SCAD ENGINEERING COLLEGE

Cheranmahadevi – 627 414

ME 2402 COMPUTER INTEGRATED MANUFACTURING

Two Marks Questions and Answers

Unit: 1

1. 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.

2. What are the components of CIM?

Business functions, Plant operations, Engineering Database.

3. 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

4. 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.

5. 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

6. 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.

7. 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.

8. List our 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.

9. What are the major communications 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)

10. 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.

11. Define automation.

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

12. 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

13. What are the functions 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 handing, in some cases accomplishing more than one of these operations in the same systems.

14. Give the classification of automation.

Automated manufacturing systems can be classified into three basic types: 1) Fixed automation 2) Programmable automation 3) Flexible automation.

15. 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.

16. What are the capabilities of computer control?
The capabilities are: 1) Polling (or) Data sampling 2) Interlocks 3) Interrupt system 4) Exception handling

17. 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

18. 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.

19. Differentiate zoom and pan.
Zoom: It display the entire drawing in the current view port.
Pan: Moves the drawing display in the current view port.

20. Differentiate regenerate and redraw.
Redraw: Refreshes the display in the current view port. It removes marker blips and display artifacts (stray pixels) left by editing commands.
Regenerate: It regenerates the entire drawing and refreshes the current view port. It recomputes the screen coordinates for all objects. It also re indexes the drawing database for optimum display and object selection performance.

21. What is meant by dimensioning?
It is the process of adding measurement annotation to a drawing. During annotation , the designer adds text, numbers and other symbols to communicate such information as the size and materials of design elements or notes for constructing the design.

22. What is meant by linear dimension? List out their types.
It creates distance measurements between two points in the XY plane of the current user coordinate system (UCS).
Types:
Horizontal: Measures a distance between two points parallel to the X-axis.
Vertical: Measures a distance between two points parallel to the Y axis.
Rotated: Measures a distance between two points at a specified orientation in the current UCS.

23. What do you understand by aligned dimension?
It is also called true length dimension. It is used to create a linear dimension aligned with the dimension points.

24. What is meant by ordinate dimensions?
Ordinate dimensions display the X or Y ordinate of any drawing point based on an origin point called a datum. X- datum ordinate dimensions measure the distance of a point from the datum along the X- axis. Y- datum ordinate dimensions measure the distance along the Y- axis.

25. Define erase and move commands in editing.
Erase: Remove objects from a drawing.
Move: The objects in a drawing can be moved from one place to another. When you move objects, you can rotate or align them or move them without changing orientation or size.

26. Define extend command in editing.
You can extend objects so they end precisely at a boundary defined by other objects. You can also extend objects to where they would intersect a boundary. This is called extending to an implied boundary.

27. Define Copy and Mirror command.
Copy: To copy objects within a drawing, create a selection set and specify a start point and an endpoint for the copy. These points are called the base point and the second point of displacement, respectively and can be anywhere the within the drawing.
Mirror: Creates a mirror image copy of objects. The two specified points become the endpoints of a line about which the selected objects are reflected. In 3D, this line orients a mirroring plane perpendicular to the XY plane of the UCS containing the mirror line.

28. Define concatenation.
Concatenation or composite of transformation is a combination of transformation processes. If rotation and scaling are combined the resultant matrix will be concatenation.

UNIT –II

1. What are the two types of channel?

Two basic channel types are used in data communications. They are
i) Analog type ii) Digital type

2. List the characteristics of channel.

The channel characteristics are
i) Electronic noise ii) Signal attenuation
iii) Analog channel capacity iv) Digital channel capacity

3. 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,

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

4. 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.

5. 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.

6. 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.

7. What are the reasons for using LAN?

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

8. What are the features of LAN?

i) Compatibility ii) Protected Mode Operation
iii) Internetworking iv) Growth Path and Modularity
v) System Reliability

9. Define topology and explain its classification.

The pattern of interconnection of nodes in a network is called topology. Topology 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 topolgy iii) Star topology iv) Mesh topology

10. 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 al lows sharing of mass central storage and printers.
- It allows file/record locking.

