B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Eighth Semester

Mechanical and Automation Engineering

20MUPE803 - INDUSTRIAL PROCESS AUTOMATION

Regulations - 2020

Duration: 3 Hours   Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)
Answer ALL Questions

		Marks	K–Level	CO
1.	A Programmable Logic Controller's (PLC) primary purpose is........ (a) Managing enterprise-level business processes (b) providing real-time process control and automation (c) Storing historical data for analysis (d) Designing human-machine interfaces	1	K1	CO1
2.	In a Modbus RTU network, how many nodes may be added at once? (a) 32 devices (b) 64 devices (c) 247 devices (d) 1000 devices	1	K1	CO1
3.	A hygrometer is used to measure (a) Pressure (b) Flow rate (c) Humidity (d) Displacement	1	K1	CO2
4.	An LVDT (Linear Variable Differential Transformer) is primarily used to measure (a) Temperature (b) Displacement (c) Pressure (d) Humidity	1	K1	CO2
5.	When it comes to measurement and control systems, which computer component is absolutely necessary for interacting with sensors? (a) Graphics card (b) Sound card (c) Microcontroller or Data Acquisition System (DAQ) (d) Keyboard	1	K1	CO3
6.	To what extent does measurement and control make use of man-machine interfaces (MMIs)? (a) A mechanical lever (b) A touch screen control panel (c) A pneumatic valve (d) A simple LED light	1	K1	CO3
7.	In an SFC, what are the main components that define the sequence of operations? (a) Timers and Counters (b) Steps and Transitions (c) Relays and Contacts (d) Sensors and Actuators	1	K1	CO4
8.	Communication protocol is commonly used for PLC networking------------- (a) RS-232 (b) Ethernet/IP (c) USB 3.0 (d) Bluetooth	1	K1	CO4
9.	-------------- is the main communication protocol used in modern DCS systems? (a) Ethernet/IP (b) PROFIBUS (c) MODBUS (d) All of the above	1	K1	CO5
10.	In a DCS, which software tool is primarily used for designing and configuring process control strategies? (a) SCADA Editor (b) Function Block Programming (FBP) (c) Database Management System (d) Web Browser	1	K1	CO5

PART - B (12 × 2 = 24 Marks)
Answer ALL Questions

		Marks	K–Level	CO
11.	List the key components of a SCADA system.	2	K1	CO1
12.	Write the advantages of automation in modern industries.	2	K1	CO1
13.	Give one example each of an open-loop and a closed-loop control system.	2	K1	CO1
14.	Why is a Hall effect sensor used in speed measurement?	2	K1	CO2
15.	List the function of a process control valve in an industrial system.	2	K1	CO2
16.	Differentiate between pneumatic actuator and hydraulic actuator.	2	K2	CO2

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

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17.	How do computers improve accuracy in measurement systems?		*2*	*K1* CO3
18.	In the context of computer-assisted measurement, what does a Data Acquisition System (DAQ) do?		*2*	*K1* CO3
19.	What are the key elements of a Sequential Flow Chart (SFC)?		*2*	*K1* CO4
20.	Mention two major advantages of using PLCs in industrial automation.		*2*	*K1* CO4
21.	List any two key advantages of using a DCS in industrial automation.		*2*	*K1* CO5
22.	Write the main components of a DCS? Mention any two.		*2*	*K1* CO5

PART - C (6 × 11 = 66 Marks)
Answer ALL Questions

23.	a)	Discuss the requirements for automation systems and their role in modern industrial processes.	*11*	*K2* CO1
		OR		
	b)	Explain the architecture, components, and applications of SCADA systems in industrial automation.	*11*	*K2* CO1
24.	a)	Describe the different pressure sensors, their working principles, and applications.	*11*	*K2* CO2
		OR		
	b)	Discuss the different flow measurement techniques, their advantages, and applications.	*11*	*K2* CO2
25.	a)	Discuss the advantages and limitations of using computers in measurement and control systems.	*11*	*K2* CO3
		OR		
	b)	Explain the benefits and challenges of implementing IoT in plant automation.	*11*	*K2* CO3
26.	a)	Compare the functions and advantages of using PLCs in industrial automation in detail.	*11*	*K2* CO4
		OR		
	b)	Compare Sequential Flow Chart (SFC) with Ladder Logic in PLC programming.	*11*	*K2* CO4
27.	a)	Discuss the advantages and disadvantages of a Distributed Control System.	*11*	*K2* CO5
		OR		
	b)	Explain redundancy in DCS and its role in improving system reliability.	*11*	*K2* CO5
28.	a) (i)	Compare MTU and RTU.	*6*	*K2* CO4
	(ii)	Discuss the communication protocols.	*5*	*K2* CO5
		OR		
	b) (i)	Explain an SFC-based PLC program for an automatic washing machine process.	*6*	*K2* CO4
	(ii)	Summarise the significance of SCADA in industrial automation.	*5*	*K2* CO5