Reg. No.																

Question Paper Code	13185

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Seventh Semester

Electrical and Electronics Engineering

20EEEL709 - INDUSTRIAL CONTROL AND AUTOMATION

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	What is a closed-loop control system? (a) A system that operates without any feedback (b) A system that uses feedback to adjust its inputs (c) A system that runs in open space (d) A system that does not require sensors	1	K1	CO1
2.	Which of the following is an example of an automatic control system? (a) Manual machine operation (b) Home thermostat regulating room temperature (c) A machine requiring operator adjustment (d) Operator-controlled assembly line	1	K1	CO1
3.	Sensors in industrial automation systems are primarily used to: (a) Initiate machine programs (b) Gather real-time data from the environment (c) Control the temperature of machines (d) Program industrial computers	1	K1	CO1
4.	The CPU of a PLC is responsible for: (a) Storing I/O data (b) Executing control instructions based on the program logic (c) Providing power to input and output modules (d) Displaying data to operators	1	K1	CO2
5.	A relay-based control system differs from PLCs mainly because it: (a) Requires more physical wiring for logic changes (b) Allows for easy program modifications (c) Operates without electricity (d) Is highly compatible with modern software	1	K1	CO2
6.	Which PLC instruction would be used to change a data value from binary to decimal? (a) CMP (b) MOV (c) CONVERT (d) ADD	1	K1	CO2
7.	Direct Digital Control (DDC) involves: (a) Manually controlling industrial equipment (b) Using a digital computer to directly control process equipment (c) Relaying control signals through analog controllers (d) Control without any computational systems	1	K1	CO3
8.	A typical application of SCADA includes: (a) Real-time monitoring of water distribution networks (b) Internal data storage in small offices (c) Control of personal computers (d) Controlling small household appliances	1	K1	CO3
9.	The alarm management function in a DCS is primarily used for: (a) Displaying only real-time data (b) Tracking and notifying operators of abnormal process conditions (c) Archiving historical data (d) Enhancing communication protocols	1	K1	CO3

10.	The primary purpose of automation in production systems is to: (a) Increase manual labor (b) Reduce production efficiency (c) Improve productivity, consistency, and safety (d) Minimize machine use	*1*	*K1*	*CO4*
11.	Adaptive control in advanced automation allows a system to: (a) Function at a fixed speed only (b) Adjust operations based on real-time feedback (c) Ignore variations in process parameters (d) Be controlled manually at all times	*1*	*K1*	*CO4*
12.	In a multi-level automation system, which level is responsible for coordinating activities within a production cell? (a) Device level (b) Supervisory level (c) Cell or system level (d) Enterprise level	*1*	*K1*	*CO4*
13.	The main purpose of a production control system is to: (a) Increase machine downtime (b) Optimize the production process and manage resources efficiently (c) Decrease production efficiency (d) Increase the reliance on manual labor	*1*	*K1*	*CO5*
14.	In CAN networks, messages are prioritized based on: (a) Message length (b) Node address (c) Random access order (d) Message ID, allowing higher-priority messages to be transmitted first	*1*	*K1*	*CO5*
15.	Ethernet is commonly used in industrial networks because it: (a) Supports real-time, high-speed data transfer and is widely compatible (b) Only supports short-distance communication (c) Does not support integration with control systems (d) Is exclusively for small networks	*1*	*K1*	*CO5*
16.	Among ControlNet, PROFIBUS-DP, and Ethernet, which is the most widely adopted for general industrial communication? (a) Control Net (b) PROFIBUS-DP (c) Ethernet (d) CAN	*1*	*K1*	*CO5*
17.	The primary purpose of an RFID system is to: (a) Store data on a physical barcode (b) Identify and track objects using radio waves (c) Process image-based information (d) Control motor speed	*1*	*K1*	*CO6*
18.	One important feature of an advanced HMI system is: (a) Limited user interface options (b) Integration with control systems for real-time adjustments (c) Audio-only feedback (d) No customization options for operators	*1*	*K1*	*CO6*
19.	A commonly used controller in the control subsystem of industrial automation is: (a) Barcode scanner (b) PLC (Programmable Logic Controller) (c) Projector (d) Desktop computer	*1*	*K1*	*CO6*
20.	A significant benefit of advanced human interface systems in complex processes is: (a) Increased need for manual adjustments (b) Enhanced data visualization and analytics for better decision-making (c) Less access to real-time information (d) Reduced operator situational awareness	*1*	*K1*	*CO6*

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

21.	What are the main objectives of process control in industrial systems?	*2*	*K1*	*CO1*
22.	List the three main types of automation in industrial systems.	*2*	*K1*	*CO1*
23.	Why might a plant choose a specific PLC based on I/O module specifications?	*2*	*K1*	*CO2*
24.	Assess the importance of using sequence control relays in a PLC.	*2*	*K1*	*CO2*
25.	Demonstrate how SCADA can be used to generate real-time reports for management.	*2*	*K1*	*CO3*

26.	Evaluate how communication latency might impact SCADA system performance.	*2*	*K1*	*CO3*
27.	Define automation in a production system.	*2*	*K1*	*CO4*
28.	How would you use an induction motor drive in a production line requiring variable speeds?	*2*	*K1*	*CO4*
29.	Compare the benefits of RFID technology to barcode systems in tracking inventory.	*2*	*K2*	*CO5*
30.	Outline a plan for implementing a new HMI system in a factory automation process.	*2*	*K1*	*CO6*

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31.	a)	Compare the differences between analog and digital control in process control systems.	*10*	*K2*	*CO1*
		OR			
	b)	Examine the impact of the industrial revolutions on the evolution of automation in manufacturing and production.	*10*	*K2*	*CO1*
32.	a) i)	Explain the primary functions of a PLC in an industrial control system.	*6*	*K2*	*CO2*
	ii)	Outline the importance for automation.	*4*	*K2*	*CO2*
		OR			
	b)	Summarize in detail about PLC based control of process with example.	*10*	*K2*	*CO2*
33.	a)	Assess the benefits of using SCADA over manual monitoring systems in remote, geographically dispersed applications.	*10*	*K2*	*CO3*
		OR			
	b)	Evaluate the effectiveness of SCADA system features in industrial automation.	*10*	*K2*	*CO3*
34.	a) i)	Apply the different levels of automation to a manufacturing scenario.	*6*	*K2*	*CO4*
	ii)	Organize how each level can enhance scalability and flexibility in production.	*4*	*K2*	*CO4*
		OR			
	b)	Identify the role of networking sensors, actuators, and controllers in an automated production system.	*10*	*K2*	*CO4*
35.	a)	Examine the role of Control Net and PROFIBUS-DP in production control systems.	*10*	*K2*	*CO5*
		OR			
	b)	Formulate a solution to improve the reliability and fault tolerance of a production control system using ControlNet and Ethernet.	*10*	*K2*	*CO5*
36.	a)	Compare RFID and Barcode technologies in terms of their functionality, application and advantages in industrial automation.	*10*	*K2*	*CO6*
		OR			
	b)	Demonstrate a fully integrated industrial automation system that uses RFID, barcode, and HMI technologies for monitoring production, inventory, and operator performance in a manufacturing plant.	*10*	*K2*	*CO6*