SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur– 603203

DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK

VI SEMESTER

ME3661 - COMPUTER INTEGRATED MANUFACTURING SYSTEMS

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UNIT I INTRODUCTION **9**

Introduction to CAD, CAM, CAD/CAM and CIM - Evolution of CIM – CIM wheel and cycle – Production concepts and mathematical models – Simple problems in production models – CIM hardware and software– Major elements of CIM system – Three step process for implementation of CIM – Computers in CIM – Computer networks for manufacturing – The future automated factory – Management of CIM – safety aspects of CIM– advances in CIM.

PART-A (2 MARKS)

1	Define CAD & CAM.	CO1	BTL-2	Understand
2	Mention the practical applications of closed loop system.	CO1	BTL-1	Remember
3	Identify what is CIM.	CO1	BTL-1	Remember
4	Examine Manufacturing Planning	CO1	BTL-2	Understand
5	Where is Manufacturing Control applied?	CO1	BTL-1	Remember
6	Name the relationship between CAD and CAM	CO1	BTL-1	Remember
7	Summarize Concurrent Engineering.	CO1	BTL-2	Understand
8	Discuss the concepts of CIM.	CO1	BTL-2	Remember
9	Contrast the elements of CIM system.	CO1	BTL-1	Remember
10	Express the types of production.	CO1	BTL-2	Understand
11	Define Manufacturing lead time.	CO1	BTL-1	Remember
12	Distinguish between MTBF and MTTR.	CO1	BTL-1	Remember
13	Express the term utilization.	CO1	BTL-1	Remember
14	Quote the expression for production capacity.	CO1	BTL-2	Understand
15	Classify the basic elements of automated system.	CO1	BTL-1	Remember
16	Differentiate between pull and push production system.	CO1	BTL-1	Remember
17	Mention the factors used to increase or decrease plant capacity over short term.	CO1	BTL-2	Understand
18	Define cycle time.	CO1	BTL-2	Understand
19	Prepare the salient features of JIT.	CO1	BTL-1	Remember
20	Formulate the components of Lean.	CO1	BTL-2	Understand
21	Define CAD and CAM.	CO1	BTL-2	Understand
22	What is meant by the CIM wheel?	CO1	BTL-1	Remember
23	List any two major elements of a CIM system.	CO1	BTL-1	Remember
24	What are the three steps in the implementation of CIM?	CO1	BTL-2	Understand
25	Mention two safety aspects of CIM in automated factories.	CO1	BTL-1	Remember

PART- B (16 MARKS)

1	Explain the concepts of CAD, CAM, CAD/CAM, and CIM with suitable examples.	(16)	CO1	BTL-3	Apply
2	Trace the evolution of CIM. How has manufacturing progressed from manual to computer-integrated systems?	(16)	CO1	BTL-3	Apply
3	Describe the CIM wheel and cycle. Explain its significance in modern manufacturing.	(16)	CO1	BTL-3	Apply
4	Discuss various production concepts and mathematical models used in CIM.	(16)	CO1	BTL-3	Apply
5	Solve and explain simple problems in production models with examples.	(16)	CO1	BTL-2	Understand
6	How do production models help in decision-making and optimization in CIM?	(16)	CO1	BTL-4	Understand
7	Explain the hardware components of CIM. Illustrate their roles in integration.	(16)	CO1	BTL-3	Understand
8	Discuss the software elements of CIM and their importance in manufacturing.	(16)	CO1	BTL-3	Apply
9	Describe the major elements of a CIM system with neat sketches.	(16)	CO1	BTL-3	Apply
10	Explain the three-step process for implementation of CIM.	(16)	CO1	BTL-4	Understand
11	Discuss the role of computers in CIM. How do they integrate design, planning, and control?	(16)	CO1	BTL-3	Understand
12	Explain the importance of computer networks in manufacturing.	(16)	CO1	BTL-3	Apply
13	Describe the concept of the future automated factory. What are its key features?	(16)	CO1	BTL-3	Apply
14	Discuss the management aspects of CIM. How can organizations successfully adopt CIM?	(16)	CO1	BTL-3	Apply
15	Explain the safety aspects of CIM in automated manufacturing environments.	(16)	CO1	BTL-3	Apply
16	Write notes on recent advances in CIM technologies.	(16)	CO1	BTL-3	Apply
17	Discuss the impact of Industry 4.0 and IoT on CIM systems.	(16)	CO1	BTL-3	Apply
18	Explain how Artificial Intelligence and Robotics are shaping the future of CIM.	(16)	CO1	BTL-3	Apply

