JEPPIAAR ENGINEERING COLLEGE

Jeppiaar Nagar, Rajiv Gandhi Salai – 600 119

DEPARTMENT OF

MECHANICAL ENGINEERING

QUESTION BANK

VII SEMESTER

ME6703 – COMPUTER INTEGRATED MANUFACTURING SYSTEMS

Regulation – 2013

JEPPIAAR ENGINEERING COLLEGE

Vision of Institution

To build Jeppiaar Engineering College as an institution of academic excellence in technological and management education to become a world class university.

Mission of Institution

- To excel in teaching and learning, research and innovation by promoting the principles of scientific analysis and creative thinking.
- To participate in the production, development and dissemination of knowledge and interact with national and international communities.
- To equip students with values, ethics and life skills needed to enrich their lives and enable them to meaningfully contribute to the progress of society.
- To prepare students for higher studies and lifelong learning, enrich them with the practical and entrepreneurial skills necessary to excel as future professionals and contribute to Nation's economy.

PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

JEPPIAAR ENGINEERING COLLEGE

DEPARTMENT OF MECHANICAL ENGINEERING

Vision of the Department

To create excellent professionals in the field of Mechanical Engineering and to uplift the quality of technical education on par with the International Standards.

Department Mission

1. **To reinforce** the fundamentals of Science and Mathematics to Mechanical Engineering **and critically and relatively investigate co**mplex mechanical systems and processes.
2. To engage in the **production, expansion and practice** of advanced engineering applications through knowledge sharing activities by interacting with global communities and industries.
3. To **equip** students with **engineering ethics, professional roles, corporate social responsibility** and life skills and **apply** them for the betterment of society.
4. **To promote** higher studies and lifelong learning and entrepreneurial skills and **develop** excellent professionals for empowering nation's economy.

PEO's

1. To **enrich** the technical knowledge of design, manufacturing and management of mechanical systems and **develop creative and analytical thinking** in research.
2. To **relate, strengthen and develop** the theoretical knowledge of the Mechanical Engineering by exhibiting various concepts applied through diverse industrial exposures and experts' guidance.
3. **Facilitate** the students to communicate effectively on complex social, professional and engineering activities with strict adherence to ethical principles.
4. **Create awareness for independent and life long learning and develop the ability to keep abreast of modern trends and adopt them for personal technological growth of the nation.**

PSO's

1. To understand the basic concept of various mechanical engineering field such as design, manufacturing, thermal and industrial engineering.
2. To apply the knowledge in advanced mechanical system and processes by using design and analysis techniques.
3. To develop student's professional skills to meet the industry requirements and entrepreneurial skills for improving nation's economy stronger.

ME6703 – COMPUTER INTEGRATED MANUFACTURING SYSTEMS

COURSE OUTCOMES

C403.1	outline the application of computers in various aspects of Manufacturing and various Mathematical models
C403.2	determine the planning and control of production cost , inventory, material requirement ,shop floor and enterprise resource
C403.3	construct the part family's, classification and coding and Machine cell design and explain the concept of production flow analysis
C403.4	apply the concepts of adaptable systems in production planning and control and automated guidance system
C403.5	explain the control systems in robots and develop programming skill based on various applications

ME6703 COMPUTER INTEGRATED MANUFACTURING SYSTEMSL T P C 3 0 0 3

OBJECTIVES:

To understand the application of computers in various aspects of Manufacturing viz., Design, Proper planning, Manufacturing cost, Layout & Material Handling system.

UNIT I INTRODUCTION 10

Brief introduction to CAD and CAM – Manufacturing Planning, Manufacturing control- Introduction to CAD/CAM – Concurrent Engineering-CIM concepts – Computerised elements of CIM system – Types of production - Manufacturing models and Metrics – Mathematical models of Production Performance – Simple problems – Manufacturing Control – Simple Problems – Basic Elements of an Automated system – Levels of Automation – Lean Production and Just-In-Time Production

UNIT II PRODUCTION PLANNING AND CONTROL AND COMPUTERISED PROCESS PLANNING 10

Process planning – Computer Aided Process Planning (CAPP) – Logical steps in Computer Aided Process Planning – Aggregate Production Planning and the Master Production Schedule – Material Requirement planning – Capacity Planning- Control Systems-Shop Floor Control-Inventory Control – Brief on Manufacturing Resource Planning-II (MRP-II) & Enterprise Resource Planning (ERP) - Simple Problems

UNIT III CELLULAR MANUFACTURING 9

Group Technology(GT), Part Families – Parts Classification and coding – Simple Problems in Opitz Part Coding system – Production flow Analysis – Cellular Manufacturing – Composite part concept – Machine cell design and layout – Quantitative analysis in Cellular Manufacturing – Rank Order Clustering Method - Arranging Machines in a GT cell – Hollier Method – Simple Problems

UNIT IV FLEXIBLE MANUFACTURING SYSTEM (FMS) AND AUTOMATED GUIDED VEHICLE SYSTEM (AGVS) 8

Types of Flexibility - FMS – FMS Components – FMS Application & Benefits – FMS Planning and Control– Quantitative analysis in FMS – Simple Problems. Automated Guided Vehicle System (AGVS) – AGVS Application – Vehicle Guidance technology – Vehicle Management & Safety.

UNIT V INDUSTRIAL ROBOTICS 8

Robot Anatomy and Related Attributes – Classification of Robots- Robot Control systems – End Effectors – Sensors in Robotics – Robot Accuracy and Repeatability - Industrial Robot Applications – Robot Part Programming – Robot Accuracy and Repeatability – Simple Problems

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Mikell.P.Groover "Automation, Production Systems and Computer Integrated Manufacturing", Prentice Hall of India, 2008..

2. Radhakrishnan P, Subramanyan S.and Raju V., "CAD/CAM/CIM", 2nd Edition, New AgeInternational (P) Ltd, New Delhi, 2000.

REFERENCES:

1. Kant Vajpayee S, "Principles of Computer Integrated Manufacturing", Prentice Hall India, 2003.

2. Gideon Halevi and Roland Weill, "Principles of Process Planning – A Logical Approach" Chapman & Hall, London, 1995.

3. Rao. P, N Tewari &T.K. Kundra, “Computer Aided Manufacturing”, Tata McGraw Hill Publishing Company, 2000.

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DEPARTMENT OFMECHANICAL ENGINEERING

QUESTION BANK

Subject : ME6703 COMPUTER INTEGRATED MANUFACTURING SYSTEMS
Year / Sem : IV / VII

UNIT I- INTRODUCTION

Brief introduction to CAD and CAM – Manufacturing Planning, Manufacturing control- Introduction to CAD/CAM – Concurrent Engineering-CIM concepts – Computerized elements of CIM system –Types of production - Manufacturing models and Metrics – Mathematical models of Production Performance – Simple problems – Manufacturing Control – Simple Problems – Basic Elements of an Automated system – Levels of Automation – Lean Production and Just-In-Time Production

PART-A

CO Mapping : C703.1

Q.No.	Questions	BT Level	Competence	PO
1	List any two reasons for using a CAD system	**BTL-1**	Remembering	**PO5**
2	What are the components of CAD systems?	**BTL-1**	Remembering	**PO5**
3	What are the drawing features of CAD package?	**BTL-1**	Remembering	**PO3**
4	What are the advantages of CAD modeling?	**BTL-1**	Remembering	**PO5**
5	What is meant by and topology?	**BTL-1**	Remembering	**PO1**
6	List any four rules of dimensioning?	**BTL-1**	Remembering	**PO1**
7	Distinguish between reflection and scaling transformations.	**BTL-4**	Analyzing	**PO4**
8	What is sculptured surface?	**BTL-1**	Remembering	**PO1**
9	What are the advantages to be gained by the adoption of CAD?	**BTL-1**	Remembering	**PO5**
10	Measure the range of applications for which typical geometric modeling information is used.	**BTL-5**	Evaluating	**PO1**
11	Explain CIM	**BTL-2**	Understanding	**PO5**
12	What are the components of CIM?	**BTL-1**	Remembering	**PO5**
13	What are the steps involved in designing and	**BTL-1**	Remembering	**PO3**

	manufacturing a product?			
14	What is the role of CIM in manufacturing?	**BTL-1**	Remembering	**PO5**
15	What are important applications of CIM in manufacturing planning?	**BTL-1**	Remembering	**PO5**
16	What are the important applications of CIM in manufacturing control?	**BTL-1**	Remembering	**PO5**
17	What is cim management?	**BTL-1**	Remembering	**PO6**
18	List out the tasks for the managers in effective management	**BTL-1**	Remembering	**PO6**
19	What are the major communications used in manufacturing industry?	**BTL-1**	Remembering	**PO10**
20	What is videoconferencing?	**BTL-1**	Remembering	**PO1**
21	Define automation	**BTL-1**	Remembering	**PO5**
22	What are the goals of automation in manufacturing industry?	**BTL-1**	Remembering	**PO5**
23	What are the functions of automated manufacturing system?	**BTL-1**	Remembering	**PO5**
24	List the classification of automation.	**BTL-1**	Remembering	**PO5**
25	What are the benefits of automation?	**BTL-1**	Remembering	**PO5**
26	What are the capabilities of computer control?	**BTL-1**	Remembering	**PO1**
27	Explain the types of interlocks	**BTL-2**	Understanding	**PO1**
28	What is MAP?	**BTL-1**	Remembering	**PO5**
29	What are the approaches of physical distributions?	**BTL-1**	Remembering	**PO6**
30	Define lean manufacturing	**BTL-1**	Remembering	**PO4**
PART-B&PART-C				
1	Discuss the applications of computers for design.	**BTL-6**	Creating	**PO1**
2	Explain the drawing features of CAD.	**BTL-2**	Understanding	**PO5**
3	Name the types of modeling of CAD? Explain about any one of them**.**	**BTL-1**	Remembering	**PO5**
4	Discuss about operator input devices used at the graphics workstation**.**	**BTL-6**	Creating	**PO1**
5	Explain about the following types of transformations with example. (i) Translation (ii) scaling (iii) rotation	**BTL-2, BTL-5**	Understanding	**PO1**
6	Explain the short notes on 3D scaling and 3D shearing geometric transformation	**BTL-2, BTL-5**	Understanding	**PO5**