11. 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

12. 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

13. What are the functions of physical layers?

The physical layer consists of the hardware that drives the network and circuits.

14. What is the function of data link layer?

The data link layer handles the task of transferring information across the physical link by sending blocks of data

15. What is the function transport layer?
The transport layer provides transparent transfer of packets (data) to and from the session layer without disruption.

16. What is the role of application in OSI model?
The application layer provides the user interface to the networking system.

17. What is gateway?
A gateway device is a special-purpose computer, a workstation with associated software, or a software module that runs as a task in a mainframe. It is essentially a protocol converter that facilitates the connection of two dissimilar network architectures. Gateways are integration tools to permit end-to-end communications.

18. List the application protocols of TCP/IP.
A number of application protocols and user applications have been developed based on TCP/IP. These include Telnet, FTP, Network File System (NFS), Simple Mail Transfer Protocol (SMTP), and Simplified Network Management Protocol (SNMP).

19. How data's are classified in engineering/manufacturing environment?
Data encountered in an manufacturing environment can be classified into 4 basic types
a) Resource data, which describes the resources involved in production, such as machines and tools.
b) Product data, which consists of graphic, text and numeric data.
c) Operational data, which describes the events of production, such as schedules and lot sizes.
d) Production data, which describes how the parts are to be manufactured.

20. What is MAP?
MAP standard is essentially an application specific subset of the ISO protocols designed to meet the needs of factory automation.. The objective of MAP is to establish one set of LAN protocols for communications between intelligent devices, such as computer controlled machine tools, engineering work stations, process controllers, factory floor terminals and control rooms.

21. What is TOP?
TOP stands for Technical and office protocol. It is a subset of the OSI standards for technical and office applications. It provides a framework in which software can be developed for the full range of office and factory automation problems.

22. What is the use of transport and session layers in OSI model?
Transport Layer: It performs the service of sending and receiving segments of data to session layers. It also provides flow control, sequence numbering and message acknowledgement.
Session Layer: It allows users on different machines to establish between them. It establishes, maintains synchronizes and manages the interaction between communicating systems.

UNIT –III

1. Define Group Technology (GT).

Group Technology (GT) is a manufacturing methodology in which indentical 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.

2. 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

3.Define Part families.

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

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

5. 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.

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

i) A part may be best characterized bytes basic shape, usually is most appartment 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

7. 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

8. 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.

9. 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.

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

11. 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 determation of the methods by which product is to be manufactured, economically and competitively.

12. 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).

13. What are the steps involved in Process planning?
Analyzing finished part requirements, determining operating sequence, selecting machines, selecting material parameters, calculating processing times and documenting process planning.

14. 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)
- The succeeding operations such as finish grinding and honing

• The recommendations given in tables should be considered only as a starting point. A detailed analysis is further required in each individual case to arrive at the most feasible solution.

15. 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.

16. 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.

17. 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.

18. 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.

19. 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)

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

1. Process rationalization: Computer-automated preparation of operation 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.

UNIT – IV

1. Gives the major objectives of a 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.

2. 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

3. 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

4. What are the phases of SFC?
The three phases or modules are: 1. Order Release 2. Order Scheduling 3. Order Progress

5. 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

6. 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.

7. What are the technologies used in ADC?
1. Optical 2. Magnetic type 3. Electromagnetic type 4. Smart card 5. Touch techniques
6. Biometric

8. What Bar code consists?
The bar code consists of a thick and narrow coloured bars separates thick and narrow spaces separating the bars. The pattern of bars and spaces is co to represent alphanumeric characters

9. 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

10. 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.

11. 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 8) Sortation

12. What are the types of SFC?
The types of SFC data that would be collected the FDC system include
Labour time turned in against a job
Count on scrapped parts or needing rework.
Piece counts
Machine breakdowns.
Completion of operations in the routing sequence.

13. 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

14. 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.

15. 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

16. What are the FMS layout configurations?

FMS can be divided into five categories

1) In-line layout
2) Loop layout
3) Ladder layout
4) Open fie1d 1ayout
5) Robot-centered cell.

