Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER II (NEW) – • EXAMINATION – SUMMER 2016

Subject Code: 2725407 **Date: 27/05/2016**

Subject Name: Programmable Logic Controllers and Applications

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)** Write a short note of Function Block Diagram (FBD) used to program PLC. Also design function block diagram for the following Boolean expression. **07**

$$Y = \overline{\bar{C}\left(\bar{A} + \left(\overline{\bar{A} + \left(\overline{\bar{B}\bar{C}\left(\overline{A + \overline{B\bar{C}}}\right)}\right)}\right)\right)}$$

(b) Draw a block diagram of a PLC showing the main functional items and how buses link them, explaining the functions of each block. **07**

Q.2 **(a)** Design and implement PLC ladder logic diagram and PLC FBD for three digital inputs A, B, C and one digital output Y as per following truth table. **07**

A	B	C	Y
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	0

(b) Explain scan cycle, scan time and significance of scan time for PLCs. **07**

OR

(b) Explain the continuous updating and the mass input/output copying methods of processing inputs/outputs. **07**

Q.3 **(a)** Explain Retentive On Delay timer instruction in PLC with timing diagram and suitable example. **07**

(b) Explain analog input modules in PLC with suitable block diagram. **07**

OR

Q.3 **(a)** Explain Up-Down counters in detail. **07**

(b) Explain different data comparison functions in PLC. **07**

Q.4 **(a)** Design and draw a ladder diagram for the equation $Y = X^2 + sinX + 2$ where X is the initial value and Y is the final output. **07**

(b) With suitable example and timing diagram, explain PULSE timer used in PLC programming. **07**

OR

Q.4 **(a)** List and explain different JUMP instructions in PLC with suitable examples. **07**

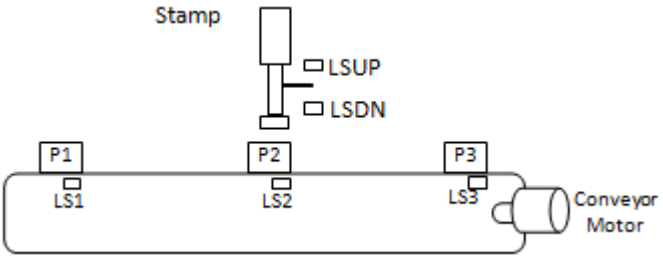
(b) Design and draw ladder diagram to generate square wave at digital output terminal with ON time of 5 seconds and OFF time of 10 seconds when toggle switch is ON. **07**

Q.5 **(a)** Design a FBD program for following process. A temperature control system consists of three thermostats. The system operates two heating units. The thermostats are set on 70°C, 75°C and 80°C. Below 70°C, two heaters are on. The temperature between 70°C and 75°C causes one heater to be on. Above 80°C, there is safety shutoff for two heaters in case one stays on by mistake. A master switch turns the system on and off. **07**

(b) Develop the PLC ladder diagram for Car parking system which is having two separate door of entry and exit, which is operated by motor M1 and M2 in order. The detection of car is being done by proximity sensor P1 and P2 in order. Total capacity of system is 10 Cars. Entry door will be close if parking is full, and exit door will be close if parking is empty. Assume other require i/o. **07**

OR

Q.5 **(a)** Create the PLC system for given control action. **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, pushbuttons, and other devices required. Figure is only for reference.

(b) Develop the PLC ladder logic diagram for the control of traffic lights in four directions. The timing chart is shown in following figure. **07**

← 30 Seconds →		← 30 Seconds →	
Red=North/South		Red=East/West	
Green=East/West	Yellow=East/West	Green=North/South	Yellow=North/South
← 25 Seconds →	← 5 Seconds →	← 25 Seconds →	← 5 Seconds →

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