UNIT II PRODUCTION PLANNING AND CONTROL AND COMPUTERISED PROCESS PLANNING

Process planning – Computer Aided Process Planning (CAPP) – Logical steps in Computer Aided Process Planning – Aggregate Production Planning and the Master Production Schedule – Material Requirement planning – Capacity Planning- Control Systems-Shop Floor Control-Inventory Control – Brief on Manufacturing Resource Planning-II (MRP-II) & Enterprise Resource Planning (ERP) - Simple Problems

PART-A

CO Mapping : C703.2

Q.No.	Questions	BT Level	Competence	PO
1	List any two benefits of CIM	**BTL-1**	Remembering	**PO5**
2	What are the various network topologies?	**BTL-1**	Remembering	**PO5**
3	What is the difference between automation and CIM?	**BTL-1**	Remembering	**PO3**
4	What is meant by asynchronous data transfer?	**BTL-1**	Remembering	**PO5**
5	Distinguish between LAN model and MAN model	**BTL-4**	Analyzing	**PO1**
6	What is communications network? list its types	**BTL-1**	Remembering	**PO1**
7	What is MAP model?	**BTL-1**	Remembering	**PO4**
8	Compare IGES and GKS graphic standards.	**BTL-2**	Understanding	**PO1**
9	Compare modulation and demodulation	**BTL-2**	Understanding	**PO5**
10	Define Group Technology (GT)	**BTL-1**	Remembering	**PO1**
11	List out the stages in Group Technology	**BTL-1**	Remembering	**PO5**
12	Define Part families	**BTL-1**	Remembering	**PO5**
13	What are the methods available for solving problems in GT?	**BTL-1**	Remembering	**PO3**
14	Explain the two categories of attributes of parts	**BTL-2**	Understanding	**PO5**
15	List out the premises for the developed of DCLASS code.	**BTL-1**	Remembering	**PO5**
16	What is PFA?	**BTL-1**	Remembering	**PO5**
17	What is the weakness of PFA?	**BTL-1**	Remembering	**PO6**
18	What are the applications of GT?	**BTL-1**	Remembering	**PO6**
19	What is FMS?	**BTL-1**	Remembering	**PO10**
20	What is Process planning?	**BTL-1**	Remembering	**PO1**
21	What are the results of Process Planning?	**BTL-1**	Remembering	**PO5**
22	What are the steps involved in Process planning?	**BTL-1**	Remembering	**PO5**
23	What are the factors should be considered in selection of tooling?	**BTL-1**	Remembering	**PO5**
24	What are the principles should adhere while determining the efficient sequence?	**BTL-1**	Remembering	**PO5**

25	What arc the prerequisites for process planning?	**BTL-1**	Remembering	**PO5**
26	What are the approaches the CAPP will recognize?	**BTL-1**	Remembering	**PO1**
27	Why CAPP systems are called as variant system?	**BTL-1**	Remembering	**PO1**
28	List the main component of generative CAPP systems.	**BTL-1**	Remembering	**PO5**
29	What arc the benefits of CAPP over manual process?	**BTL-1**	Remembering	**PO6**
30	Define agile manufacturing	**BTL-1**	Remembering	**PO4**
Q.No.	**Questions**	**BT Level**	**Competence**	**PO5**
PART-B&PART-C				
1	Explain the open system interconnection architecture (OSI) formulated by ISO	**BTL-2**	Understanding	**PO3**
2	What are the different network topologies available? Discuss them in detail	**BTL-2**	Understanding	**PO5**
3	Explain the important of CIM. Also write the reasons for implementing CIM	**BTL-2**	Understanding	**PO1**
4	Explain and compare the different types of network topologies.	**BTL-2** **BTL-5**	Understanding Evaluating	**PO1**
5	Discuss the significance of MAP in CIM environment**.**	**BTL-6**	Creating	**PO4**

UNIT III CELLULAR MANUFACTURING

Group Technology(GT), Part Families – Parts Classification and coding – Simple Problems in Opitz Part Coding system – Production flow Analysis – Cellular Manufacturing – Composite part concept – Machine cell design and layout – Quantitative analysis in Cellular Manufacturing – Rank Order Clustering Method - Arranging Machines in a GT cell – Hollier Method – Simple Problems.

PART-A

CO Mapping : C703.3

Q.No.	**Questions**	**BT Level**	**Competence**	**PO5**
1	Define the role of GT in CAD/CAM integration	**BTL-1**	Remembering	**PO3**
2	List any two benefits of CAPP	**BTL-1**	Remembering	**PO5**
3	Name the benefits of GT.	**BTL-1**	Remembering	**PO5**
4	What is CAPP?	**BTL-1**	Remembering	**PO5**
5	What is mean by mono code and poly codes structures?	**BTL-1**	Remembering	**PO6**
6	List out the technique available for formation	**BTL-1**	Remembering	**PO6**

	of cell in GT.			
7	What is the main difference between hierarchical codes and attribute codes structures?	**BTL-1**	Remembering	**PO10**
8	What is CMPP system?	**BTL-1**	Remembering	**PO1**
9	Explain Opitz coding system	**BTL-2**	Understanding	**PO5**
10	Define Group technology.	**BTL-1**	Remembering	**PO5**
11	List the major objectives of a Production Management Systems (PMS).	**BTL-1**	Remembering	**PO5**
12	Define SFC.	**BTL-1**	Remembering	**PO5**
13	What are the primary function of SFC?	**BTL-1**	Remembering	**PO5**
14	What are the phases of SFC?	**BTL-1**	Remembering	**PO1**
15	What is the purpose of FDS?	**BTL-1**	Remembering	**PO1**
16	What is an Automatic Data Capture (ADC) method?	**BTL-1**	Remembering	**PO5**
17	What are the technologies used in ADC?	**BTL-1**	Remembering	**PO6**
18	What Bar code consists?	**BTL-1**	Remembering	**PO4**
19	What are the types of Bar code?	**BTL-1**	Remembering	**PO5**
20	What is DAS?	**BTL-1**	Remembering	**PO5**
21	List out the application of ADC technology.	**BTL-1**	Remembering	**PO3**
22	What are the types of SFC?	**BTL-1**	Remembering	**PO5**
23	Define FMS.	**BTL-1**	Remembering	**PO1**
24	What arc the Objectives of FMS?	**BTL-1**	Remembering	**PO1**
25	What are the components of FMS?	**BTL-1**	Remembering	**PO4**
26	What are the FMS layout configurations?	**BTL-1**	Remembering	**PO1**
27	What arc the functions of computers in FMS?	**BTL-1**	Remembering	**PO5**
28	List the applications of FMS.	**BTL-1**	Remembering	**PO1**
29	Discuss the benefits of FMS.	**BTL-6**	Creating	**PO5**
30	List any two advantages and disadvantages of FMS implementation.	**BTL-1**	Remembering	**PO5**
31	How FMS classified does based on level of flexibility?	**BTL-1**	Remembering	**PO5**
PART-B & PART-C				
Q.No.	**Questions**	**BT Level**	**Competence**	**PO**
1	Explain about Optiz classification and coding system.	**BTL-2**	Understanding	**PO5**
2	Explain retrieval and generative CAPP systems	**BTL-2**	Understanding	**PO5**

3	Discuss the various benefits of implementing a GT in a firm. Also bring out the advantages and limitations of using GT.	**BTL-6**	Creating	**PO5,PO1**
4	Explain about i) Composite part concept &ii) Key machine concept	**BTL-2**	Understanding	**PO5**
5	Explain why the GT is important in achieving CAD&CAM integration?	**BTL-2**	Understanding	**PO5,PO1**
6	(a) Elaborate the composite part concept in cellular manufacturing. (b) Discuss the importance of process planning in product development	**BTL-6**	Creating	**PO1,PO5,PO9**

UNIT IV FLEXIBLE MANUFACTURING SYSTEM (FMS) AND AUTOMATED GUIDED VEHICLE SYSTEM (AGVS)

Types of Flexibility - FMS – FMS Components – FMS Application & Benefits – FMS Planning and Control– Quantitative analysis in FMS – Simple Problems. Automated Guided Vehicle System (AGVS) – AGVS Application – Vehicle Guidance technology – Vehicle Management & Safety.