17. 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

18. List the applications of FMSs.

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

19. Give the benefits of FMSs.

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

20. 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

21.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

22. How does FMS classified based on number of machines?

- Single Machine Cell (SMC)
- Flexible Manufacturing Cell (FMC)
- Flexible Manufacturing System (FMS)

UNIT - V

1. What is production planning?
   It is a preproduction activity. It may be defined as the determination, acquisition and arrangement of all facilities necessary for future production of products.
2. What is production control?
   It is concerned with determining whether the necessary resources to implement the production plan have been provided or not.
3. List out the activities of production control.
   SFC, Inventory control, Manufacturing Resource Planning (MRP) & Capacity planning.
4. What is master production Schedule (MPS)?
   It is a detailed plan that states how many end items will be available for sale or distribution during specific periods.
5. List the purposes of MPS.
   It is used to set due dates for the availability of end items , to provide information regarding resources and materials required to support the aggregate plan, as a input to MRP, which will set specific production schedules for parts and components used in end items.

6. What are the important functions of PPC?
   Aggregate production Planning (APP), Master production planning, Material requirement Planning (MRP), Capacity planning, SFC and Inventory control.

7. What is MRP? What is the function of MRP?
   It is a planning technique. It translates the master production schedule of end products into a detailed schedule for the raw materials and parts used in those end products.
8. List the benefits of MRP.
   Reduced inventory levels, Better production scheduling, Reduced production lead time better machine utilization, improved product quality.
9. List the sources of input data to MRP.
   MPS, BOM, Inventory record file
10. List the sources of output data to MRP.
    Order release notice, Report of planned order releases, Cancellation notices and Exception reports.
11. What is BOM?
    Bill of materials designates what items and how many of each are used to make up a specified final product.
12. What is SFC?
    It is concerned with monitoring the progress of orders in the factory and reporting the status of each order to management so that effective control can be exercised.
13. Define lean manufacturing.
    "The production of goods using less of everything by reducing 'waste' and increasing value added activity"

14. List out the basic principles of lean manufacturing.
Specify value, Identify the value stream, make the product flow, let the customer pull, continuous improvement.
15. What are the seven form of waste eliminated in lean manufacturing?
    Production of defective parts, Production of more than the number of items needed, Excessive inventories, Unnecessary processing steps, unnecessary movement of people, unnecessary transport and handling of materials, workers waiting.
16. What is agile manufacturing?
    Agile manufacturing is a method for manufacturing which combine our organization, people and technology into an integrated and coordinated whole.

17. What are the four core concepts behind agile manufacturing?
    - A strategy to become an Agile Manufacturing enterprise.
    - Integration of organization, people and technology into a coordinated interdependent system which is our competitive advantage
    - An interdisciplinary design methodology to achieve the integration of Organization, people and technology
    - A strategy to exploit agility to achieve competitive advantage.

18. Define the kanban system.
    The kanban system for just in time production provides a control mechanism at each workstation to produce only the minimum quantity of parts needed to feed the next

process in the sequence. It limits the amount of inventory that is allowed to accumulate between operations.

19. Define pull system.
    Pull system: In which the order to make and deliver parts at each workstation in the production sequence comes from the downstream station that uses those parts. When the supply of parts at a given workstation is about to be exhausted, that station orders the upstream station to replenish the supply. Only upon the receipt
    Of this order is the upstream station authorized to produce the needed parts. When this procedure is repeated at each workstation throughout the plant , it has the effect of puling parts through the production.

20. Define push system.
    Push System: In this parts at each workstation are produced irrespective of the immediate need for those parts at their respective downstream station. In effect this production discipline pushes parts through the plant. The risk in a push system is that more parts get produced in the factory than the system can handle, resulting in large queues of work in front of machines.

