Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER 2012

Subject code: 710305N **Date: 10/01/2013**

Subject Name: Programmable Logic Controller

Time: 02.30 pm – 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.**

Q.1	**(a)**	Explain solid-state memory chips used in PLC as well as memory map of PLC with hexadecimal addresses.	**07**
	(b)	Explain Internal Architecture of PLC with the help of functional block diagram.	**07**
Q.2	**(a)**	Explain PLC operational cycle including detailed process scan.	**07**
	(b)	Discuss limitations of PLC programming format with suitable examples.	**07**
		OR	
	(b)	Explain start-stop-jog circuits using selector switch and using a control relay with three push buttons. Also draw PLC connection diagram for any one circuit.	**07**
Q.3	**(a)**	Discuss Fail-Safe circuit concept in PLC.	**07**
	(b)	Implement following Boolean expressions using ladder diagrams: (1) Y = ((A+B') . (C' + D)) + (AC'+B'D') (2) Y = (AB+A'B') + (C'D+CD') + (A.B.C'.D')	**07**
		OR	
Q.3	**(a)**	Enumerate the steps needed in planning a program for a large process.	**07**
	(b)	Explain PLC data handling functions used to move data within PLC, with suitable examples.	**07**
Q.4	**(a)**	Explain TON, TOFF and RTO functions with necessary timing diagrams.	**07**
	(b)	Explain advanced comparison functions of PLC.	**07**
		OR	
Q.4	**(a)**	Explain PLC analog signal processing.	**07**
	(b)	Describe levels of Industrial Control with the help of Control System Level Triangle.	**07**
Q.5	**(a)**	Explain PLC Sequencer function with suitable example.	**07**
	(b)	Construct ladder diagram for the following processes:- (1) One NO push button and one DC motor is available. When the Push button is pressed for first time, the motor should be on. When it is pressed for second time the motor should be turned off. Then the sequence should be repeated. (2) Semi finished parts are moving on the conveyor belt which are sensed by proximity sensor. After a count of 10 from the sensor, a paint spray is to run for 20 seconds.	**07**
		OR	
Q.5	**(a)**	Draw schematic diagram, prepare event sequence, list I/O devices with their addresses, construct PLC ladder diagram and draw PLC connection details for the following process:	**08**

Process tank is marked with LEVEL A at 40% of tank height and level switch A is mounted at the same place. The same tank is marked with LEVEL B at 80% of tank height and level switch B is mounted at that place. Initially process tank is empty. When START push button is pressed, Inlet solenoid Valve A should be opened and tank should be filled up to level A. Then Valve A should be closed and another Inlet valve B should be opened. As soon as tank level reaches to level B, valve B should be closed. Then heater and stirrer should be ON for 3 minutes. Then outlet Solenoid valve C should be open until the tank becomes empty and then sequence should be repeated. Entire process operation is stopped when STOP push button is pressed. Assume suitable other data if needed.

(b) Explain FAL, One Shot and Sweep functions of PLC. **06**

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