UNIT II PROCESS PLANNING **9**

Process planning – Activities in process planning, Informations required. From design to process planning – classification of manufacturing processes – Selection of primary manufacturing processes –Computer Aided Process Planning – Process planning module and data base – Variant process planning – Two stages in VPP – Generative process planning – Flow chart showing various activities in generative PP – Semi generative process planning- Comparison of CAPP and Manual Process Planning.

PART A (2 MARKS)

1	Define what is meant by process planning	CO4	BTL-1	Remember
2	List the activates associated with process planning.	CO4	BTL-1	Remember
3	Mention the basic approaches of CAPP	CO4	BTL-1	Remember
4	Identify what is meant by CAPP?	CO4	BTL-1	Remember
5	Name any two advantages of CAPP.	CO4	BTL-2	Understand
6	Define reorder point system in inventory control	CO4	BTL-2	Understand
7	Summarize the various components of a generative CAPP system.	CO4	BTL-1	Remember
8	Compare commercial variant and generative	CO4	BTL-2	Understand
9	Distinguish some commercial variant and generative	CO4	BTL-2	Understand
10	CAPP software systems.	CO4	BTL-2	Understand
11	Express master production schedule (MPS)	CO4	BTL-2	Understand
12	Give an important function of PPC	CO4	BTL-1	Remember
13	Mention the two inputs and outputs to process planning.	CO4	BTL-1	Remember
14	Illustrate MRP and capacity planning	CO4	BTL-1	Remember
15	Classify the benefits of MRP.	CO4	BTL-2	Understand
16	Analyze the of inputs data to MRP and outputs of MRP.	CO4	BTL-1	Remember
17	Define Economic order quantity.	CO4	BTL-2	Understand
18	Point out are the functions of shop floor control	CO4	BTL-2	Understand
19	Assess the phases of SFC	CO4	BTL-2	Understand
20	State the objective of inventory control	CO4	BTL-1	Remember
21	Mention the reasons for keeping the inventories.	CO4	BTL-1	Remember
22	Define enterprise resource planning (ERP)	CO4	BTL-2	Understand
23	List any two activities involved in process planning.	CO4	BTL-1	Remember
24	What are the two stages in Variant Process Planning (VPP)?	CO4	BTL-2	Understand
25	Define Generative Process Planning.	CO4	BTL-1	Remember

PART B (16 MARKS)

1	Explain the activities involved in process planning. Illustrate with suitable examples from manufacturing industries.	(16)	CO4	BTL-4	Remember