PART – B Questions and Answers

UNIT- I

1. Explain wire frame modeling in detail.
   - ❖ Wire frame models
   - ❖ Wire frame models
   - ❖ Curve representation.
   - ❖ Parametric representation of analytic curves – lines, circles, Ellipses, Parabolas, Hyperbolas, conics.
   - ❖ Parametric representation of synthetic curves – Bezier curves, B- Spline curves, Rational curves.
   - ❖ Curve manipulations – Displaying, Evaluating points on curves, Blending, Segmentation, Trimming, Intersection, and Transformation.
   - ❖ Design and Engineering Applications.

2. Explain surface modeling in detail.
   - ❖ Surface models
   - ❖ Surface entities.
   - ❖ Surface representation.
   - ❖ Parametric representation of analytic surfaces – Plane and ruled surface, surface of revolution.
   - ❖ Parametric Representation of Synthetic surfaces – Bezier surface, B-Spline surface, Coons surface, Blending surface.
   - ❖ Surface manipulations- Displaying, Evaluating points and curves on surfaces, Segmentation, Trimming, Intersection, Projection, Transformation.
   - ❖ Design and engineering applications.

3. Explain solid modeling in detail.
   - ❖ Solid models
   - ❖ Solid Entities.
   - ❖ Solid representation.
   - ❖ Fundamentals of solid modeling – set theory, Regularized set operations, Set membership classification.
   - ❖ Boundary representation (B-rep) – basic elements, building operations.
   - ❖ Constructive Solid Geometry (CSG) – basic elements, Building operations
   - ❖ Sweep representations - basic elements, Building operations
   - ❖ Analytic Solid Modeling (ASM) - basic elements, Building operations.
   - ❖ Solid manipulations – Displaying, Evaluating points, curves and surfaces on solids, Segmentation, Trimming and Intersection, Transformation.

4. Explain 2-D transformations in detail.
   - ❖ Translation
   - ❖ Scaling
   - ❖ Rotation
   - ❖ Mirror
   - ❖ Concatenation

5. Explain 3D transformation in detail.
   - ❖ Translation
   - ❖ Scaling
   - ❖ Rotation
   - ❖ Mirror
   - ❖ Concatenation

6. A point at (28,0,-17) is rotated by 30 ^{o} with respect to ‘x’ direction and then the resultant point is mirrored with respect to ‘y’ direction and finally it is required to bring the point to the origin. What will be the translation matrix if the above objective is satisfied?
   - ❖ $[C] = [R_x] [M_y]$
   - ❖ Translation vectors = 28 i – 8.5j + 14.7k
   - ❖ [C] = [T] [R}

7. A point (-3, 8, -5) is rotated about Z direction to an angle of 30^{o} and then translated to a new position following a vector 3i + 7j – k and then rerotated by -30^{o} . Formulate the concatenated matrix and find the final position of a point.
   - ❖ [C] = [R1] [T] [R2]

8. A point at (8,-4) is scaled by four times in ‘X’ direction and 0.8 times in ‘Y’ direction is rotated by 45^{o}. Finally it is translated by 9i + 4j. Formulate the concatenated matrix and obtain the final position of the object.

