Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth Semester B.Tech Degree Regular and Supplementary Examination December 2022 (2019 Scheme)

Course Code: MRT 305

Course Name: PLC & DATA ACQUISITION SYSTEMS

Max. Marks: 100   Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks)

		Marks
1	Mention the programming devices of PLC also write about the importance of optocoupler?	3
2	Name the common output devices used in ladder rung of PLC?	3
3	Design a program that will convert Celsius to Fahrenheit conversion.	3
4	Write the main difference between timer and counter.	3
5	Name some control instructions formats used in PLC.	3
6	What are the types of data handling instructions?	3
7	Write the functions performed by remote terminal unit.	3
8	List various SCADA Manufactures.	3
9	Write a short note on aliasing	3
10	Define sampling.	3

PART B

(Answer any one complete questions from each module, each question carries 14 marks)

Module -1

11 a) Convert Boolean expression into gate logic and ladder logic.   7

$$[(P+Q+R)*(U+V)*W*X]+(S+T)*Y=Z$$

   b) Define scan cycle. Explain the internal operation of signal processing of PLC.   7

12 a) Draw the relay diagram, ladder diagram and sequence table for the following sequence.   14

All switches are open to start; both coils are off. Close SW1, SW2 or both; CR7 is energized. Online 3, CR7-1 closes, enabling line 3 (CR8 is still off). Closing SW3 energizes CR8 and pilot light PL1. Opening both SW1 and SW2 turns everything off. Draw relay logic and ladder logic for the process.

Module -2

13 a) Retentive instructions should not be placed within an MCR zone. Justify? 4

b) A wood saw W and Fan F and lubrication Pump P, all go on when a start button is pushed A stop button stops the saw only. The fan is to run additional 5 sec to blow the chips away. The Lube pump is to run more than 8 sec after shut down of W. Additionally if the saw has to run more than one minute the fan should stay on indefinitely. The fan may then be turned off by pushing a separate fan reset button. If the saw has run less than one minute the pump should go off when the saw is turned off 10

14 a) Write a ladder program using Up Counter to turn the red pilot light on and the green pilot light off after an accumulated count of 7. The operation of the program can be summarized as follows: 1. Operating pushbutton PB1 provides the off-to-on transition pulses that are counted by the counter. 2. The preset value of the counter is set for 7. 3. Each false-to-true transition of rung 1 increases the counter's accumulated value by 1. 4. After 7 pulses, or counts, when the preset counter value equals the accumulated counter value, output DN is energized. 5. As a result, rung 2 becomes true and energizes output O:2/0 to switch the red pilot light on. 6. At the same time, rung 3 becomes false and deenergizes output O:2/1 to switch the green pilot light off. 7. The counter is reset by closing pushbutton PB2, which makes rung 4 true and resets the accumulated count to zero. 8. Counting can resume when rung 4 goes false again. 14

Module -3

15 a) Enumerate data transfer and program control instruction used in PLC 10

b) Illustrate the advantage of Jump instruct with an example of your choice. 4

16 a) Draw a relay diagram, ladder diagram and sequence table for liquid level controller. 10

b) Discuss the use of math instructions of PLC for automatic control of upper and lower set point limits. 4

Module -4

17 a) Discuss the two algorithms used in DDC software. 10

b) Describe merits and limitations of Direct Digital control. 4

18 a) Explain in detail, with necessary diagram the architecture of SCADA. 10

b) Compare DDC with SCADA. 4

Module -5

19 a) Explain the signal flow or signal conversion in DAS with neat sketch.   10

  b) An analog signal is expressed by the equation $X(t) = 3\cos(50\pi t) + 10\sin(300\pi t) - \cos(100\pi t)$. calculate the nyquist rate of this signal.   4

20 a) Explain with the block diagram and necessary hardware circuits the Data Acquisition systems with a typical case study.   10

  b) Explain interlocking with example.   4

****