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

Sixth Semester

Mechanical and Automation Engineering

20MUPC603 - INDUSTRIAL AUTOMATION FOR MANUFACTURING

Regulations - 2020

Duration: 3 Hours   Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)
Answer ALL Questions

		Marks	K– Level	CO

1. Which of the following is a common component in an industrial automation system? — 1, K1, CO1
   (a) Actuators   (b) Sensors
   (c) Programmable Logic Controllers (PLCs)   (d) All the above

2. A Programmable Logic Controller (PLC) is primarily used for — 1, K1, CO1
   (a) Controlling complex, real-time processes   (b) Increasing manual operation
   (c) Managing data storage   (d) Supervising human labor

3. A best suited automation is for large-scale production — 1, K1, CO1
   (a) Fixed automation   (b) Manual automation
   (c) Flexible automation   (d) Programmable automation

4. Which of the following is NOT typically a benefit of industrial automation? — 1, K1, CO1
   (a) Increased production speed   (b) Reduced energy consumption
   (c) Reduced labor costs   (d) Increased human error

5. What type of flow line uses modular components that can be rearranged for different production setups? — 1, K1, CO2
   (a) Fixed flow line   (b) Continuous flow line
   (c) Assembly line   (d) Flexible flow line

6. Which of the following is a common application of automated flow lines in the automotive industry? — 1, K1, CO2
   (a) Textile production   (b) Car assembly lines
   (c) Heavy machinery manufacturing   (d) Food processing

7. What kind of simulation language provides built-in libraries for modeling specific domains, such as healthcare or logistics? — 1, K1, CO2
   (a) General-purpose simulation languages   (b) Low-level simulation languages
   (c) Continuous simulation languages   (d) Domain-specific simulation languages

8. Select a simulation languages is primarily used for discrete-event simulations in manufacturing systems — 1, K1, CO2
   (a) Vensim   (b) MATLAB
   (c) GPSS   (d) Any Logic

9. In part classification within GT, which of the following is a key criterion for grouping parts? — 1, K1, CO3
   (a) Material cost   (b) Delivery time
   (c) Supplier relationships   (d) Similarity in design and manufacturing processes

10. Common application area for Group Technology — 1, K1, CO3
    (a) Software development   (b) Delivery time
    (c) Service industries   (d) None of the above

11. What type of control strategy is commonly used in Flexible Manufacturing Systems? — 1, K1, CO3
    (a) Centralized control   (b) Decentralized control
    (c) Manual control   (d) No control strategy is needed

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create   **13018**

12. In the context of FMS, what does the term modularity refer to?   *1*   *K1*   *CO3*
    (a) The use of large, fixed machinery
    (b) A single, inflexible production line
    (c) The elimination of all manual processes
    (d) The ability to replace or upgrade components easily
13. In a DDC system, what type of device is commonly used for data acquisition?   *1*   *K1*   *CO4*
    (a) Actuators   (b) Sensors
    (c) Manual switches   (d) Programmable Logic Controllers (PLCs)
14. Which communication protocol is commonly used in DDC and DCS for data transfer?   *1*   *K1*   *CO4*
    (a) RS-232   (b) Ethernet
    (c) Modbus   (d) All of the above
15. Which flow meter type is typically used for measuring viscous fluids in small pipe sizes?   *1*   *K1*   *CO4*
    (a) Rotameter.   (b) Electromagnetic flow meter
    (c) Turbine flow meter.   (d) Differential pressure flow meter
16. In a leak-flow study, which parameter is often analyzed to identify the location and size of a leak?   *1*   *K1*   *CO4*
    (a) Fluid color   (b) Environmental conditions
    (c) Flow velocity profile   (d) Pressure fluctuations in the pipeline
17. What is the role of the input/output (I/O) modules in LCU architecture?   *1*   *K1*   *CO5*
    (a) To perform complex calculations.
    (b) To connect the LCU to sensors and actuators
    (c) To manage software application
    (d).To facilitate communication with the user interface
18. What is a common communication medium used by LCUs in a Distributed Control System?   *1*   *K1*   *CO5*
    (a) Fiber optics   (b) Ethernet
    (c) RS-232   (d) All of the above
19. What does PROFIBUS stand for?   *1*   *K1*   *CO5*
    (a) Process Field Bus   (b) Programmable Field Bus
    (c) Protocol for Industrial Automation   (d) Professional Field Bus
20. What is a key benefit of using data analytics in process automation?   *1*   *K1*   *CO5*
    (a) Increased manual workload.
    (b) Reduced system complexity
    (c) Improved decision-making based on insights
    (d) Elimination of all human operators

PART - B (10 × 2 = 20 Marks)
Answer ALL Questions

21. Identify the five levels of automation in a production plant.	*2*	*K2*	*CO1*
22. Differentiate open loop and closed loop control system in an automation system.	*2*	*K2*	*CO1*
23. Define concurrent engineering	*2*	*K1*	*CO2*
24. What are the main inputs to the MRP processor?	*2*	*K1*	*CO2*
25. List out the stages in Group Technology.	*2*	*K1*	*CO3*
26. What is the role of sensors in automated assembly systems?	*2*	*K1*	*CO3*
27. How does SCADA support remote monitoring?	*2*	*K2*	*CO4*
28. Why is flow rate analysis important in leak detection for pipelines?	*2*	*K2*	*CO4*
29. Name two key components of a Local Control Unit (LCU).	*2*	*K1*	*CO5*
30. What type of network topology does the HART protocol typically use?	*2*	*K1*	*CO5*

PART - C (6 × 10 = 60 Marks)
Answer ALL Questions

31.   a)   Explain the principles, strategies of automation and basic elements of an automated system in detail.   *10*   *K2*   *CO1*

OR

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create   **13018**

b) i)	Discuss about the different types of transfer mechanisms used in automated flow lines.		*5*	*K2*	*CO1*
ii)	Compare and contrast the automated flow lines with storage buffers.		*5*	*K2*	*CO1*

32. a) Explain the master production schedule in the manufacturing support system.   *10*   *K2*   *CO2*

OR

   b) Differentiate the process planning and production planning.   *10*   *K2*   *CO2*

33. a) i) Explain the different types of FMS.   *5*   *K2*   *CO3*
   ii) Describe about Opitz Classification system.   *5*   *K2*   *CO3*

OR

   b) Discuss the basic structure of the parts classification and coding system with neat sketch.   *10*   *K2*   *CO3*

34. a) Explain the construction and working of direct digital control with neat block diagram.   *10*   *K2*   *CO4*

OR

   b) Prepare a detail SCADA implementation procedure and stages for a process industry.   *10*   *K2*   *CO4*

35. a) Discuss and compare the different architecture of DCS.   *10*   *K3*   *CO5*

OR

   b) Explain about Distributed Control System (DCS) data gathering, data analytics, real-time analysis of data in a production unit.   *10*   *K3*   *CO5*

36. a) i) Implement a computer based industrial automation for a bolt & nut manufacturing facility.   *5*   *K3*   *CO4*
   ii) Interpret the process interfacing issues of LCU.   *5*   *K3*   *CO5*

OR

   b) i) Explain the SCADA in transport automation in detail.   *5*   *K3*   *CO4*
   ii) Illustrate notes on communication protocols – Profibus & Field bus.   *5*   *K3*   *CO5*