UNIT – II

1. Draw and Explain CASA/SME's new manufacturing enterprise wheel.

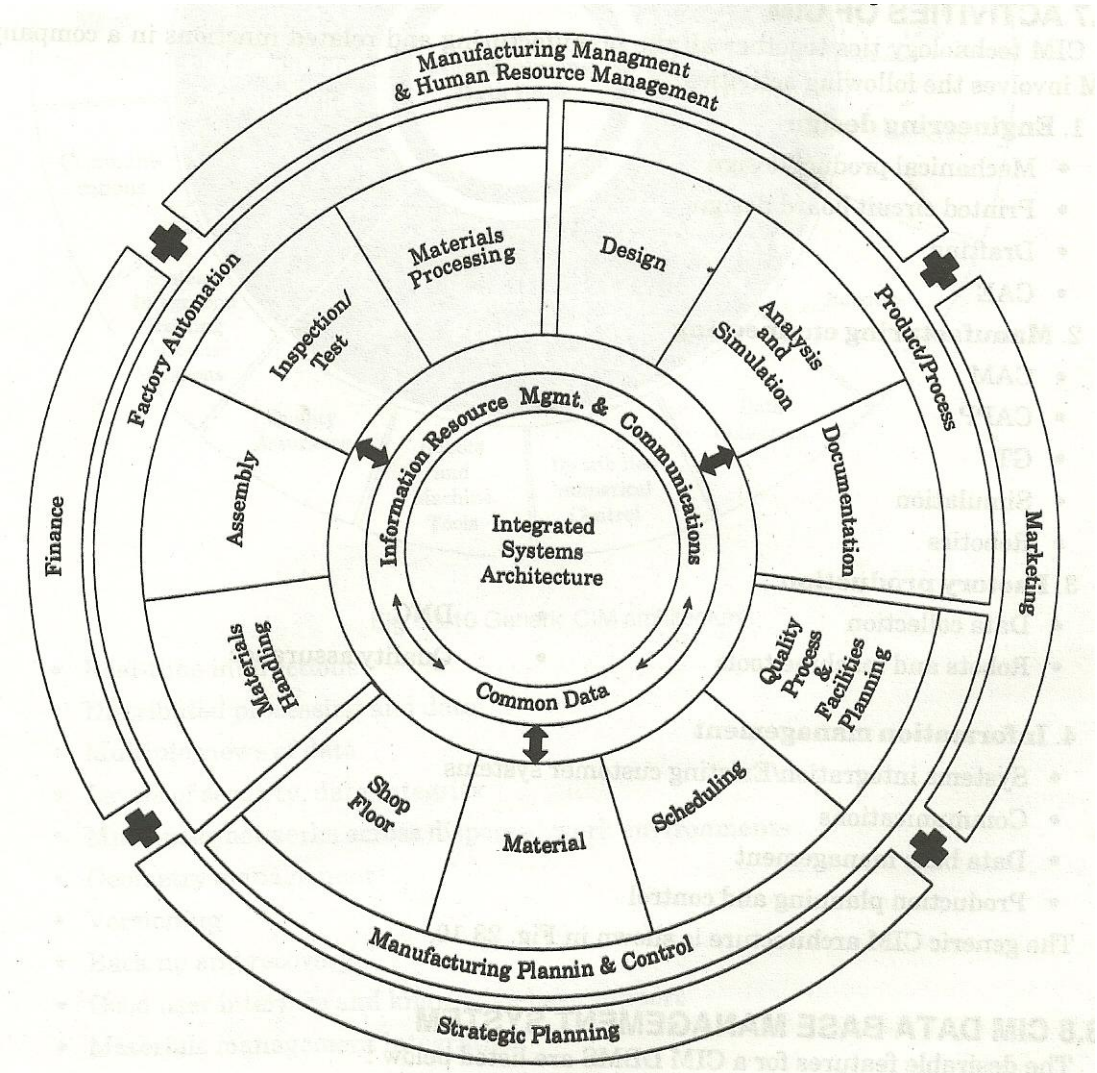


Fig. 23.9 CIM wheel.

2. Write short notes on LAN, MAN and WAN.
   - ❖ LAN
   - ❖ MAN
   - ❖ WAN

3. Discuss CIM data transmission methods.
   - ❖ Serial, Parallel
   - ❖ Asynchronous, Synchronous.
   - ❖ Modulation, Demodulation.
   - ❖ Simplex, Duplex

4. Discuss CIM data transmission methods.
    - ❖ PTP, Star and Multiplexing.

5. Explain the components of a Local Area Network and network topologies.
    - ❖ Star, Ring, Bus
    - ❖ LAN is a data communication system within a building ,plant campus or between nearby buildings

6. Write short notes on Ethernet, token ring and FDDI
    - ❖ Ethernet
    - ❖ Token Ring
    - ❖ Fiber Distributed Data Interface.

