# GUJARAT TECHNOLOGICAL UNIVERSITY
## ME SEMESTER II EXAMINATION – SUMMER 2017

**Subject Code: 2725407**                                   **Date:29/05/2017**
**Subject Name: Programmable logic Controllers and Applications**
**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.**

| | | | |
|---|---|---|---|
| **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. $$Y = \overline{(AB\bar{C}D + AB\bar{C}\bar{D} + \bar{A}BCD + \bar{A}\bar{B}CD)} + D$$ | 07 |
| | **(b)** | Explain PLC architecture with suitable diagram. | 07 |
| **Q.2** | **(a)** | Explain scan cycle, scan time and significance of scan time for PLCs. | 07 |
| | **(b)** | Discuss various logic gates (AND, OR, NOT, NAND, NOR, XOR, XNOR) using FBD and Ladder logic diagram. | 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 Up-Down counter instruction of PLC with suitable ladder logic example. | 07 |
| | | **OR** | |
| **Q.3** | **(a)** | Explain OFF delay timer instruction of PLC with timing diagram and suitable ladder logic example. | 07 |
| | **(b)** | With suitable example and timing diagram, explain PULSE timer used in PLC programming. | 07 |
| **Q.4** | **(a)** | List different arithmetic operations which can be carried out by PLC. Explain anyone arithmetic operation with a programming example in ladder diagram. | 07 |
| | **(b)** | Explain analog input modules of PLC with suitable diagram. | 07 |
| | | **OR** | |
| **Q.4** | **(a)** | List and explain different JUMP instructions in PLC with suitable examples. | 07 |
| | **(b)** | Explain analog output modules of PLC with suitable diagram. | 07 |
| **Q.5** | **(a)** | Two flash lights (L1 and L2 respectively) operation is to be controlled by PLC. When START pushbutton is pressed momentarily, operation of the lights will turn ON, where L1 will remain ON and L2 will remain OFF for 5 seconds. Thereafter L1 will turn OFF and L2 will turn ON for 8 seconds. This ON and OFF process for both L1 and L2 for 5 seconds and 8 seconds will continue until a STOP pushbutton is pressed. Develop and draw ladder diagram to control this operation. | 07 |

**(b)** Develop the PLC ladder diagram for the following system. When the start push button is pressed, a stacker (S) starts stacking metal sheets at position A. When 15 sheets are stacked there is a pause of 2 seconds and then conveyor starts and sheet moves to position B. When stacked sheets reach at the position B, conveyor stops and paint is applied for 15.5 seconds through paint spray mechanism. After painting is complete there is a pause of 1 minute. Then again conveyor starts and transfers the metal sheets to position C from where stack is removed manually. Assume that only one stack is on conveyor at a time. Add emergency stop push button to stop the process immediately.  **07**

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**OR**

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**Q.5 (a)** Create the PLC system for given control action.  **07**
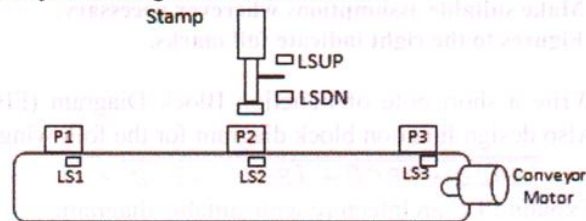


When a part is placed on the conveyor at position 1, it automatically moves to position 2. Upon reaching position 2, it stops and is stamped. After stamping, it automatically moves to position 3. It stops at 3, where the part is removed manually from the conveyor. Assume that only one part is on the 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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