

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER– VI (New) EXAMINATION – WINTER 2019****Subject Code: 2161709****Date: 11/12/2019****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.

- Q.1**
- (a) Implement the ladder diagram for 4 to 1 multiplexer. **03**
- (b) In drawing room there are three fans (P, Q, R), each having its own start and stop pushbuttons. Any one or two fans may run at a time (i.e. all three fans cannot run at a time). Implement this system in PLC ladder diagram. **04**
- (c) A parking lot is automated with a PLC which counts the number of cars that enter and exit and if the parking lot is about to be full, PLC sends a Red light signal to say that the parking is full. The capacity of this parking lot is assumed to be 100 cars. When there are less than 100 but more than 50 cars in the parking lot, Green light remains on. When there are less than 51 and more than 0 cars in the lot, blue light remains on. At a time not more than one light remains on. Draw PLC ladder diagram. **07**
- Q.2**
- (a) Develop a ladder diagram of OR and EX-OR Logic gates. **03**
- (b) Implement the following Boolean equations in PLC ladder diagrams. **04**
- (i)  $Y = (AB' + A'B)C$
- (ii)  $Z = (P+Q+R).(D+E).G'.H$
- (c) For the wood cutting application, when switch IN001 is on, both the saw (Output A) and the blower (Output B) go on at the same time. The saw goes off after 20 seconds and the blower continues to run till the system is turned off by switches. Draw timing diagram of the system. **07**
- OR**
- (c) Two liquids A and B have to be taken in equal quantities in one tank when START pushbutton is pressed. Stir the mixture for 30 minutes using motor operated stirrer. Then open the drain valve for 60 minutes to let out the mixture. Keep provision of emergency STOP button X0 to disable all the outputs and to stop the system running. **07**
- Include red pilot light for system on and green pilot light when tank is fully drained.
- Draw the operation layout of the system, list procedural steps, inputs and outputs of the system. Draw PLC ladder diagram of the system.
- Q.3**
- (a) What is the importance of PLC scanning? Explain PLC scanning with the help of necessary figures. **03**
- (b) Draw block diagram of PLC system and explain it. **04**
- (c) There are three conveyors A, B, and C. Sensors are connected to each conveyor. Packed boxes having 5, 10, and 15 number of soaps pass through conveyor A, B and C, respectively. Find the total number of soaps produced in one hour and store it in holding registers HR100 and HR101 of PLC. Assume no overflow in registers. **07**

**OR**

- Q.3** (a) List 2 discrete input devices, 2 discrete output devices, 2 analog input devices, and 2 analog output devices that can be connected to a PLC. **03**  
(b) Explain solid state memory organization in PLC with the help of memory map. **04**  
(c) Draw and explain basic two-axis pick and place robot with PLC sequencer control. **07**
- Q.4** (a) Explain SKIP function of PLC with example. **03**  
(b) Draw and explain Input module of PLC. **04**  
(c) The linear input of 0 to 80 volts is to be displayed on a 9999-maximum count BCD output. Assume input module volts 0 to 5 volts, 128 steps binary. Trace 32 volts through the PLC system (input signal, conversion, input module, CPU, output module etc) and draw it. **07**
- OR**
- Q.4** (a) Explain MCR instruction of PLC. **03**  
(b) Explain TABEL-TO-REGISTER (TR) MOVE function of PLC. **04**  
(c) Two linear input signals of 0 to 4 volts are to be multiplied and the result put out on a linear output of 0 to 150 volts. Trace the numbers through PLC system if the inputs are 2.85 and 3.45 volts. **07**
- Q.5** (a) List major considerations in choosing a fuse for PLC. **03**  
(b) Write a brief note on PLC network communication. **04**  
(c) List various shift register functions of PLC and explain any two of them in detail. **07**
- O**
- Q.5** (a) List out various PLC manufacturer brand. **03**  
(b) What is the use of interrupt instructions in PLC? Explain any one instruction. **04**  
(c) Explain PLC sequencer functions in detail with application. **07**
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