Reg. No.																

Question Paper Code	13231

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

Seventh Semester

Mechanical Engineering

20MUOE901 - INTRODUCTION TO DIGITAL MANUFACTURING

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	What does CAM primarily focus on? (a) Designing products (b) Analyzing designs (c) Controlling manufacturing processes (d) Planning production schedules	1	K1	CO1
2.	Which of the following best describes CAM? (a) A process for designing products using software (b) A system for analyzing engineering designs (c) A method for controlling machinery based on CAD data (d) A technique for managing the lifecycle of a product	1	K1	CO1
3.	Which of the following factors is most critical when planning a factory layout? (a) The aesthetic appeal of the workspace (b) The distance between machines and workstations (c) Employee preferences for decoration (d) The color of the walls	1	K2	CO1
4.	What is the main purpose of CAPP? (a) To create design models (b) To automate the planning of manufacturing processes (c) To simulate product performance (d) To manage product data	1	K1	CO1
5.	What does Industry 4.0 primarily focus on? (a) Manual labor processes (b) Digital transformation in manufacturing (c) Traditional manufacturing methods (d) Resource extraction	1	K1	CO2
6.	If a factory implements IoT devices, what is one immediate benefit they might expect? (a) Increased labor costs (b) Enhanced machine connectivity and data collection (c) Longer production times (d) Reduced product customization	1	K2	CO2
7.	Which technology is NOT typically associated with Industry 4.0? (a) Artificial Intelligence (b) Big Data Analytics (c) Renewable Energy (d) Cloud Computing	1	K1	CO2
8.	Which of the following is a key characteristic of Industry 4.0? (a) Increased manual intervention (b) Decentralized decision-making (c) Isolated machinery (d) Static production processes	1	K2	CO2
9.	When developing a new product concept, which of the following should be prioritized first? (a) Launching the product immediately (b) Refining ideas into viable concepts (c) Gathering customer feedback after launch (d) Conducting a financial analysis	1	K2	CO3
10.	Which factor is critical when assessing risks associated with technology adoption? (a) Employee satisfaction (b) Market share (c) Potential impact on business objectives (d) The aesthetic appeal of products	1	K2	CO3

11. What role does stakeholder engagement play in the strategy phase? *1 K1 CO3*
    (a) It slows down the decision-making process
    (b) It helps gather insights and fosters collaboration
    (c) It focuses solely on financial contributions
    (d) It is irrelevant to the technology roadmap
12. What is the primary purpose of a technology roadmap? *1 K1 CO3*
    (a) To increase product sales
    (b) To outline a strategic plan for technology integration
    (c) To assess employee performance
    (d) To manage financial resources
13. How can artificial intelligence improve predictive maintenance in manufacturing? *1 K1 CO4*
    (a) By replacing all manual processes
    (b) By analyzing data to predict machine failures
    (c) By increasing production speed without data
    (d) By minimizing employee involvement
14. Which technology enhances design visualization and collaboration in manufacturing? *1 K2 CO4*
    (a) Big Data Analytics (b) Virtual Reality (c) Traditional CAD (d) Manual prototyping
15. How does big data analytics support reconfigurable manufacturing systems? *1 K2 CO4*
    (a) By storing data without analysis
    (b) By enabling quick adjustments based on real-time insights
    (c) By focusing on manual processes
    (d) By limiting production flexibility
16. In implementing IoT technologies, what would be the first step for a manufacturing company? *1 K1 CO4*
    (a) Purchase new machinery without assessment
    (b) Conduct a comprehensive needs assessment
    (c) Ignore employee input
    (d) Increase production speed immediately
17. Which of the following business models focuses on sustainability and reducing waste? *1 K2 CO5*
    (a) Subscription-based model (b) On-demand manufacturing
    (c) Circular economy model (d) Traditional retail model
18. What is a significant barrier to digital transformation in organizations? *1 K1 CO5*
    (a) Increased employee training (b) High initial investment costs
    (c) Improved data security (d) Enhanced customer satisfaction
19. Which of the following is a challenge of digital transformation? *1 K2 CO5*
    (a) Increased efficiency (b) Employee resistance
    (c) Improved customer service (d) Enhanced data security
20. What is a primary goal of smart supply chains? *1 K1 CO5*
    (a) To complicate logistics (b) To improve efficiency
    (c) To increase manual labor (d) To reduce technology use

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

21. How does the integration of CAD and CAM improve manufacturing outcomes? *2 K2 CO1*
22. List two drivers for digital transformation in the manufacturing sector. *2 K1 CO1*
23. What are cyber-physical systems, and how do they relate to Industry 4.0? *2 K1 CO2*
24. Discuss the main building blocks of Industry 4.0. *2 K2 CO2*
25. Define the strategy phase in the context of a technology roadmap. *2 K1 CO3*
26. How does the Process Development Phase align with business goals? *2 K2 CO3*
27. Name the advantage of using virtual reality (VR) for product design. *2 K1 CO4*
28. What is the purpose of using collaborative robots (cobots) in industrial settings? *2 K1 CO4*
29. Why circular economy model is important in today's industry? *2 K2 CO5*
30. Describe the digital transformation on traditional manufacturing models. *2 K2 CO5*

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31.	a)	Explain the concept of CAPP (Computer-Aided Process Planning) and its relevance in the manufacturing process. Discuss how CAPP can improve efficiency and accuracy in production planning.	*10*	*K2*	*CO1*
		OR			
	b) i)	Discuss the future trends in digital manufacturing.	*5*	*K2*	*CO1*
	ii)	Describe the significance of offline robot programming in modern manufacturing.	*5*	*K2*	*CO1*
32.	a)	Discuss the concept of Industry 4.0 in detail. Include its definition, key components, and how it differs from previous industrial revolutions.	*10*	*K2*	*CO2*
		OR			
	b)	Compare and contrast a traditional factory with an Industry 4.0-enabled factory. Discuss the technological advancements and operational changes that characterize this evolution.	*10*	*K2*	*CO2*
33.	a)	Discuss the significance of a new product technology roadmap in strategic planning for organizations. Include its key components.	*10*	*K2*	*CO3*
		OR			
	b)	Explain the framework for developing a technology roadmap. Describe each phase in detail, emphasizing the activities involved and the expected outcomes.	*10*	*K2*	*CO3*
34.	a)	Explain how self-configuration and self-diagnosis methods, driven by IoT technologies, enhance manufacturing efficiency.	*10*	*K2*	*CO4*
		OR			
	b)	Examine the applications of augmented reality and virtual reality in the manufacturing sector.	*10*	*K2*	*CO4*
35.	a)	Explain how control algorithms improve logistics, inventory management, and overall efficiency. Provide examples to illustrate their impact.	*10*	*K2*	*CO5*
		OR			
	b)	Assess the impact of dynamic routing algorithms on logistics operations within smart supply chains.	*10*	*K2*	*CO5*
36.	a) i)	Evaluate the significance of big data analytics in reconfigurable manufacturing systems.	*5*	*K2*	*CO4*
	ii)	Explore the benefits and challenges of subscription-based business models in the manufacturing sector.	*5*	*K2*	*CO5*
		OR			
	b) i)	Discuss the role of additive manufacturing in modern manufacturing processes.	*5*	*K2*	*CO4*
	ii)	Evaluate the role of predictive analytics in enhancing supply chain decision-making.	*5*	*K2*	*CO5*