PART-A

CO Mapping : C703.4

Q.No.	Questions	BT Level	Competence	PO
1	List any two methods used to collect data from the shop floor.	**BTL-1**	Remembering	**PO5**
2	list any two applications of FMS	**BTL-1**	Remembering	**PO5**
3	Explain the functions of computer control system of FMS.	**BTL-2**	Understanding	**PO3**
4	List the different stages of shop floor control.	**BTL-1**	Remembering	**PO5**
5	Compare the dedicated FMS and random order FMS.	**BTL-5**	Evaluating	**PO1**
6	Name the purpose of primary and secondary material handling system	**BTL-1**	Remembering	**PO1**
7	Compare the on line and off line data collecting systems.	**BTL-5**	Evaluating	**PO4**
8	List some important advantages of implementing FMS	**BTL-1**	Remembering	**PO1**
9	list the importance of shop floor control system (SFC).	**BTL-1**	Remembering	**PO5**
10	What are the inputs and output of MRP?	**BTL-1**	Remembering	**PO1**
11	Which is ideal state in computer based manufacturing applications?	**BTL-1**	Remembering	**PO5**

12	Construct the simple E-R diagram.	**BTL-2**	Understanding	**PO5**
13	What are the types of IDEF models?	**BTL-1**	Remembering	**PO3**
14	Explain about CIMOSA.	**BTL-2**	Understanding	**PO5**
15	How CIMOSA separates functions?	**BTL-1**	Remembering	**PO5**
16	Explain about MRR	**BTL-2**	Understanding	**PO5**
17	What is the role of process planning in CIM architecture?	**BTL-1**	Remembering	**PO6**
18	What is dispatching?	**BTL-1**	Remembering	**PO6**
19	What about shop-floor information?	**BTL-1**	Remembering	**PO10**
20	Explain PDM.	**BTL-2**	Understanding	**PO1**
21	List different types of production monitoring system.	**BTL-1**	Remembering	**PO5**
22	What are the inputs to MRP system?	**BTL-1**	Remembering	**PO5**
23	Write down three phases of shop floor control	**BTL-1**	Remembering	**PO5**
24	What is meant by procurement lead time?	**BTL-1**	Remembering	**PO5**
25	What is meant by fixed order quantity model?	**BTL-1**	Remembering	**PO5**
26	What is foreign key?	**BTL-1**	Remembering	**PO1**
27	What is normalization?	**BTL-1**	Remembering	**PO1**
28	Show the different levels of data modeling.	**BTL-1**	Remembering	**PO5**
29	What is Network Data Model?	**BTL-1**	Remembering	**PO6**
30	What is Hierarchical Data Model?	**BTL-1**	Remembering	**PO4**
PART-B& PART-C				
1	Explain various components of FMS? And list out applications, advantages, disadvantages of FMS	**BTL-2**	Understanding	**PO9, PO5, PO1**
2	What is shop floor control? And what are the functions of SFC? Explain various phases of SFC	**BTL-1**	Remembering	**PO5**
3	Explain the FMS Layout and its application and benefits.	**BTL-2**	Understanding	**PO1,PO5**
4	Explain about FMS workstation	**BTL-2**	Understanding	**PO5, PO1**
5	Discuss the technology behind automated data collection system	**BTL-6**	Creating	**PO5**
6	Explain the FMS Layout and SFC flow control.	**BTL-2**	Understanding	**PO1,PO5**

UNIT V INDUSTRIAL ROBOTICS

Robot Anatomy and Related Attributes – Classification of Robots- Robot Control systems – End Effectors – Sensors in Robotics – Robot Accuracy and Repeatability - Industrial Robot Applications – Robot Part Programming – Robot Accuracy and Repeatability – Simple Problems

PART-A

CO Mapping : C703.5

Q.No.	Questions	BT	Competence	PO

		Level		
1	Define an Industrial Robot**.**	**BTL-1**	Remembering	**PO5**
2	Define base and tool Coordinate system?	**BTL-1**	Remembering	**PO5**
3	What are the rules of Robotics? Write any two laws of robotics**.**	**BTL-1**	Remembering	**PO3**
4	Why are robots used?	**BTL-1**	Remembering	**PO5**
5	What is meant by Robot anatomy?	**BTL-1**	Remembering	**PO1**
6	List the classification of robots?	**BTL-1**	Remembering	**PO1**
7	What are the benefits of industrial robots?	**BTL-1**	Remembering	**PO4**
8	Name the important specifications of an industrial robot**.**	**BTL-1**	Remembering	**PO1**
9	What is meant by accuracy of robot?	**BTL-1**	Remembering	**PO5**
10	What is repeatability of robot?	**BTL-1**	Remembering	**PO1**
11	Define End effector. Give some examples of Robot End Effector**.**	**BTL-1**	Remembering	**PO5**
12	What is meant by Gripper? What are the types of grippers?	**BTL-1**	Remembering	**PO5**
13	List out the gripper design considerations?	**BTL-1**	Remembering	**PO3**
14	What are the methods of robot programming?	**BTL-1**	Remembering	**PO5**
15	What are the ways of accomplishing lead through programming?	**BTL-1**	Remembering	**PO5**
16	What are the components of DDC?	**BTL-1**	Remembering	**PO5**
17	What is direct digital control?	**BTL-1**	Remembering	**PO6**
18	Discuss the CIM data transmission methods.	**BTL-6**	Creating	**PO6**
19	What are the two types of channel?	**BTL-1**	Remembering	**PO10**
20	List the characteristics of channel.	**BTL-1**	Remembering	**PO1**
21	What is channel bandwidth?	**BTL-1**	Remembering	**PO5**
22	What are two types of transmission mode?	**BTL-1**	Remembering	**PO5**
23	What is modulation?	**BTL-1**	Remembering	**PO5**
24	What is demodulation?	**BTL-1**	Remembering	**PO5**
25	What are the reasons for using LAN?	**BTL-1**	Remembering	**PO5**
26	What are the features of LAN?	**BTL-1**	Remembering	**PO1**
27	Define topology and explain its classification.	**BTL-1**	Remembering	**PO1**
28	What are the Advantages of LAN?	**BTL-1**	Remembering	**PO5**
29	Define OSI.	**BTL-1**	Remembering	**PO6**
30	List out the layers of OSI model.	**BTL-1**	Remembering	**PO4**
PART-B& PART-C				
1	Explain about Robot Anatomy and Related Attributes	**BTL-2**	Understanding	**PO5, PO6, PO7**
2	Explain about Robot Control systems	**BTL-2**	Understanding	**PO5, PO6, PO7**
3	Explain about End Effectors – Sensors in Robotics	**BTL-2**	Understanding	**PO5, PO6, PO7**
4	Explain about Robot Accuracy and Repeatability	**BTL-2**	Understanding	**PO5,**

				PO6, PO7
5	Explain about Industrial Robot Applications	**BTL-2**	Understanding	**PO5, PO6, PO7**
6	Explain shortly on Robot Part Programming	**BTL-2**	Understanding	**PO5, PO6, PO7**

UNIT I INTRODUCTION

Brief introduction to CAD and CAM – Manufacturing Planning, Manufacturing control- Introduction to CAD/CAM – Concurrent Engineering-CIM concepts – Computerized elements of CIM system –Types of production - Manufacturing models and Metrics – Mathematical models of Production Performance – Simple problems – Manufacturing Control – Simple Problems – Basic Elements of an Automated system – Levels of Automation – Lean Production and Just-In-Time Production

PART-A

1. List any two reasons for using a CAD system. (Nov/Dec 2011)

(i) To increase the productivity of the designer
(ii) To improve the quality of the design.
(iii) To improve the communications.

2. What are the components of CAD systems? (Nov/Dec 2011)

1. Geometric modeling.
2. Design analysis and optimization,
3. Design review and evaluation and
4. Documentation and drafting

3. What are the drawing features of CAD package? (May/June 2012)

(i) Geometric modeling features.
(ii) Editing or manipulation features.
(iii) Display control features.
(iv) Drafting features.

4.What are the advantages of CAD modeling? (May/June 2012)

(i) Mass properties of physical model can be calculated quicky
(ii) Solid models are unambiguous models.
(iii) Cross sectional views of models can be obtained easily.
(iv) It can be used for interference/clearance checking of moving parts

5.What are the functions of a manager/management?(MAY 2012, MAY 2016)

Planning, Organizing, Directing, and Controlling. Some people include additional roles such as Leading, Staffing, Coordinating, etc.

