Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII(NEW) EXAMINATION – SUMMER 2019

Subject Code:2182001 **Date:15/05/2019**

Subject Name:Programmable Logic Controllers

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.**

			MARKS
Q.1	**(a)**	Explain functions of PLC I/O modules.	**03**
	(b)	List and explain any four advantages of PLC based control systems over conventional relay based control systems.	**04**
	(c)	Explain the factors to be considered at the time of PLC purchase.	**07**
Q.2	**(a)**	Explain advantages of remote I/O modules for PLC.	**03**
	(b)	Convert the following ladder logic (figure 1) into a Boolean equation, simplify the Boolean equation and convert back it to simplified ladder logic.	**04**

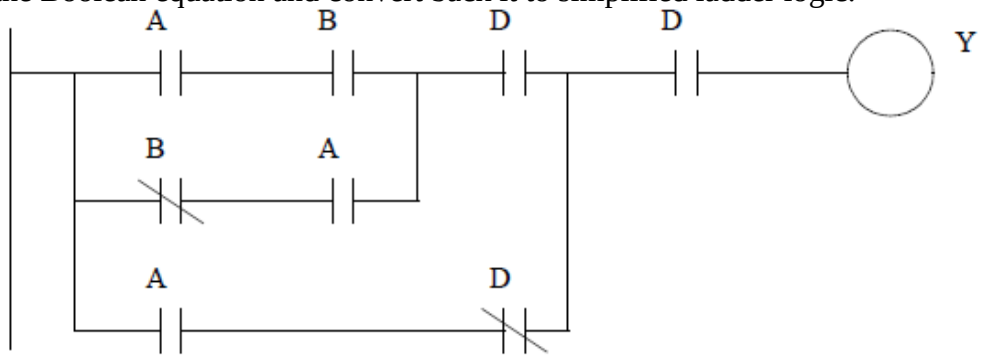

Figure 1

	(c)	Explain digital DC input module of PLC using suitable diagrams.	**07**
		OR	
	(c)	Sketch the wiring for following outputs with a PLC. (1) A 12V DC (PMDC) motor with forward and reverse operation (2) A 230V, 1-phase AC lamp (3) A 230V, 1-phase AC heater (4) A 24V DC lamp	**07**
Q.3	**(a)**	What is latching? Explain how latching is done in ladder network.	**03**
	(b)	Develop and draw Functional Block Diagram (FBD) program for the following application When START push button is pressed momentarily, an output X will turn ON. If another push button is pressed momentarily while X is on, another output Y will turn ON. When STOP push button is pressed momentarily, only X will turn OFF. Y can be turned OFF by separate push button only if X is off	**04**
	(c)	Give Instruction List (IL) program for the ladder diagram given in figure 2	**07**
		OR	
Q.3	**(a)**	Give IL program for the following Boolean expression O=A(BC)+D(B+C) Where O=digital output, A, B, C and D are digital inputs.	**03**

(b) Give Sequential Function Chart (SFC) programming for the following: **04**
(i) Two input EX-OR gate
(ii) Two input EX-NOR gate

(c) Design and draw Functional Block Diagram (FBD) program for the ladder diagram given in figure 2. **07**

Q.4 **(a)** Explain ON delay timer instruction for PLC with its timing diagram. **03**

(b) Develop ladder diagram for the following operation: **04**
A machine M is to be turned on either when 11 parts are sensed at position A or when 16 parts are sensed at position B. One stop button resets the entire process.

(c) Four outputs (Q, W, E and R) will be started when START push button is pressed. When STOP push button is pressed, Q and W will be stopped immediately. If STOP is pressed within 20 seconds of pressing START, then E will remain on for 5 seconds extra and R will remain on until another push button C is pressed (only if Q is not ON). But if STOP is pressed 20 seconds after pressing START, E will remain on until another push button D is pressed and R will be stopped immediately when Q is stopped. Develop and draw PLC ladder diagram to control the system. **07**

OR

Q.4 **(a)** Using suitable diagram, explain DOWN counter instruction for PLC. **03**

(b) Explain OFF delay timer instruction for PLC with its timing diagram and suitable example. **04**

(c) In automatic temperature control system of fluid is to be controlled by PLC. An electric heater is used. The heater is operated by 230 V, single phase, AC supply. A temperature sensor is used to measure temperature of fluid. The sensor output is 0V to 10V DC for the temperature range of 0°C to 100°C. The sensor output is linear with the change in temperature. There is a START (NO) pushbutton and a STOP (NC) pushbutton. The system operates as follow: **07**
- When START is pressed, initial temperature will be recorded by PLC. - After 10 seconds, heater will turn ON and will remain ON for 1 minute.
- After waiting for 5 seconds, heater will turn ON again.
- The heater then will stop permanently when the temperature of the fluid exceeds 5 times than its initial temperature.
- When STOP is pressed at any time, heater will be stop and can be restarted only after 30 minutes by pressing START once again.
Develop and draw ladder diagram and also draw connection of the system with PLC. The PLC works on 24 V DC supply and digital output terminals of the PLC gives 10 V DC signal when output is energized by PLC.

Q.5 **(a)** Using suitable programming example, explain how two numbers are multiplied in PLC. **03**

(b) Using suitable diagrams, explain Jump within Jump operation in PLC ladder diagram. **04**

(c) Explain fail safe connection of start and stop switches with PLC with suitable wiring and ladder diagram. **07**

OR

Q.5 **(a)** Explain data transfer (move) function in PLC. **03**

(b) Design PLC ladder diagram for the following equation **04**
X=Y+2Y+3, Where X is analog output and Y is analog input.

(c) Explain various number comparison functions available in PLC programming. **07**

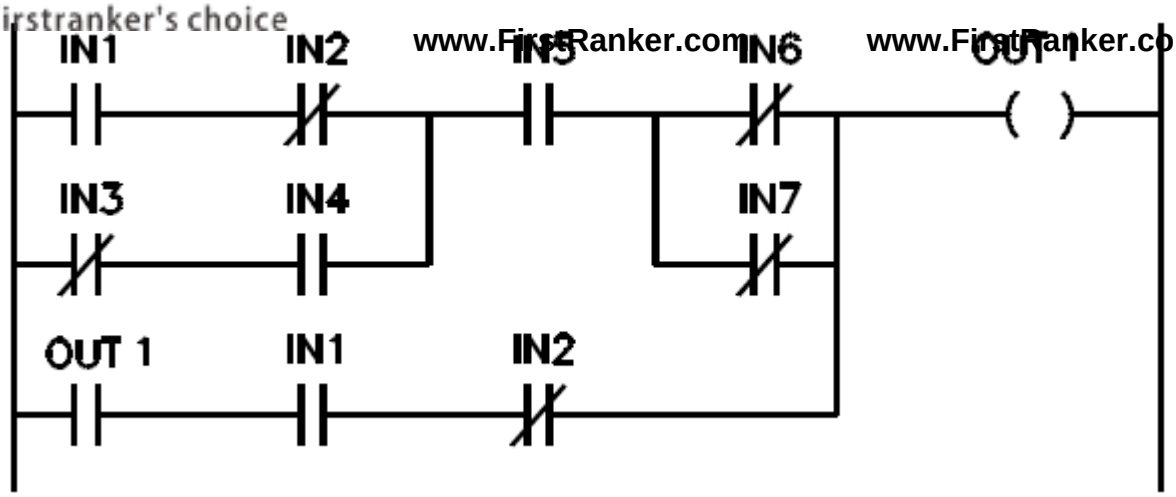

Figure 2 for question no. 3(c)

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