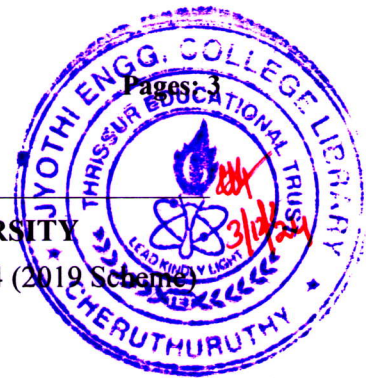Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
Fifth Semester B.Tech Degree (R, S) Examination November 2024 (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	What are the different communication protocols for a specific PLC application?	3
2	Define scan cycle.	3
3	Explain about Cascaded Timers	3
4	Classify counters. Write any two applications for the same.	3
5	State about Skip and MCR functions	3
6	Write short note on PLC analog signal processing	3
7	With neat block diagram, elucidate on how Computer Control System works.	3
8	List out the features of data logger	3
9	Define Shannon's sampling theorem	3
10	Explain Sample and Hold (S/H) Circuit. Why is it Necessary?	3

PART B
(Answer one full question from each module, each question carries 14 marks)

Module -1

11	a)	Draw and explain the Internal Architecture of a PLC System.	10
	b)	Sketch the ladder diagram for EX-OR and NAND gates	4
12	a)	What strategies can be used to troubleshoot ground loop? Explain.	7
	b)	Describe input/output modules of PLC	7

Module -2

13	a)	Explain various arithmetic and number comparison functions of PLC	10
	b)	Execute the ladder diagram to convert Celsius to Fahrenheit	4

14 a) Design a ladder logic program for a parking garage counter system.   4

    b) Explain with ladder diagram, the different types of timers used in PLC.   10

Module -3

15 a) Discuss the functions subroutine, jump and move   6

    b) Design a ladder logic diagram for automatic sequence control of three motors   8
M1,M2 and M3 as per following conditions,

a.. Closing the switch S1 should turn ON the motors M1, M2 and M3
Immediately.

b. When the switch S1 is opened, the motors M1, M2 and M3 should turned
OFF with an interval of 5seconds.

16 a) Explain in detail about Program control Instructions in PLC Programming.   7

    b) To write ladder logic for the bottle filling systems for the following sequence   7

       i)   Start the program by processing the start push button

       ii)   Once the start push button is pressed the conveyor belt start moving.

       iii)   If the proximity sensor senses the bottle in the conveyor belt, the belt
stops.

       iv)   After the proximity sensor senses the bottle, give a delay of 2 sec &
turn ON the solenoid value to fill the bottle.

       v)   Once the bottle is filled then the solenoid valve have to close.

       vi)   Give a delay the conveyor belt has to start to move to position the
next bottle.

       vii)   The sequence (i) to (vii) has to repeat until the stop push button is
pressed.

Module -4

17 a) Explain the generalized architecture of DDC with neat sketch   7

    b) Explain Data loggers with an example and its different types.   7

18 a) Define SCADA. Explain the architecture of SCADA   10

    b) List out the benefits of direct digital control   4

Module -5

19 a) How a DAC is interfaced to microprocessor. Explain the procedure with necessary block diagram.   10

b) An analog signal is expressed by the equation $X(t) = 3\cos(500\pi t) + 10\sin(400\pi t) + \cos(200\pi t)$. Calculate the Nyquist rate of this signal.   4

20 a) Discuss in detail about the basic components of data acquisition systems.   10

b) Define resolution of an ADC. Calculate the resolution of 10 bit ADC for analog voltage range from -10V to 10V in mV.   4

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