6. List any four rules of dimensioning? (Nov/Dec 2012)

- Each dimension should be given so clearly so that it can be interpreted in only one way.
- Dimensions should not be duplicated.
- Dimensions should be given between points or surfaces that have a functional relation to each other.

- Dimensions should be placed in views where the features dimensioned are shown true shape.

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7. Distinguish between reflection and scaling transformations. (May/June 2013)

- Both reflection and scaling involve only diagonal elements of the transformation matrix.
- The magnitude of the diagonal element results into scaling (enlargement or compression) while the sign of the same element will produce reflection.

8. What is sculptured surface? (May/June 2013)

Sculptured surface means the surface produce by combining two families of curves that intersect one another in crises cross manner, creating network of inter connected patches.

9. What are the advantages to be gained by the adoption of CAD? (Nov/Dec 2013)

(a) Increased design productivity
(b) Shorter lead time
(c) Flexibility in design
(d) Improved design analysis
(e) Fewer design errors
(f) Greater accuracy in design calculation.

10.Specify the range of applications for which typical geometric modeling information is used.(Nov/Dec 2013)

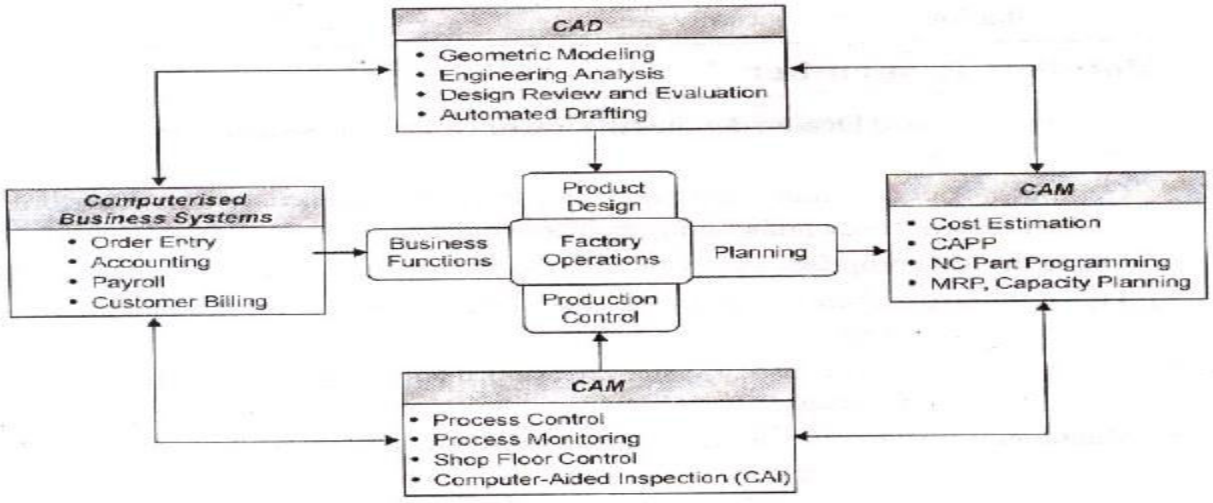
Surface modeling can be used generally to model exterior shell objects like sheet metals works and thin molded plastic parts. Other areas of applications of surface modeling are:

- Body panels of passenger cars, structural components of aircraft and marine structures.
- Plastic containers, telephones, impellers of pump and turbine, development of surface for cutting shoe leather, glass marking.

11. Explain CIM.

CIM is the integration of the total manufacturing enterprise through the use of integrated systems and data communications coupled with new managerial philosophies that improve organizational and personnel efficiency.

12. What are the components of CIM?



13. What are the steps involved in designing and manufacturing a product?

Steps involved in designing and manufacturing a product.

- Definition of product
- Design analysis
- Drifting
- Pilot production
- Inspection
- Packing
- Conceptual design
- Prototype
- Material and process selection
- Production, Quality assurance and Final product

14. What is the role of CIM in manufacturing?

CIM is most closely associated with functions in manufacturing engineering such a process planning and numerical control (NC) part programming.

15. What are important applications of CIM in manufacturing planning?

The applications of CIM can be divided into two broad categories.

1) Manufacturing planning
2) Manufacturing control

16. What are the important applications of CIM in manufacturing control?

- The applications of computer process control are pervasive today in automated production systems.
- Quality control includes a variety of approaches to ensure the highest possible quality levels in the manufactured product.
- Shop floor control refers to production management techniques.

17. What is management?

Management is the process of making decisions and directing the activities of personnel to achieve stated objective. The objectives are successfully met when efforts are organized by communicating appropriate information for control and readjustment.

18.List out the tasks for the managers in effective management:

The following six tasks for the managers of CIM:

1. Develop a business model to understand the problem environment
2. Develop a functional model for the processes, functions, and activities to describe both "as is" and "to be".
3. Develop an information model that identifies system interfaces, information exchange patterns, database requirements and applicable technologies.
4. Develop a network model to identify communication and networking requirements
5. Develop an organizational model to investigate the implications of integrating the various islands of automation on the existing organization structure and culture, and how to safeguard against detrimental effects.
6. Finally, develop the implementation plan which should take into account special features of the business and operations.

19. What are the major communication used in manufacturing industry?

The major communication used in manufacturing industry

1. Telephones, including cellular systems
2. Facsimile terminals (or) Fax machines
3. Satellite dish and video conferencing
4. Personal computers (PCs)

20. What is videoconferencing?

The videoconferencing is a live, interactive television program delivered through satellite for a special audience. Videoconferencing can encompass several countries. In it, even two or more persons can participate. For example, in a videoconference manufacturing engineers may discuss "live" about the product with the designers who may be located at company headquarters 1000kms away. Occasionally, customers or distributors may be called in "live" to clarify a point relating to the defect.

21. Define automation.

Automation is generally defined as the process of having machines follow a predetermined sequence of operations with little or no human labor, using specialized equipment and devices that performs and control manufacturing processes.

22. What are the goals of automation in manufacturing industry?

Automation has the following primary goals.

i) Process Integration

ii) Improve Productivity

iii) Economize on floor space

v) Improve quality

23. What are the function of automated manufacturing system?

Automating manufacturing systems operate in the factory on the physical product.

They perform operations such as processing, assembly, inspection, or material handling, in some cases accomplishing more than one of these operations in the same systems.

24. Give the classification of automation.

Automated manufacturing systems can be classified into three basic types:

1) Fixed automation

2) Programmable automation

3) Flexible automation.

25. What are the benefits of automation?

- To increase labour productivity
- To reduce labour cost
- To mitigate the effects of labour shortages
- To reduce or eliminate routine and clerical takes
- To improve worker safety.

26. What are the capabilities of computer control?

The capabilities are:

1) Polling (or) Data sampling 2) Interlocks

3) Interrupt system 4) Exception handling

27. Explain the types of interlocks.

There are two types of interlocks:

i)Input interlocks ii) Output interlocks

i) Input interlocks: An input interlocks that originates from an external device.

(e.g., a limit switch, sensor, or production machine) and is sent to the controller.

ii) **Output interlocks**: An output interlock is a signal from sent the controller to same external devises. It is used to control the activities of each external device and coordinate its operation with that of the other equipment in the cell.

28. What is MAP?

Manufacturing Automation Protocol (MAP) is a specialized LAN designed for a factory environment. It is hardware cum-software implement able set of rules that facilitate information transfer among networked computers and computer-based equipment.

29. What are the approaches of physical distributions?

- **Customer service**: What level of customer service should be provided?
- **Transportation**: How will the products be shipped?
- **Warehousing:** Where will the goods be located? How many warehouses should be utilized?
- **Order processing:** How should the order be handled?
- **Inventory control:** How much inventory should be maintained at each location?
- **Protective packing and materials handling:** How can efficient methods be developed for handling goods in the factory, warehouse, and transport terminals?

30.Define lean manufacturing.(Nov/Dec 2011)

Lean manufacturing may be defined as an adaption of mass production in which workers and work cells are made more flexible and efficient by adapting methods that reduce waste in all form.

PART-B

1. Describe the applications of computers for design. (Nov/dec 2011)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9

Refer: "Mikell P.Groover, "Automation,Production Systems,and CIM", Prentice- Hall, 1987", Page No from 6 to 7 and from 10 to 11.