2	Discuss the information required for effective process planning. How does accurate design data influence downstream manufacturing?	(16)	CO4	BTL-3	Apply
3	From design to process planning: Describe the transition stages and highlight the role of design engineers and process planners.	(16)	CO4	BTL-3	Apply
4	Classify manufacturing processes. Explain each category with examples and discuss its relevance in process planning.	(16)	CO4	BTL-3	Apply
5	Explain the criteria for selecting primary manufacturing processes. How do material, design, and cost factors influence this selection?	(16)	CO4	BTL-3	Apply
6	Define Computer-Aided Process Planning (CAPP). Discuss its importance in modern manufacturing systems.	(16)	CO4	BTL-3	Apply
7	Explain the structure of a process planning module and database. How does it integrate with CAD/CAM systems?	(16)	CO4	BTL-3	Apply
8	Differentiate between variant process planning and generative process planning. Provide industrial examples for each.	(16)	CO4	BTL-3	Apply
9	Explain the two stages in Variant Process Planning (VPP). How does coding and retrieval support process standardization?	(16)	CO4	BTL-3	Apply
10	Discuss Generative Process Planning (GPP). Draw a flow chart showing the various activities involved in GPP.	(16)	CO4	BTL-3	Apply
11	Explain Semi-Generative Process Planning. How does it combine the strengths of variant and generative approaches?	(16)	CO4	BTL-3	Apply
12	Compare Computer-Aided Process Planning (CAPP) with Manual Process Planning. Highlight advantages, limitations, and industrial applications.	(16)	CO4	BTL-3	Apply
13	Discuss the role of process planning in achieving productivity and quality. Support your answer with case studies.	(16)	CO4	BTL-2	Understand
14	Explain how process planning contributes to cost reduction and resource optimization.	(16)	CO4	BTL-3	Apply
15	Discuss the challenges faced in implementing CAPP in Indian manufacturing industries. Suggest possible solutions.	(16)	CO4	BTL-3	Apply
16	Explain the importance of process planning in flexible manufacturing systems (FMS).	(16)	CO4	BTL-3	Apply
17	Evaluate the impact of Industry 4.0 and digital manufacturing on process planning.	(16)	CO4	BTL-3	Apply
18	Compare of CAPP and Manual Process Planning.	(16)	CO4	BTL-3	Apply

UNIT III GROUP TECHNOLOGY AND FMS				9
Part families – Visual – Parts classification and coding – Production flow analysis – Grouping of parts and Machines by rank order clustering method – Benefits of GT – Case studies. FMS – Components – workstations – FMS layout configurations – Computer control systems – FMS planning and implementation issues – Architecture of FMS – flow chart showing various operations in FMS – Machine cell design – Composite part concept, Holier method, Key machine concept – Quantitative analysis of FMS – Bottleneck model – Simple and complicated problems – Extended Bottleneck model - sizing the FMS ─ FMS applications, Benefits.				
PART A (2 MARKS)				
1	Define group technology.	CO3	BTL-1	Remember
2	List the roles of group technology in CAD/CAM Integration.	CO3	BTL-1	Remember
3	Compare monocode with polycode.	CO3	BTL-1	Remember
4	Define part family.	CO3	BTL-2	Understand
5	List components of GT.	CO3	BTL-1	Remember
6	Examine the general methods used for grouping parts into part families.	CO3	BTL-2	Understand
7	Summarize PFA.	CO3	BTL-2	Understand
8	Distinguish the steps involved in production flow analysis.	CO3	BTL-1	Remember
9	Mention the three basic code structure used in GT application.	CO3	BTL-2	Understand
10	Express the factors to be considered in selection of coding systems.	CO3	BTL-2	Understand
11	Mention the production system where GT & cellular manufacturing applicable	CO3	BTL-1	Remember
12	Illustrate what do you understand concept of DCLASS?	CO3	BTL-1	Remember
13	Express the concept of Opitz classification system	CO3	BTL-2	Understand
14	Mention the differences between hierarchical codes and attribute code structure.	CO3	BTL-2	Evaluate
15	Define composite part.	CO3	BTL-2	Understand
16	Define cellular manufacturing	CO3	BTL-2	Understand
17	Assess any four benefits implementation of cellular manufacturing.	CO3	BTL-1	Remember
18	Summarize any four design considerations guiding the cell formation.	CO3	BTL-1	Remember
19	List the limitations for implementation cellular manufacturing	CO3	BTL-2	Understand
20	State applications of rank order clustering algorithm.	CO3	BTL-2	Understand
21	State applications of rank order clustering algorithm.	CO3	BTL-1	Remember

22	What is meant by part families in Group Technology (GT)?	CO3	BTL-2	Understand
23	Define rank order clustering method used for grouping parts and machines.	CO3	BTL-1	Remember
24	List any two components of a Flexible Manufacturing System (FMS).	CO3	BTL-1	Remember
25	What is the bottleneck model in FMS analysis?	CO3	BTL-2	Understand

PART B (16 MARKS)

