks: 70

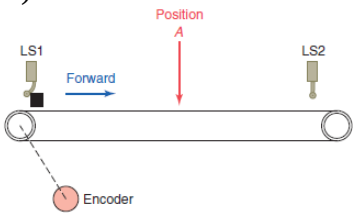
Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	Why PLC replaced Relay logic conventional control in the Industry? Give its reasons.	**03**
	(b)	List the programming languages used for PLC. How it will differ than embedded controller languages? Explain it in brief.	**04**
	(c)	Draw Functional block diagram of PLC and describe each block in details	**07**
Q.2	**(a)**	What the benefits are of fixed I/O's and modular I/O's?	**03**
	(b)	List the name of PLC modules. Justify the need of communication modules for PLC Operation.	**04**
	(c)	Draw and give details of symbols used to prepare Ladder Logic Diagram (LLD)	**07**
		OR	
	(c)	Draw the symbols of input and output devices which will be connected with PLC for control application..	**07**
Q.3	**(a)**	Draw and describe rack/slot based addressing format for Input/output devices of the PLC.	**03**
	(b)	Implement PID module to PLC with neat diagram.	**04**
	(c)	Prepare Ladder Logic Diagram (LLD) for latching of Motor start scheme.	**07**
		OR	
Q.3	**(a)**	How many timers instruction for PLC operation?. Describe TON timer with suitable example	**03**
	(b)	Explain ADD, SUB, MUL and DIV instruction	**04**
	(c)	Develop Ladder logic diagram for each of the following Boolean expressions using AND, OR, and NOT gates: (a) $Y = AB + C\,D$ (b) $Y = A + CD$ (c) $Y = (A + B)(\bar{C} + D)$	**07**
Q.4	**(a)**	Draw and describe PLC Input Module layout	**03**
	(b)	Draw and design LLD to generate wave from with 30% duty cycle at digital output terminal when toggle switch is ON. Take output frequency generated by assigning TIMER as 7 sec On time and 3 sec OFF timer	**04**
	(c)	Prepare LLD to control Traffic light towards only North direction by Turning ON green Lamp for 15 sec, Next turning ON yellow Lamp for 5 sec, and finally turning ON Red Lamp for 120 sec. Repeat it continuously	**07**
		OR	
Q.4	**(a)**	The counter instructions of PLCs are normally retentive. Explain what this means.	**03**
	(b)	Differentiate UP counter versus DOWN Counter	**04**

(c) Develop LLD conveyor belt system **07**

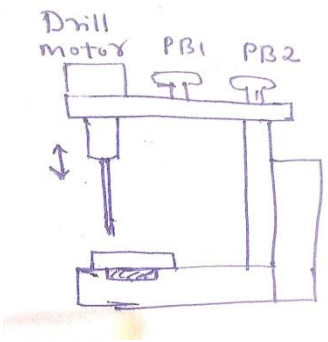
1). Product in position (limit switch LS1 contacts close).
2). The start button is pressed and the conveyor motor starts to move the product forward toward position *A* (limit switch LS1 contacts open when the actuating arm returns to its normal position)
3). The conveyor moves the product forward to position *A* and stops (position detected by 8 off to-on output pulses from the encoder, which are counted by an up-counter).
4). A time delay of 10 s occurs, after which the conveyor starts to move the product to limit switch LS2 and stops (LS2 contacts close when the actuating arm is hit by the product).



Q.5 **(a)** How will Jump and subroutine instruction applicable in PLC programming? Discuss in brief. **03**

(b) Prepare LLD for COMPARE PLC Function **04**
A light to be turned on if a plc counter has value 0r 40 or 75.

(c) Prepare LLD for following Drilling process system. **07**
Drill motor turns on only if there is a part present
Operator has one hand on each of the switches to move down (Switch-1) and Up (Switch-2).



OR

Q.5 **(a)** Enlist data handling Function. Describe for data move and rotate instructions. **03**

(b) Describe with ladder diagram, **04**
FIFO
FAL
ONS
SWEEP

(c) Prepare LLD for following. **07**
A FAN is to be STARTed and STOPed from any one of the three location. Each location has a START and STOP Button.