2. Explain the drawing features of CAD. (Nov/dec 2011)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9

3 .Name the types of modeling of CAD? Explain about any one of them. (Nov/dec 2011)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9

4. Describe about operator input devices used at the graphics workstation. (May/june2012)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9

5. Explain about the following types of transformations with example. (Nov/dec2012)
(i) Translation (ii) scaling (iii) rotation

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9

6. Write the short notes on 3D scaling and 3D shearing geometric transformation. (May/june 2013)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9

UNIT II PRODUCTION PLANNING AND CONTROL AND COMPUTERISED PROCESS PLANNING

Process planning – Computer Aided Process Planning (CAPP) – Logical steps in Computer Aided Process Planning – Aggregate Production Planning and the Master Production Schedule – Material Requirement planning – Capacity Planning- Control Systems-Shop Floor Control-Inventory Control – Brief on Manufacturing Resource Planning-II (MRP-II) & Enterprise Resource Planning (ERP) - Simple Problems

PART-A

1.List any two benefits of CIM I(Nov/Dec 2011)

Tangible benifits	inTangible benifits
• Higher profits • Improved quality • Shorter time to market with new products • Shorter flow time • Shorter vendor lead time	• Improved customer service • Greater flexibility • Greater responsiveness • Improved competitiveness • Safer working environment • Higher employee moralee

2. What are the various network topologies? (Nov/Dec 2011)

The five basic network topologies are:
(i)Star, (ii) Tree, (iii). Bus, (iv). Ring, (v). Hybrid

3. What is the difference between automation and CIM? (May/June 2012)

Automation may be defined as the process of having machines follow a predetermined sequence of operations with little or no human labor, using specialized equipment and devices that perform and control manufacturing process. CIM is the automated version of the manufacturing process where the three major manufacturing functions-product and product design, production planning and control, and production process-are replaced by the automated technologies. If fact, CIM represents the logical evolution if the automation concept.

4. What is meant by asynchronous data transfer? (Nov/Dec 2012)

In asynchronous data transfer, data is sent one byte (or one character) at a time. Each string of bits making up the byte is bracketed, or marked off, with special control bits.

5. Differentiate between LAN model and MAN model. (Nov/Dec 2012)

- A local area network is a privately owned communications network that serves users with in a confined geographical area.
- A metropolitan area network is a communication network covering a geographic area of the of a city of suburb.

6. What is communications network? list its types.(May/June 2013)

- A communications network is a collection of equipment and physical media that interconnects two or more computers.
- Three categories of networks are:
  (i) Local area networks (LANs)
  (ii) Metropolitan area net work (MANs)
  (iii) Wide area networks (WANs)

7. What is MAP model? (May/June 2013)

Both goal and objective can be defined as statements that reflect the end towards which the organization is aiming to achieve. However, there are significant differences between the two. A goal is an abstract and general umbrella statement, under which specific objectives can be clustered. Objectives are statements that describe—in precise, measurable, and obtainable terms which reflect the desired organization's outcomes.

8. Differentiate IGES and GKS graphic standards. (Nov/Dec 2013)

- Graphical kernel system (GKS) is a device independent graphics language for 2D, 3D and bitmapped graphics images. It allows graphics applications to be developed on one system and easily moved to another with minimal or no change.
- Initial graphic exchange specifications (IGES) is the most comprehensive standard and designed to transmit the entire product definitions including that of manufacturing and any other associated information.

9. Differentiate modulation and demodulation. (Nov/Dec 2013)

- The process of changing some characteristics (e.g. amplitude, frequency or phase) of a carrier

wave in accordance with the intensity of the signal is known as modulation.

- The process of recovering the audio signal from the modulated wave is known as demodulation.

10. Define Group Technology (GT).

Group Technology (GT) is a manufacturing methodology in which identical or similar components grouped processed together during design, process planning and manufacturing so that a wide variety of components can be manufactured, at the least expense of time, inventory, man hours and material handling.

11. List out the stages in Group Technology.

a) Production planners to setup the GT database.

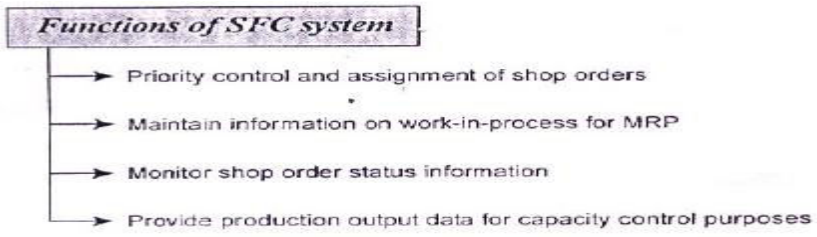
b) Grouping the parts or components into part-families with some similar characteristics.

c) Re-design the shop-floor arrangement according to common shape, function or manufacturing process and tooling.

12. Define Part families.

Part-family is defined as" collection of parts which are similar in terms of geometric shape, size, and similar processing steps required in manufacturing, so flow of materials through the plant improves".

13. What are the methods available for solving problems in GT?



14. Explain the two categories of attributes of parts.

1) Design attributes, which are concerned with part characteristics such as geometry, size, and material.

2) Manufacturing attributes, which consider the sequence of processing steps required to make a part.

15. List out the premises for the developed of DCLASS code.

i) A part may be best characterized bytes basic shape, usually is most apartment attribute.

ii) A Each basic shape may have several features, such as holes, slots, threads and grooves.

iii) A part can be completely characterized by basic shape; size; precision and material type, from and condition.

iv) Several short code segments can be linked to from classification code that is human recognizable and adequate for human monitoring.

v) Each of these code segments can point to more detailed information

16. What is PFA?

Production flow analysis is a technique for pre-planning the division of the whole factory into groups or departmental groups. When the knowledge of division is available, then it is possible to plan the layout.

17. What is the weakness of PFA?

The weakness of production flow analysis (PFA) that the data used are derived from production route-sheets. But the process-sequences have been prepared by different process lanners and the difference is reflected on to these route-sheets.

18. What are the applications of GT?

1. **Design**: In a firm many components have similar shape. They can be grouped into design families and a design can be created by simply modifying an existing component design from the same family.

2. **In Manufacturing**: For this purpose GT gives a great importance than simply a design philosophy. Parts that are not similar in shape may still need similar manufacturing processes. Parts of this type are called production family. (All parts may need same operation like drilling, milling thread cutting etc.)

3. **Process Planning:** Process planning work can be facilitated as similar processes are needed for all components of a particular family.

This helps production planning and control much easier because only similar parts are considered for each cell. Such a cell-oriented layout is called a group technology layout or cellular layout.

19. What is FMS?

FMS is a manufacturing system based on multi-operation machine tools, incorporating (automatic part handling and storage).

20. What is Process planning?

Process planning consists of preparing a set of instructions that describe how to fabricate a part or build an assembly which will satisfy engineering design specifications.

Process planning is the systematic determination of the methods by which product is to be manufactured, economically and competitively.

21. What are the results of Process Planning?

Routings which specify operations, operation sequences, work centers, standards, tooling and fixtures. This routing becomes a major input to the manufacturing resource planning system to define operations for production activity control purpose and define required resources for capacity requirements planning purposes.

*Process plans which typically provide more detailed, step-by-step work instructions including dimensions related to individual operations, machining parameters, set-up instructions, and quality assurance checkpoints.

*Fabrication and assembly drawings to support manufacture (as opposed to engineering drawings to define the part).

22. What are the steps involved in Process planning?

Steps involved in Process Planning

i) Preliminary analysis and Product design evaluation

ii) Selection of manufacturing process

iii) Selection of Machine Tool

iv) Selection of Tooling and Process parameters

v) Final operation sequence selection

23. What are the factors should be considered in selection of tooling?

- The type and amount of the material to be cut
- The surface finish required
- The rigidity and shape of the part.
- The capacity and condition of the available equipment
- The required production volume (high volume jobs usually permit optimum speeds and feeds while lot jobs may use lower speeds to achieve completion of the lot without regrinding of the cutting tool)

24. What are the principles should adhere while determining the efficient sequence?

- The first operation in the sequence should be one in which the largest layer of metal is removed.
- Finishing operations should be performed at the end of the operation sequence.

* Surfaces whose machining docs not greatly affect the rigidity of the work should be machined earlier in the sequence, and

* The sequence of machining operations should be coordinated with heal treating operations, it any in the processor manufacture.

25. What arc the prerequisites for process planning?

The other prerequisites for process planning are:

* Part list" Annual demand/ batch size
* Accuracy and surface finish requirement
* Equipment details
* Data on cutting fluids, tools, jigs and fixtures, gauges.
* Standard available stock sizes.
* Machining data, data on handling and setup.

26. What are the approaches the CAPP will recognize?

Two approaches to CAPP are traditionally recognized: the variant approach and the generative approach. Many CAPP systems combine both approaches.

27. Why CAPP systems are called as variant system?

The main reasons probably are:

1. The investment is less and the development time is shorter. Especially for medium sized companies which want to establish their own research groups.
2. The development costs and hardware costs are lower. Especially for some small companies where the products do not vary much and who still have process planners.

28. Give the main component of generative CAPP systems.

CAPP system contains of two main components.

i) Manufacturing data base (part description, machine tool library etc.)

ii) Decision logic (to represent the process planner)

29. What arc the benefits of CAPP over manual process?

1. ***Process rationalization:*** Computer-automated prepared ion of operate ion routings is more likely to be consistent, logical, and optimal than its manual counterpart. The process plans will be consistent because the same computer software is being used by all planners.

2. Increased productivity of process planners: With computer-aided process planning, there is reduced clerical effort, fewer errors arc made and the planners have immediate access to the process planning database. These benefits translate into higher productivity of the process planners.

3. Reduced turnaround time: Working with the CAPP system, the process planner is able to prepare a route sheet for a new part in less time compared to manual preparation. This leads to an overall reduction in manufacturing lead time.