1	Explain the concept of part families in Group Technology with suitable examples.	(16)	CO3	BTL-2	Understand
2	Describe the rank order clustering method for grouping parts and machines.	(16)	CO3	BTL-3	Apply
3	List and explain the components of a Flexible Manufacturing System (FMS).	(16)	CO3	BTL-3	Apply
4	Discuss the benefits of Group Technology (GT) with case studies.	(16)	CO3	BTL-3	Analyze
5	Explain different FMS layout configurations with neat diagrams.	(16)	CO3	BTL-2	Understand
6	Describe the architecture of FMS and illustrate with a flow chart of operations.	(16)	CO3	BTL-3	Apply
7	Apply the composite part concept to design a machine cell.	(16)	CO3	BTL-3	Apply
8	Using the Hollerith (Holier) method, show how parts can be grouped for FMS.	(16)	CO3	BTL-3	Apply
9	Demonstrate the key machine concept with an example of machine cell design.	(16)	CO3	BTL-2	Understand
10	Analyze the bottleneck model in FMS. Provide examples of simple and complicated problems.	(16)	CO3	BTL-3	Apply
11	Compare the basic bottleneck model with the extended bottleneck model in FMS sizing.	(16)	CO3	BTL-3	Apply
12	Examine the role of computer control systems in managing FMS operations.	(16)	CO3	BTL-3	Apply
13	Evaluate the planning and implementation issues in FMS. Suggest strategies to overcome them.	(16)	CO3	BTL-3	Apply
14	Critically assess the quantitative analysis methods used in FMS performance measurement.	(16)	CO3	BTL-3	Apply
15	Discuss the applications and benefits of FMS in modern manufacturing industries.	(16)	CO3	BTL-3	Apply
16	Design a machine cell layout for a given set of part families using GT principles.	(16)	CO3	BTL-3	Apply
17	Propose a framework for integrating GT and FMS in a smart factory	(16)	CO3	BTL-3	Apply

	environment.				
18	Develop a future-oriented FMS model incorporating Industry 4.0 technologies (IoT, AI, robotics).	(16)	CO3	BTL-3	Apply

UNIT IV AUTOMATED MANUFACTURING SYSTEMS				9
Automated production line – system configurations, work part transfer mechanisms – Fundamentals of Automated assembly system – System configuration, Part delivery at workstations – Design for automated assembly – Overview of material handling equipment – Consideration in material handling system design – The 10 principles of Material handling. Conveyor systems – Types of conveyors – Operations and features. Automated Guided Vehicle system – Types &applications – Vehicle guidance technology – Vehicle management and safety.				
PART A (2 MARKS)				
1	Define an automated production line.	CO2	BTL-1	Remember
2	What is the difference between synchronous and asynchronous transfer systems?	CO2	BTL-2	Understand
3	Name two common system configurations in automated production lines.	CO2	BTL-1	Remember
4	List two work part transfer mechanisms used in automation.	CO2	BTL-2	Understand
5	What is the role of pallets in automated transfer systems?	CO2	BTL-1	Remember
6	Differentiate between fixed automation and flexible automation.	CO2	BTL-2	Understand
7	What is the function of a vibratory bowl feeder?	CO2	BTL-1	Remember
8	Mention two methods of part delivery at workstations.	CO2	BTL-2	Evaluate
9	State two design guidelines for automated assembly.	CO2	BTL-2	Evaluate
10	What is meant by “self-locating features” in design for assembly?	CO2	BTL-1	Remember
11	Define material handling.	CO2	BTL-2	Understand
12	List two categories of material handling equipment.	CO2	BTL-2	Understand
13	What is the importance of ergonomics in material handling system design?	CO2	BTL-1	Remember
14	Mention two factors to consider in material handling system design.	CO2	BTL-1	Remember
15	What is an Automated Storage and Retrieval System (AS/RS)?	CO2	BTL-1	Remember
16	State the principle of “Unit Load” in material handling.	CO2	BTL-2	Understand
17	What does the principle of “System” emphasize?	CO2	BTL-2	Understand
18	Mention two environmental considerations in material handling.	CO2	BTL-1	Remember
19	What is meant by “Life Cycle Cost” principle?	CO2	BTL-1	Remember
20	Define the principle of “Standardization” in material handling.	CO2	BTL-1	Remember
21	List any two types of conveyors.	CO2	BTL-2	Understand
22	What is the main advantage of belt conveyors?	CO2	BTL-1	Remember
23	Differentiate between gravity roller and powered roller conveyors.	CO2	BTL-1	Apply
24	State one limitation of conveyor systems.	CO2	BTL-2	Understand
25	What is the role of pneumatic conveyors?	CO2	BTL-2	Understand
PART B (16 MARKS)				