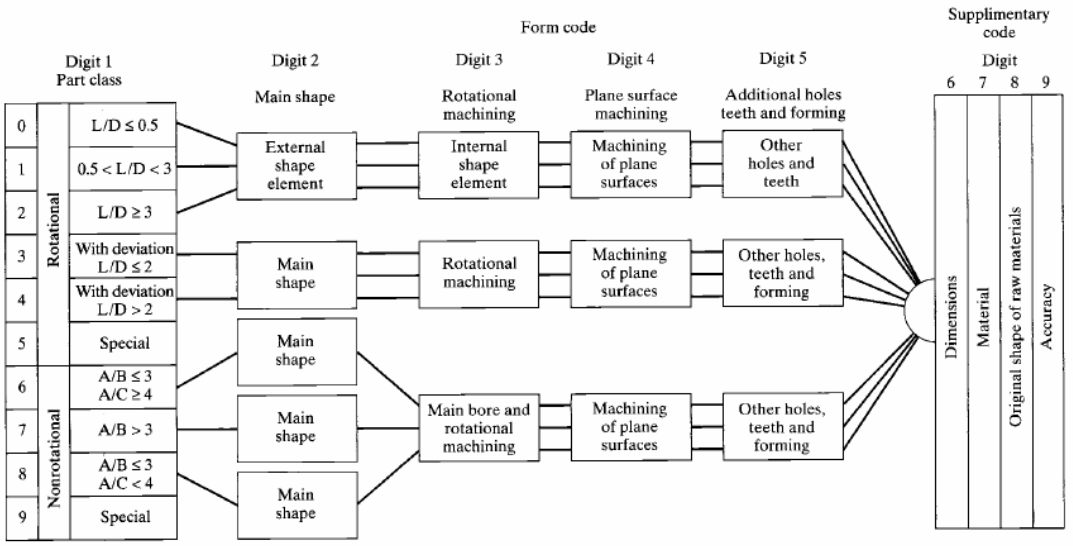
7. What are medium access control techniques? Explain CSMA/CD and token passing.
   These techniques describe the rules for managing / controlling access to networks.
    - ❖ Carrier Sense Multiple Access with Collision Detection.
    - ❖ Token Passing.

8. What is data communication? Identify and briefly explain the five components of a data communication system.
   Data communication is the exchange of data in the form of 0s and 1s between two devices through some form of transmission medium.
    - ❖ Message
    - ❖ Sender
    - ❖ Receiever
    - ❖ Sender
    - ❖ Medium
    - ❖ Protocol

UNIT – III

1. Explain about Optiz classification and coding system.

Basic structure of the Opitz system of parts classification and coding



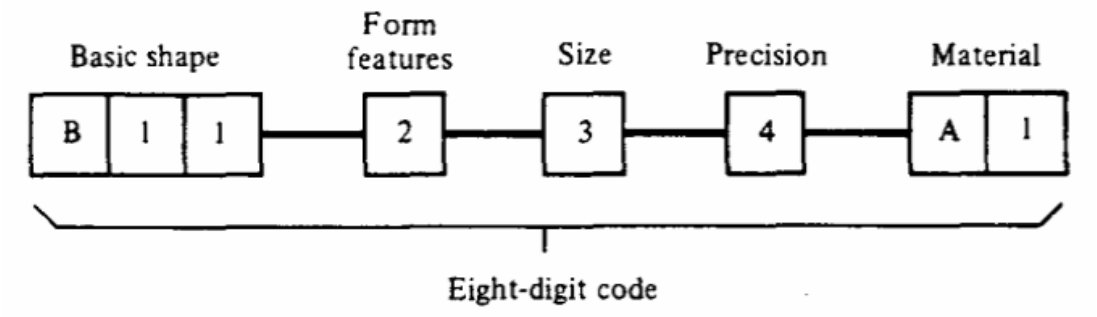
2. Explain retrieval and generative CAPP systems.