4. Improved legibility: The computer-prepared document is neater and easier to read than manually written route sheets. CAPP systems employ standard text, which facilitates interpretation of the process plan in the factory.

5. Incorporation of other application programs: The process planning system can be designed to operate in conjunction with other software packages to automate many of the time-consuming manufacturing support functions.

30. Define agile manufacturing. (May/June 2012)

Agile manufacturing is (i) an enterprise level manufacturing strategy of introducing new products into rapidly changing markets, and (ii) an organizational ability to thrive in a competitive environment characterized by continuous and sometimes unforeseen change.

PART-B& PART-C

1. Explain the open system interconnection architecture (OSI) formulated by ISO. (Nov/dec2013)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9

Refer: "Mikell P.Groover, "Automation,Production Systems,and CIM", Prentice- Hall, 1987", Page No from 6 to 7 and from 10 to 11.

2. What are the different network topologies available? Discuss them in detail. (Nov/dec2013)

Refer: "Mikell P.Groover, "Automation,Production Systems,and CIM", Prentice- Hall, 1987", Page No from 6 to 7 and from 10 to 11..

3. Explain the important of CIM. Also write the reasons for implementing CIM. (May/June 2013)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9

4. Explain and compare the different types of network topologies. (Nov/dec2012)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited,

3rd Edition, 2008.", Page No:9

5. Brief the significance the MAP in CIM environment. (Nov/dec2013)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9

6. Explain the open system interconnection with CAPP. (May/June 2013)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9

UNIT III CELLULAR MANUFACTURING

Group Technology(GT), Part Families – Parts Classification and coding – Simple Problems in Opitz Part Coding system – Production flow Analysis – Cellular Manufacturing – Composite part concept – Machine cell design and layout – Quantitative analysis in Cellular Manufacturing – Rank Order Clustering Method - Arranging Machines in a GT cell – Hollier Method – Simple Problems

PART-A

1. State the role of GT in CAD/CAM integration. (Nov/Dec 2011)

GT applications provide a common database for effective integration of CAD and CAM, which leads to successful implementation if CIM.For the effective integration of CAD and CAM, one needs to integrate the information used by all the departments in a shop such a design, manufacturing, quality, etc. GT provides the much needed common language for the users. It gives a means to structure and save information about parts, such a design and manufacturing attributes, processes, and manufacturing capabilities.

2.List any two benefits of CAPP (Nov/Dec 2011)

- Process rationalization and standardization
- Productivity improvement
- Product cost reduction
- Elimination of human error
- Reduction in time

3.Mention the benefits of GT. (May/June 2012)

- GT results in product design
- GT results in reduced materials handling cost because of the group layout of the shop
- GT simplifies production and inventory control activities
- GT leads to an automated process planning system

4. What is CAPP? (May/June 2012)

CAPP refers to computer aided process planning it is used to overcome the drawbacks of manual process planning. With the use of computers in the process planning, one can reduce the routine clerical work of manufacturing engineers, also it provides the opportunities to generate rational, consistant and optimal plans.

5. What is mean by mono code and poly codes structures? (Nov/Dec2012)

- In mono codes (or hierarchical code),the interpretation of each successive symbol depends on the value of the proceeding symbols
- In poly codes (or attributes codes), the interpretation of each symbol in the seconds does not depends on the value of proceeding symbols

6.List out the technique available for formation of cell in GT. (Nov/Dec2012)

7.What is the main difference between hierarchical codes and attribute codes structures?(May/June 2013)

In hierarchical structure, the interpretation of each symbol in the sequence depends on the value of preceding

symbols. Whereas in attributes/polycode structure, the interpretation of each symbol in the sequence does not depend on the value of preceding symbols.

8. What is CMPP system? (May/June 2013)

The CMPP stands for computer managed process planning. It is a commercial generative process planning system capable of automatically making process decisions.

9. Explain Opitz coding system.

- The Opitz coding system uses alpha numeric symbols to represent the various attributes of a part.
- The Opitz coding scheme uses the following digit sequence: 12345 6789 ABCD
- The first five digits (12345) code the major design attributes of a part and are called the "form code". The next four digits (6789) are for coding manufacturing related attributes and are called the "supplementary code". The letters (ABCD) code the production operation and sequence and sequence and are referred to as the "secondary code".

10. Define Group technology.

It is a manufacturing philosophy to increase production efficiency by grouping a variety of parts having similarities of shape, dimensions, and/or process route.

11. Gives the major objectives of Production Management Systems (PMS).

The two major objectives of a production management system (PMS) are planning and controlling of the manufacturing operations. The Planning Stage deals initial Production planning, development of master schedule, capacity planning, and MRP.

12. Define SFC.

Shop Floor Control (SFC) is defined as the important manufacturing activity that will control flow of the product and materials on the factory flow involving the quantities, types of parts, schedule dates, priorities and the status of jobs and orders.

13. What are the primary functions of SFC?

Functions of SFC system

- Priority control and assignment of shop orders
- Maintain information on work in process for MRP
- Monitor shop order status information
- Provide production output data for capacity control purposes

14. What are the phases of SFC?

The three phases or modules are:

1. Order Release 2. Order Scheduling 3. Order Progress

15. What is the purpose of FDS?

The purpose of the Factory Data Collection (FDS) system in shop floor control is to provide basic data for monitoring order progress. In a computerized SFC system these data are submitted to the order progress module for analysis and generation of work order status reports and exception reports.

16. What is an Automatic Data Capture (ADC) method?

Automatic Identification methods is also known as Automatic Data Capture (ADC) it is refers to the technologies that provides direct entry of data into the computer or other control systems without using a keyboards. These technologies require no human involvement in the data capture and entry process.

17. What are the technologies used in ADC?

1. Optical 2. Magnetic type 3. Electromagnetic type
4. Smart card 5. Touch techniques 6. Biometric

18. What Bar code consists?

The bar code consists of a thick and narrow colored bars separates thick and narrow spaces separating the bars. The pattern of bars and spaces is co to represent alphanumeric characters.

19. What are the types of Bar code?

Bar codes divide into two basic types:

1) Linear, in which the encoded data are read using a linear sweep of the scan

2) Two-dimensional, in which the encoded data must be read in both directions

20. What is DAS?

A data acquisitions system (DAS) is a computer system used to automatically col data from a process or piece of equipment. They either perform an analysis data or transmit the data to another computer for processing and analysis.

21. List out the application of ADC technology.

The following are the most common application of ADC technologies.

1) Parts receiving 2) Shipping

3) Order picking 4) Finished goods storage

5) Manufacturing processing 6) Work-in-process storage

7) Assembly

22. What are the types of SFC?

The types of SFC data that would be collected the FDC system include

- Labor time turned in against a job
- Count on scrapped parts or needing rework.
- Piece counts
- Machine breakdowns.
- Completion of operations in the routing sequence.

23. Define FMS.

A Flexible Manufacturing System (FMS) is an individual machine or group of machines served by an automated materials handling system that is computer controlled and has a tool handling capability.

24. What arc the Objectives of FMS?

- To provide flexible manufacturing facility for pan family components.
- To provide the benefits of grouping the operation in single location.
- To provide the flexibility in producing small and medium parts.
- To maximize the utilization of facilities.
- To have a good management control.

25. What are the components of FMS?

Flexible Manufacturing Systems (FMS) consists of the following four components.

1. Processing stations or workstations
2. Material handling and storage
3. Computer control system
4. Human labor

26. What are the FMS layout configurations?

FMSs can be divided into five categories

1) In-line layout

2) Loop layout

3) Ladder layout

4) Open fie1d 1ayout

5) Robot-centered cell.

27. What arc the functions of computers in FMS?

The functions of computers in FMS

1. Workstation control
2. Distribution of control instructions to workstations
3. Production control
4. Traffic control
5. Shuttle control
6. Work piece monitoring

7. Tool control
8. Performance monitoring and reporting
9. Diagnosis

28. List the applications of FMS.

Applications of FMS installations are in the following areas.

- Machining
- Assembly
- Sheet-metal press-working
- Forging
- Plastic injection molding
- Welding
- Textile machinery manufacture
- Semiconductor component manufacture

29. Give the benefits of FMS.

The benefits that can be expected from an FMS include

- Increased machine utilization
- Fewer machines required
- Reduction in factory floor space required
- ¨ Greater responsiveness to change
- Reduced inventory requirements
- 1ower manufacturing lead times
- Reduced direct labour requirements and higher labor productivity
- Opportunity for unattended production

30. List any two advantages and disadvantages of FMS implementation.

Advantages

- Faster, lower-cost changes from one part to another which will improve capital utilization.
- 1ower direct labor cost, due to the reduction in number of workers.

Disadvantages

- Substantial pre-planning activity.
- Expensive, costing millions of dollars.