1	Explain the different system configurations of automated production lines with neat sketches.	CO2	(16)	BTL-3	Understand
2	Discuss various work part transfer mechanisms used in automated production lines. Illustrate with examples.	CO2	(8)	BTL-4	Evaluate
3	Describe the fundamentals of automated assembly systems. Explain system configuration and part delivery methods at workstations.	CO2	(16)	BTL-3	Apply
4	What is Design for Automated Assembly (DFAA)? Discuss its principles with suitable examples.	CO2	(16)	BTL-3	Apply
5	Give an overview of material handling equipment. Explain the considerations in material handling system design.	CO2	(16)	BTL-3	Apply
6	Explain the 10 principles of material handling with practical examples.	CO2	(16)	BTL-3	Apply
7	Describe the different types of conveyor systems. Explain their operations and features with diagrams.	CO2	(16)	BTL-4	Evaluate
8	Compare and contrast belt conveyors, roller conveyors, and pneumatic conveyors with respect to applications and limitations.	CO2	(16)	BTL-3	Apply
9	Explain the types and applications of AGV systems in modern industries.	CO2	(16)	BTL-3	Apply
10	Discuss various vehicle guidance technologies used in AGV systems.	CO2	(16)	BTL-3	Apply
11	Write notes on vehicle management and safety features in AGV systems.	CO2	(16)	BTL-3	Apply
12	Discuss the advantages and limitations of automated production lines. How do system configurations influence productivity?	CO2	(16)	BTL-3	Apply
13	Explain the integration of work part transfer mechanisms with automated assembly systems. Support your answer with suitable examples.	CO2	(16)	BTL-3	Apply
14	Evaluate the role of ergonomics and safety in material handling system design. Suggest improvements with case examples.	CO2	(16)	BTL-3	Apply
15	Explain how the 10 principles of material handling can be applied in designing a modern warehouse system.	CO2	(16)	BTL-3	Apply
16	Describe the selection criteria for conveyor systems in manufacturing industries. Compare different conveyor types with respect to cost, flexibility, and efficiency.	CO2	(16)	BTL-3	Apply
17	Discuss the future trends and challenges in AGV systems. How do guidance technologies and safety features evolve with Industry 4.0?	CO2	(16)	BTL-3	Apply
18	Automated Guided Vehicle (AGV) Systems- Narrate a Case Study	CO2	(16)	BTL-3	Apply

