Reg. No.																

Question Paper Code	13407

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

Eighth Semester

Mechanical Engineering

20MEEL803 - SMART MANUFACTURING

Regulations - 2020

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	*K – Level*	*CO*
1.	What is an artificial neural network? (a) A type of computer network used for communication (b) A computational model inspired by the human brain for pattern recognition and prediction (c) A system for managing expert knowledge (d) An algorithm for solving linear equations	*1*	*K1*	*CO1*
2.	Why are expert systems particularly useful in quality control and inspection in manufacturing? (a) They can handle large amounts of data efficiently (b) They can mimic human expert decision-making for defect identification (c) They are cheaper than human inspectors (d) They can work in hazardous environments	*1*	*K1*	*CO1*
3.	How does the intelligent CAD systems useful for design optimization? (a) They automate repetitive tasks and improve design efficiency (b) They focus only on aesthetic aspects of design (c) They require manual input for every decision (d) They limit collaboration between teams	*1*	*K1*	*CO2*
4.	How does rapid prototyping benefit product development? (a) It slows down the design iteration process (b) It allows quick validation and refinement of designs (c) It increases production costs significantly (d) It eliminates the need for CAD software	*1*	*K1*	*CO2*
5.	Why the hard automation is suitable for mass production? (a) It offers high efficiency for repetitive tasks (b) It adapts easily to design changes (c) It requires frequent reprogramming (d) It is ideal for low-volume production	*1*	*K1*	*CO3*
6.	LISP commonly used for (a) Managing inventory systems (b) Symbolic reasoning and prototyping AI applications (c) Designing hardware components (d) Manual process control	*1*	*K1*	*CO3*
7.	What is knowledge engineering? (a) Designing mechanical parts manually (b) Structuring expert knowledge into intelligent systems (c) Programming CNC machines (d) Managing factory inventory	*1*	*K1*	*CO4*
8.	How does machine learning enhance intelligent systems? (a) By learning from data to improve predictions (b) By restricting adaptability (c) By increasing manual intervention (d) By eliminating data analysis	*1*	*K1*	*CO4*
9.	How do force sensors contribute to condition monitoring? (a) By measuring mechanical loads on tools (b) By detecting angular position (c) By monitoring air flow (d) By measuring light changes	*1*	*K1*	*CO5*

10.	How does the Industrial Internet of Things (IIoT) support OT/IT integration? (a) By connecting devices for data collection and action (b) By isolating OT systems from IT networks (c) By reducing real-time monitoring (d) By eliminating the need for analytics		*1*	*K1*	*CO6*

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11.	List two key benefits of smart manufacturing.		*2*	*K1*	*CO1*
12.	Illustrate with a small case how expert systems work in factories.		*2*	*K2*	*CO1*
13.	Define intelligent process control.		*2*	*K1*	*CO2*
14.	Compare traditional CAD and web-based CAD systems.		*2*	*K2*	*CO2*
15.	What is the meaning of heuristic search?		*2*	*K1*	*CO3*
16.	Infer how expert systems help in decision-making in intelligent manufacturing.		*2*	*K2*	*CO3*
17.	What is an inference engine in expert systems?		*2*	*K1*	*CO4*
18.	Illustrate how intelligent systems support shop floor operations.		*2*	*K2*	*CO4*
19.	Label the parts of a linear position sensor.		*2*	*K1*	*CO5*
20.	Classify different position monitoring sensors.		*2*	*K2*	*CO5*
21.	When was the term Smart Manufacturing first widely adopted?		*2*	*K1*	*CO6*
22.	Interpret the market opportunities are identified through smart data analytics.		*2*	*K2*	*CO6*

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Demonstrate the digital enterprises used in manufacturing portals to support smart manufacturing.	*11*	*K2*	*CO1*
		OR			
	b)	Explain the simple model showing the flow of intelligent manufacturing using fuzzy logic and neural networks.	*11*	*K2*	*CO1*
24.	a)	Apply intelligent process control concepts to improve product design.	*11*	*K3*	*CO2*
		OR			
	b)	Develop the role of CAPP and CNC in internet-based manufacturing systems.	*11*	*K3*	*CO2*
25.	a)	Outline the system architecture and data flow in an intelligent manufacturing system.	*11*	*K2*	*CO3*
		OR			
	b)	Infer a simple model using AI programming languages such as LISP or PROLOG for a manufacturing task.	*11*	*K2*	*CO3*
26.	a)	Apply the fuzzy logic is used in knowledge engineering and intelligent systems.	*11*	*K3*	*CO4*
		OR			
	b)	Develop a scheduling system for a smart shop floor using AI methods.	*11*	*K3*	*CO4*
27.	a)	Illustrate the working principle of pneumatic and capacitance sensors with suitable diagrams.	*11*	*K2*	*CO5*
		OR			
	b)	Compare and Contrast traditional sensors with advanced optical and vision-based sensors used today.	*11*	*K2*	*CO5*
28.	a)	Classify the various technologies used under OT and IT, and show how they interact in smart manufacturing.	*11*	*K2*	*CO6*
		OR			
	b)	Summarize the major challenges faced during the integration of OT and IT in smart manufacturing processes.	*11*	*K2*	*CO6*