Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) - EXAMINATION – SUMMER 2016

Subject Code:2161709 **Date:13/05/2016**

Subject Name: Programmable Logic Controller

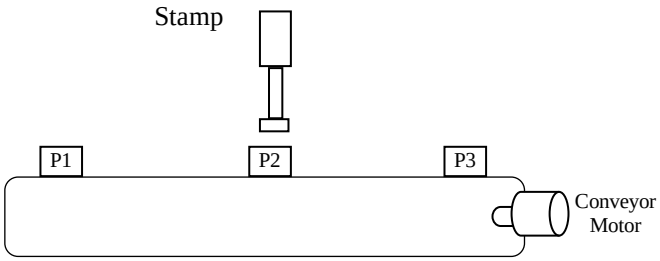
Time: 10:30 AM to 01:00 PM **Total Marks: 70**

Instructions:

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

Q.1	**(a)**	Draw a block diagram of a PLC showing the main functional items and how buses link them, explaining the functions of each block.	**07**
	(b)	What is scan time? Explain the operational cycle of PLC.	**07**
Q.2	**(a)**	List the five standard PLC languages as defined by the International Standard for Programmable Logic Controllers, and give a brief description of each.	**07**
	(b)	Express the following equation in ladder logic program: *1.* X = A + B(A + CB + DAC) + ABCD *2.* F (a,b,c) = Σ (0,1,3,4,6,7)	**07**
		OR	
	(b)	In a system, following components/devices are to be connected with a PLC. The PLC is operated using 24V DC supply. PLC digital input level is 24V DC and output of the PLC is also 24V DC TTL signal. Draw the connections of these components/devices with PLC. (i) a NO pushbutton (ii) a limit switch (iii) a dc motor which is required to be operated in forward and reverse mode (iv) a temperature sensor (v) a flow sensor (vi) a 230 V, single phase Fan	**07**
Q.3	**(a)**	Explain ON delay timer instruction of PLC with timing diagram and suitable ladder logic example.	**07**
	(b)	In an automatic car parking system, entry and exit of a car is detected by sensors. A PLC will keep a record of number of cars enter and exit. Maximum 50 numbers of cars in the parking area. An entry gate (controlled by electric motor) will be kept open only when number of cars in the parking area is less than 50. Design a ladder diagram to control the operation of the entry gate of the car parking system.	**07**
		OR	
Q.3	**(a)**	Name the three forms of PLC counter instructions, and explain the basic operation of each.	**07**
	(b)	Design and draw ladder diagram to generate waveform with 60% duty cycle at digital output terminal when toggle switch is ON. The output frequency is 10Hz.	**07**
Q.4	**(a)**	Explain basic Two-axis Robot with PLC sequencer control	**07**
	(b)	A temperature control system consists of four thermostats controlling three heating units. The thermostat contacts are set to close at 50°, 60°, 70°, and 80°F, respectively. The PLC ladder logic program is to be designed so that at a temperature below 50°F, three heaters are to be ON. Between 50° to 60°F, two heaters are to be ON. For 60° to 70°F, one heater is to be ON. Above 80°F, there is a safety shutoff for all three heaters in case one stays on because of a malfunction. A master switch is to be used to turn the system ON and OFF. Prepare a typical PLC program for this control process.	**07**
		OR	
Q.4	**(a)**	Write short note on “Preventive maintenance of PLC”.	**07**

(b) Develop the PLC base automation for given system. **07**



When a part is placed on the conveyor at position 1, it automatically moves to position 2. Upon reaching position 2, it stops and is stamped. After stamping, it automatically moves to position 3. It stops at 3, where the part is removed manually from the conveyor. Assume that only one part is on the conveyor at a time. Add limit switches, interlocks, start-stop pushbuttons, and other devices required (Use figure as reference).

Q.5 **(a)** Describe PID function of PLC in detail. **07**

(b) Draw and explain the three phase motor control in forward and reverse direction with PLC. **07**

OR

Q.5 **(a)** Explain the following functions in PLC with examples of each. **07**

1. ADDITION
2. SQUARE ROOT
3. Conversion of INTEGER TO DOUBLE INTEGER
4. SET & RESET BIT
5. MOV_W

(b) A machine is connected to a load cell that outputs a voltage proportional to the mass on a platform. When unloaded the cell outputs a voltage of 1V. A mass of 500Kg results in a 6V output. Write a program that will measure the mass when an input sensor (M) becomes true. If the mass is not between 300Kg and 400Kg and alarm output (A) will be turned on. Write a ladder logic program and indicate the general settings for the analog module. **07**

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