31. How does FMS classified based on level of flexibility?

FMS classified based on level of flexibility as,

- Production flexibility
- Machine flexibility
- Mix flexibility
- Product flexibility

PART-B& PART-C

1. Explain about Optiz classification and coding system. (Nov/dec2012)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9

2. Explain retrieval and generative CAPP systems. (Nov/dec2013)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9

Refer: "Mikell P.Groover, "Automation,Production Systems,and CIM", Prentice- Hall, 1987", Page No from 6 to 7 and from 10 to 11.

3. Briefly discuss the various benefits of implementing a GT in a firm. Also bring out the advantages and

limitations of using GT. (Nov/dec2011)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9

4.(a) Describe the composite part concept in cellular manufacturing.

(b)Discuss the importance of process planning in product development .(May/June 2012)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9

5. Briefly write about i) Composite part concept &ii) Key machine concept. (May/June 2011)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9

6. Explain why the GT is important in achieving CAD&CAM integration? (Nov/dec2011)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9

UNIT IV FLEXIBLE MANUFACTURING SYSTEM (FMS) AND AUTOMATED GUIDED VEHICLE SYSTEM (AGVS)

Types of Flexibility - FMS – FMS Components – FMS Application & Benefits – FMS Planning and Control– Quantitative analysis in FMS – Simple Problems. Automated Guided Vehicle System (AGVS) – AGVS Application – Vehicle Guidance technology – Vehicle Management & Safety.

PART-A

1.Mention any two methods used to collect data from the shop floor.(Nov/Dec 2011)

- **Manual/clerical data input techniques**

(i) Job traveler
(ii) Employee time sheet

- **Data collection terminals**

(i) Push button keyboards
(ii) Keyboard based terminals

- **Automated input techniques**

(i) Optical bar code readers
(ii) Magnet card readers

2. Write any two applications of FMS.(Nov/Dec 2011)

(i) Machining (ii) assembly (iii) sheet metal press working (iv) Forging (v) plastic injection moulding (vi) welding (vii) textile machinery manufacture and (viii) semi conductor component manufacture.

3. State the functions of computer control system of FMS. (May/June 2012)

- Workstation/ processing station control
- Distribution of control instructions to work stations
- Production control
- Material handling control system

4. List the different stages of shop floor control. (May/June 2012)

(i) Order release
(ii) Order scheduling
(iii) Order progress

5. Differentiate between dedicated FMS and random order FMS. (Nov/Dec 2012)

A dedicated FMS is defined to produce a limited variety of part configurations. The random order FMS is more flexible (capable of producing large variety of parts) than the dedicated FMS.

6. State the purpose of primary and secondary material handling system. (Nov/Dec 2012)

- The primary handling system establishes the basic layout of the FMS and is responsible for moving work parts between workstation in the system.
- The secondary handling system transfers work parts from the primary system to the machine tool or other processing system.

7. Distinguish between on line and off line data collecting systems. (May/June 2013)

- In on line system, the data are entered directly into the plant computer system and are immediately available to the order to the progress module.
- In off line system, the data are collected temporarily in a storage device or a stand alone computer system to be entered and processed by plant computer in a batch mode.

8.List some important advantages of implementing FMS.(May/June 2013)

- Increased machine utilization
- Reduced inventory
- Reduced manufacturing lead time
- Greater flexibility in production scheduling
- Shorter response time

9. Mention the importance of shop floor control system (SFC). (Nov/Dec 2013)

(i) The release of production orders to the factory
(ii) Monitoring and controlling the progress of the orders through the various work centres, and
(iii) Acquiring information on the status of the orders.

10. What are the inputs and output of MRP? (Nov/Dec 2013)

The three major inputs to MRP are:
(i) Master production scheduling
(ii) Bill of materials file and
(iii) Inventory record file

11. Which is ideal state in computer based manufacturing applications?

Computer Integrated Manufacturing (CIM) is an ideal state in which computer based manufacturing applications communicate information to coordinate design, planning and manufacturing processes.

12. Draw simple E-R diagram.

13. What are the types of IDEF models?

IDEF		
	0	Function Modeling *(It shows the overall high-level activities of the process)*
	1	Information Modeling *(It captures conceptual views of the industry information)*
	1X	Data Modeling *(It captures of logical view of industrial data based on ER model)*
	2	Simulation Model design *(It represent time varying behavioral of resources in a factory)*
	3	Process description capture *(It captures physical aspects of a factory system)*
	4	Object-oriented design *(It captures application of computer language in part design stage)*
	5	Ontology description capture *(It capture initial specification of the parts in a factory)*
	6	Design rationale capture *(It represents various design attributes about the parts)*
	7	Information system auditing *(It captures component manufacturing auditing parameters)*
	8	User interface modeling *(It represents description about the interfacing methods in factory)*
	9	Scenario driven IS diagram *(It represents all the inputs status in factory)*
	10	Implementation modeling *(It captures all the implementation methods in part manufacturing)*

14. Write about CIMOSA.

CIMOS A defines a model-based enterprise engineering method which categorizes manufacturing operations into Generic and Specific (Partial and Particular) functions.

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15. **How CIMOSA separates functions?**

• The CIMOSA Modeling Framework in which specific and Generic functions are-clearly separated.

• The CIMOSA Integrating Infrastructure supporting execution of Generic functions and linking specific functions. It is effectively the communication system which interconnects all of the functions in the CIM system.

16. Explain about MRR

`*The material requirements planning (MRP)* function takes current inventory levels for all components needed for the final products (a plant might have 20000 part numbers and perhaps 100 final products for which master schedules have been determined) as well as the components bills of materials and lead time information (obtained from design and process planning] and evolves component master schedules for all components needed by the demand requirements agreed upon. MRP does not take into account whether manufacturing has sufficient capacity to handle the job releases, and so capacity planning evaluates shop loading in terms of the requirements and feeds back to the master schedule for corrective action if problems occur. A further function of MRP based on such analysis is determining whether components should be produced in-house or subcontracted to outside vendors.

17. What is the role of process planning in CIM architecture?

The process planning function can ensure the profitability or non profitability of a part being manufactured because of the myriad ways in which a part can be produced.

18. What is dispatching?

Dispatching is the function of releasing all required items needed to perform an operation on a part so that part production may be accomplished at the time planned by the scheduling function.

19. What about shop-floor information?

Shop-floor information system is responsible for getting the required information down to the processing equipment local controllers and sequencing controllers as well as capturing real-time status data from the equipment and parts so that the feedback loops can effect corrections or normal continuation of operation as required.

20. Explain PDM.

Product Data Management (PDM) or Product Information Management (PIM) systems provide the tools to control access to and manage all product definition date. It does this by maintaining information (meta-data) about product information. Product Data Management (PDM) systems, when tightly integrated with other product development tools does this transparently and with minimal additional effort on the part of the user.

21. List different types of production monitoring system.

Three types production/ process monitoring systems are:

- Data acquisition systems
- Data logging system
- Multilevel scanning

22. What are the inputs to MRP system? (May/June 2012)

- Master production schedule
- Bill of material file
- Inventory record file

23.Write down three phases of shop floor control.(Nov/Dec 2012)

(i) Order release,
(ii) Order scheduling
(iii) Order progress

24.What is meant by procurement lead time?(Nov/Dec 2012)

The procurement lead time is the interval (usually in months) between the initiation of procurement action and the receipt into the supply system of the material produced.

25. What is meant by fixed order quantity model? (Nov/Dec 2013)

In fixed order quantity model, the size of the order (i,e, order quantity) is predetermined fixed, but the time of its placement (i.e, ordering time) is allowed to vary depending upon the fluctuation of demand.

26. What is foreign key?

A key used in one table to represent the value of a primary key in a related table. While primary keys must contain unique values, foreign keys may have duplicates. For instance, if we use student ID as the primary key in a Students table (each student has a unique ID), we could use student ID as a foreign key.

27. What is normalization?

The process of structuring data to minimize duplication and inconsistencies. The process usually involves breaking down a single table into two or more tables and defining relationships between those tables. Normalization is usually done in stages, with each stage applying more rigorous rules to the types of information which can be stored in a table.

28. Mention the different levels of data modelling.

The Data structures are created within a database. The extent of the relationships among them, plays an important role in determining the effectiveness of DBMS. Therefore the database design becomes a crucial activity in the database environment. The task of Database design is made simpler when data models are used. Models are "Simplified abstractions of real-world events or conditions".

For example, such abstractions will enable us to explore the characteristics of entities and the relationships that can be created among such entities. If the models are not logically sound, the database designs derived from them will not deliver the database system's promise of effective information drawn from an efficient database.

29. What is Network Data Model?

A network data model is simply a graph wherein nodes represent unique records, and links between nodes represent association between the corresponding records.

30. What is Hierarchical Data Model?

The hierarchical data model is similar to the network data model except that the relationships among the records are represented in the form of tree structure.

PART-B& PART-C

1. Explain various components of FMS? And list out applications, advantages, disadvantages of FMS. (Nov/dec2011, May/June2012)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9

Refer: "Mikell P.Groover, "Automation,Production Systems,and CIM", Prentice- Hall, 1987", Page No from 6 to 7 and from 10 to 11.