UNIT V	INTRODUCTION TO INDUSTRY 4.0			9
Industry 4.0: Globalization and Emerging Issues, The Fourth Revolution, LEAN Production Systems, Mass Customization, Smart Factories, Digital Twin Technologies, Cyber Physical Systems and Next Generation Sensors, Collaborative Platform and Product Life cycle Management, Augmented Reality and Virtual Reality, Artificial Intelligence, Big Data and Advanced Analysis Sensors.				
PART A (2 MARKS)				
1	Define Industry 4.0.	CO5	BTL-1	Remember
2	What are the emerging issues of globalization in Industry 4.0?	CO5	BTL-1	Remember
3	Why is Industry 4.0 called the Fourth Industrial Revolution?	CO5	BTL-1	Remember
4	List any two key features of Industry 4.0.	CO5	BTL-1	Remember
5	What is meant by LEAN production system?	CO5	BTL-2	Understand
6	State two advantages of LEAN production.	CO5	BTL-2	Understand
7	Define mass customization with an example.	CO5	BTL-1	Remember
8	Differentiate between mass production and mass customization.	CO5	BTL-1	Remember
9	What is a smart factory?	CO5	BTL-2	Understand
10	Mention two benefits of smart factories.	CO5	BTL-2	Understand
11	Define digital twin technology.	CO5	BTL-2	Understand
12	Give two applications of digital twins in manufacturing.	CO5	BTL-2	Understand
13	What are cyber-physical systems (CPS)?	CO5	BTL-2	Understand
14	State two examples of next-generation sensors used in Industry 4.0.	CO5	BTL-1	Remember
15	What is meant by a collaborative platform in Industry 4.0?	CO5	BT-2	Understand
16	Define Product Lifecycle Management (PLM).	CO5	BTL-2	Understand
17	Mention two advantages of PLM systems.	CO5	BTL-2	Understand
18	What is Augmented Reality (AR)?	CO5	BTL-1	Remember
19	What is Virtual Reality (VR)?	CO5	BTL-1	Remember
20	Differentiate between AR and VR.	CO5	BTL-2	Understand
21	Define Artificial Intelligence (AI) in the context of Industry 4.0.	CO5	BTL-1	Remember
22	State two applications of AI in manufacturing.	CO5	BTL-1	Remember
23	What is Big Data?	CO5	BTL-1	Remember
24	Mention two uses of Big Data analytics in Industry 4.0.	CO5	BTL-1	Remember
25	What are advanced analysis sensors? Give two examples.	CO5	BTL-1	Remember

PART B (16 MARKS)					
1	Explain the concept of Industry 4.0. Discuss globalization and emerging issues associated with the Fourth Industrial Revolution.	(16)	CO5	BTL-3	Apply
2	Trace the evolution of industrial revolutions. How does Industry 4.0 differ from the previous three revolutions?	(16)	CO5	BTL-3	Apply
3	Discuss the principles of LEAN production systems. How do they integrate with Industry 4.0 technologies?	(16)	CO5	BTL-3	Apply
4	Explain mass customization. How does Industry 4.0 enable mass customization while maintaining efficiency?	(16)	CO5	BTL-3	Apply
5	Describe the concept of smart factories. Discuss their features, benefits, and challenges in implementation.	(16)	CO5	BTL-3	Apply
6	Explain digital twin technologies. How do they support predictive maintenance and product innovation?	(16)	CO5	BTL-3	Apply
7	Discuss cyber-physical systems (CPS). How do CPS form the backbone of Industry 4.0?	(16)	CO5	BTL-3	Apply
8	Evaluate the role of next-generation sensors in Industry 4.0. Provide examples of their applications in manufacturing.	(16)	CO5	BTL-3	Apply
9	Explain collaborative platforms in Industry 4.0. How do they enhance communication across the product lifecycle?	(16)	CO5	BTL-3	Apply
10	Discuss Product Lifecycle Management (PLM). How does PLM integrate with Industry 4.0 technologies to improve competitiveness?	(16)	CO5	BT-3	Apply
11	Explain the role of Augmented Reality (AR) and Virtual Reality (VR) in Industry 4.0. Provide industrial applications.	(16)	CO5	BTL-3	Apply
12	Discuss Artificial Intelligence (AI) in Industry 4.0. How does AI transform decision-making in manufacturing?	(16)	CO5	BTL-3	Apply
13	Explain the importance of Big Data in Industry 4.0. How does advanced analytics improve productivity and efficiency?	(16)	CO5	BTL-3	Apply
14	Evaluate the role of advanced analysis sensors in Industry 4.0. How do they contribute to smart manufacturing?	(16)	CO5	BTL-3	Apply
15	Discuss the challenges and opportunities of implementing Industry 4.0 in developing countries like India.	(16)	CO5	BTL-3	Apply
16	Explain how Industry 4.0 technologies support sustainable manufacturing. Provide examples from global industries.	(16)	CO5	BTL-3	Apply
17	Discuss the integration of collaborative platforms, PLM, and AI in Industry 4.0. How do they collectively improve innovation?	(16)	CO5	BTL-3	Apply
18	Critically analyze the impact of Industry 4.0 on workforce skills and employment. Suggest strategies for adaptation.	(16)	CO5	BTL-4	Analyze