Register Number:……..

KUMARAGURU
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B.E DEGREE EXAMINATIONS: NOV/DEC 2022

(Regulation 2018)

Fifth Semester

MECHATRONICS ENGINEERING

U18MCI5203T: Programmable Logic Controllers

COURSE OUTCOMES

CO1: Outline the importance of PLC, DCS, and SCADA in industrial automation

CO2: Describe the architecture of PLCs with the analogy of relay logic components

CO3: Develop ladder logic program for applications

CO4: Integrate PLCs with electro-mechanical systems

CO5: Classify the communication protocols

CO6: Design SCADA system for industrial applications

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions :-

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

1.	Enumerate the need and benefits of low-cost automation.	CO1	[K_2]
2.	Differentiate fixed and modular PLCs	CO1	[K_2]
3.	Illustrate the function of the Zener diode used in the PLC I/O module.	CO2	[K_2]
4.	Outline the operating modes of PLC.	CO2	[K_2]
5.	Draw the PLC ladder logic diagram for a control system wherein a fan is to run only when all the following conditions are met: • Input A is OFF • Input B is ON, or input C is ON, or both B and C are ON.	CO3	[K_2]
6.	Enumerate any four arithmetic instructions used in PLC.	CO3	[K_2]
7.	Distinguish between RS232 and RS485.	CO4	[K_2]
8.	Interpret Profibus protocol.	CO4	[K_2]
9.	List out the functions of Remote-Control Units (RTUs).	CO5	[K_2]
10.	Infer about the need of alarm management in SCADA system.	CO6	[K_2]

Answer any FIVE Questions :-

PART B (5 x 16 = 80 Marks)

(Answer not more than 400 words)

11.	a)	Enumerate the importance of PLC, DCS, and SCADA in industrial automation.	(8)	CO1	[K_2]
	b)	Explain the function of special function relays with neat sketch.	(8)	CO2	[K_2]
12.	a)	Draw the architecture of PLC and explain the functions of each block.	(10)	CO3	[K_2]
	b)	Summarize how the sourcing and sinking I/O modules of the PLC are connected to field devices in industries.	(6)	CO3	[K_3]
13.	a)	Built the ladder program using EN, TT and DN bit of an on delay and off delay timer with detailed explanation.	(8)	CO4	[K_3]
	b)	Develop the PLC program to control the traffic lights. The operation of the program summarized as follows:	(8)	CO4	[K_4]

•Transition from red light to green light to amber light is carried out by only one TON timer instruction. Only one timer needs to be used to control all six lights.

• The timed sequence of the lights is: Red—30 s on Green—25 s on Amber—5 s on

14.	a)	Whenever a part is placed on the drilling table, a pneumatic clamper clamps the part, and drilling process is done. When drilling is done, the clamper releases the part by releasing pressure. When another part is detected, the process is repeated. Implement this in PLC using the Ladder Diagram programming language.	(8)	CO4	[K_4]

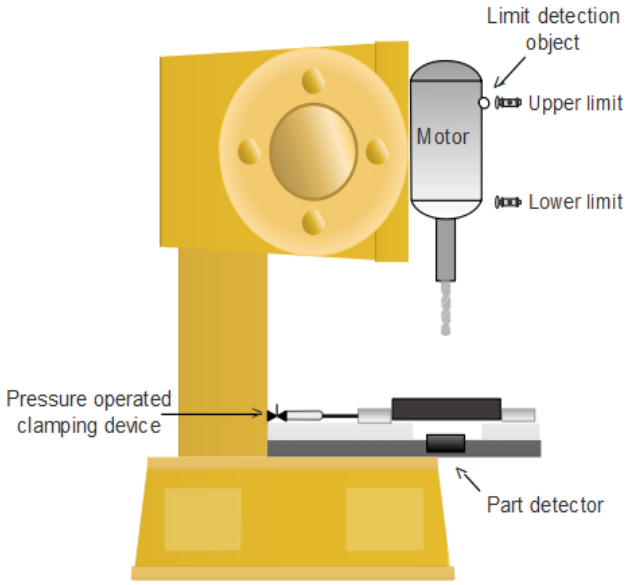

Figure - 3

	b)	Explain the JSR, SBR and RET instructions with suitable example.	(8)	CO3	[K_3]
15.	a)	Illustrate the OSI model with a neat sketch and explain each layer with hierarchy levels.	(8)	CO5	[K_2]
	b)	Extend the special features of MODBUS protocol and its usage in industrial automation.	(8)	CO5	[K_3]
16.	a)	Explain in detail about the architecture and various functions of SCADA.	(8)	CO6	[K_3]
	b)	Explain with a block diagram how to interface remote terminal units and HMIs with SCADA.	(8)	CO6	[K_3]

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