2. What is shop floor control? And what are the functions of SFC? Explain various phases of SFC. (Nov/dec2011)

Refer: "Mikell P.Groover, "Automation,Production Systems,and CIM", Prentice- Hall, 1987", Page No from 6 to 7 and from 10 to 11.

3. Explain the FMS Layout and its application and benefits. (Nov/dec2012, Nov/dec2013)

Refer: "Mikell P.Groover, "Automation,Production Systems,and CIM", Prentice- Hall, 1987", Page No from 6 to 7 and from 10 to 11.

4.Explain about FMS workstation.(May/June2012)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9

5. Discuss the technology behind automated data collection system. (Nov/dec2013)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9

6. Explain the FMS Layout and SFC flow control. (Nov/dec2011)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9.

UNIT V INDUSTRIAL ROBOTICS

Robot Anatomy and Related Attributes – Classification of Robots- Robot Control systems – End Effectors – Sensors in Robotics – Robot Accuracy and Repeatability - Industrial Robot Applications – Robot Part Programming – Robot Accuracy and Repeatability – Simple Problems

PART-A

1. Define an Industrial Robot.

An industrial robot is an automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes. A programmable mechanical device is used in place of a person to perform dangerous or repetitive tasks with a high degree of accuracy

2. Define base and tool Coordinate system? (Nov 2015) (Nov 2012)

A tool coordinates definition system capable of easily obtaining a transformation matrix for defining a tool coordinates system of a robot. The tool coordinates system at the 0° position of the robot is rotated around each axis so that the tool coordinates system becomes parallel to a base coordinates system

3. What are the rules of Robotics? Write any two laws of robotics. (May/june 2014)

Rules: 1.Do not harm human being 2. Obey human being 3. Protect itself from harm.

Laws: 1.Law zero: A robot may not injure humanity, or, through inaction, allow humanity to come to harm. 2. Law One: A robot may not injure a human being, or through inaction, allow a human being to come to harm, unless this would violate a higher order law. 3.Law Two: A robot must obey orders given it by human beings, except where such orders would conflict with a higher order law. 4.Law Three: A robot must protect its own existence as long as such protection does not conflict

4. Why are robots used?

a) To reduce production rates – Fast, Accurate, Difficulties in human nature

b) To avoid 3-d jobs – Dirty, Dangerous, Difficult

5. What is meant by Robot anatomy?

Study of structure of robot is called robot anatomy. Manipulator is constructed of a series of joints and links. A joint provides relative motion between the input links and the output link. Each joint provides the robot with one degree of freedom

6.Mention the classification of robots? (May 2014) (May 2013)

(i)Physical configuration – 1. Cartesian coordinate configuration 2. Cylindrical coordinate configuration 3. Polar or spherical coordinate configuration 4.Jointed arm configuration 5. Selective Compliance Assembly Robot Arm (SCARA)

(ii)Control system – 1.Point to point robots 2. Straight line robots 3. Continuous robot

(iii)Movement – 1.Fixed 2.Mobile 3.Walking or legged robot

(iv)Types of drive – 1.Pneumatic drive 2.Hydraulic drive 3.Electric drive

(v)Application –1.Manufacturing 2.Handling 3.Testing

(vi)Degrees of freedom 1.Single degree of freedom 2.Two 3.Three 4.Six degrees of freedom.

7. What are the benefits of industrial robots?

- Increased Productivity
- Significant Savings
- Improved Quality
- Better Safety
- Competitive Edge

8. Name the important specifications of an industrial robot. (Nov 2012)

- Accuracy

- Repeatability
- Degree of Freedom
- Resolution
- Envelope.

9. What is meant by accuracy of robot?

The robot‘s ability to reach a reference point within the robot‘s full work volume is known as accuracy of robot.

10. What is repeatability of robot?

Repeatability refers to robot‘s ability to return to the programmed point when it is commanded to do so.

11. Define End effector. Give some examples of Robot End Effector.

End effector is a device that is attached to the end of the wrist arm to perform specific task. Examples of Robot End Effector:

- Gripper
- Tools
- Welding equipment
- End of arm Tooling (EOAT)

12. What is meant by Gripper? What are the types of grippers?

Gripper is the End effector which can hold or grasp the object. Types of grippers are 1.Mechanical 2.Collect 3.Vaccum 4.Fragile object 5. Magnetic (i) permanent (ii) Temporary Grippers 6.Pneumatic.

13. List out the gripper design considerations?

1. Material specification 2. Part specification 3. Performance specification 4. Source specification 5. Position specification 6. Environment specification.

14. What are the methods of robot programming? (or) List out four methods of entering commands into the robot controller memory. (Nov 2014)

- On-line programming
- Lead through programming
- Textual robot languages
- Walk-through programming
- Mechanical programming
- Task programming
- Off-line programming

15. What are the ways of accomplishing lead through programming?

- Powered Lead through
- Manual Lead through

16. What are the components of DDC? (Nov/Dec 2011)

- Transducer , sensors, and associated instrumentation
- Actuators (process interface devices)
- Digital computer
- Analog to digital convertor (ADC)
- Digital to analog convertor (DAC)
- Input and output multiplexers

17. What is direct digital control? Nov/Dec 2013

Direct digital control is a computer process control system in which certain components in a conventional analog control system are replaced by the digital computer.

18. Describe CIM data transmission methods.

- The transmission of binary data across a link can be accomplished either in parallel mode or serial mode,

- In parallel mode multiple data are sent with each clock pulse, while, in serial method , one bit is sent with each clock pulse.

19. What are the two types of channel?

Two basic channel types are used in data communications. They are

i) Analog type ii) Digital type

20. List the characteristics of channel.

The channel characteristics are

i) Electronic noise ii) Signal attenuation

iii) Analog channel capacity iv) Digital channel capacity

21. What is channel bandwidth?

An analog signal can vary from a minimum to maximum frequency. The di (Terence between the lowest and the highest frequency of a single analog is the bandwidth of that signal. The mathematical formula for frequency is,

$$\text{Frequency} = \frac{\text{Velocity}}{\text{Wavelength}}$$

22. What are two types of transmission mode?

There are three transmission modes available. They arc

i) Simplex ii) Half-duplex iii) Duplex.

They can be applied to both analog and digital channels.

23. What is modulation?

The process of varying amplitude or frequency or phase of the carrier signal in accordance with the instantaneous value of the information signal is known as modulation.

24. What is demodulation?

The process of separating the original information signal from the modulated carrier signal is known as demodulation. It is the inverse process of modulation.

25. What are the reasons for using LAN?

1. LAN allows for decentralization of various data processing functions.
2 LAN allows departments to share hardware.
3. LAN allows for the electronic transfer of text.
4. LAN allows for communication between organizations.
5. LAN allows information to be shared.

26. What are the features of LAN?

i) Compatibility ii) Protected Mode Operation

iii) Internetworking iv) Growth Path and Modularity

v) System Reliability

27. Define topology and explain its classification.

The pattern of interconnection of nodes in a network is called topology. Topcigy can also be defined as the geometric arrangement of workstations and the links among them.

The types of LAN topology are i) Bus topology ii) Ring topology iii) Star topology iv) Mesh topology

28. What are the Advantages of LAN?

- LAN is suited to any type of application.
- It provides data integrity.
- Any number of users can be accommodated.
- A LAN can fit any site requirements.
- It is flexible and growth-oriented.
- LAN provides a cost-effective multi user computer environment.
- Data transfer rates are above 10 Mbps.
- It all lows sharing of mass central storage and printers.
- It allows file/record locking.

29. Define OSI.

Open systems interconnection (OSI) reference model is an international standards organization (ISO) standard that specifies the conceptual structure of systems that are to communicate with each other.

30. List out the layers of OSI model.

Seven layers in OSI model

i) Physical layer
ii) Data link layer
iii) Network layer
iv) Transport layer
v) Session layer
vi) Presentation layer
vii) Application layer

PART-B& PART-C

1. Explain about Robot Anatomy and Related Attributes. . (Nov/dec2013)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9

Refer: "Mikell P.Groover, "Automation,Production Systems,and CIM", Prentice- Hall, 1987", Page No from 6 to 7 and from 10 to 11.

2. Explain about Robot Control systems. (Nov/dec2013)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9

3. Explain about End Effectors – Sensors in Robotics. (May/June2012)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9

4.Explain about Robot Accuracy and Repeatability. (May/June 2012)

Refer: "Stephen P. Robbins & Mary Coulter, "Management", Prentice Hall (India)Pvt. Ltd., 10th Edition, 2009.", Page No from 526 to 530.

5. Explain about Industrial Robot Applications. (Nov/dec 2011)

Refer: "Mikell P.Groover, "Automation,Production Systems,and CIM", Prentice- Hall, 1987", Page No from 6 to 7 and from 10 to 11.

6. Write shortly on Robot Part Programming . (May/June2012)

Refer: "Radhakrishnan.P, Subramaniyan.S andRaju.V "Cad/Cam/Cim", New Age International (P) Limited, 3rd Edition, 2008.", Page No:9