Approaches to Process planning

1. Manual approach
2. Variant or retrieval type CAPP system
3. Generative CAPP system

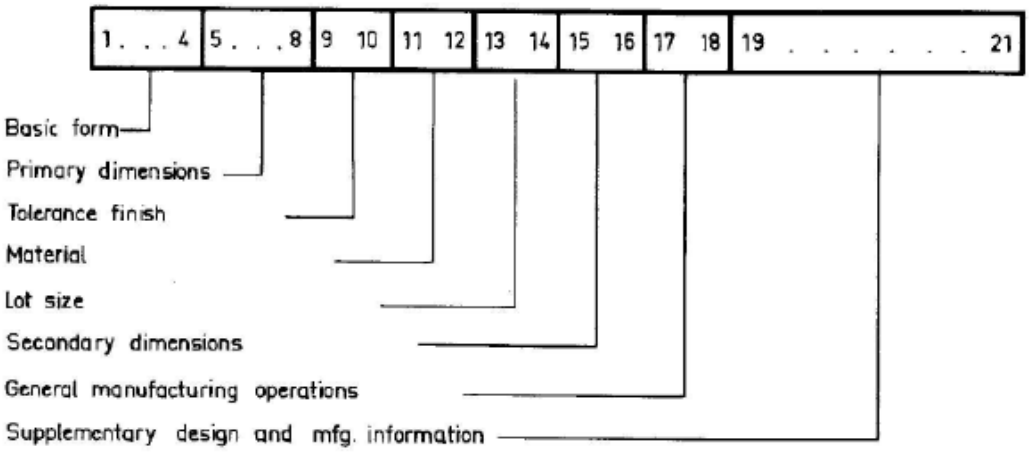
3. Discuss about MICLASS and DCLASS classification and coding system.

MICLASS and DCLASS classification and coding system



DCLASS part code segments

The structure of the MICLASS coding system



4. Explain about Multiclass coding system.

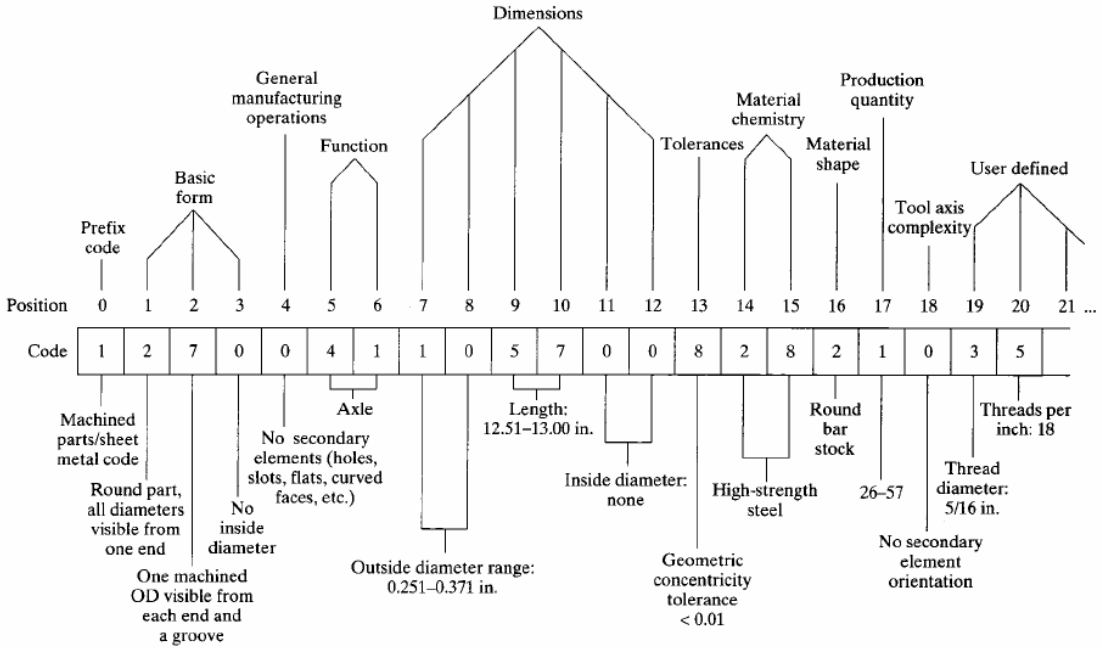
MultiClass – developed by the Organization for Industrial Research (OIR)

- First 18 digits of the Multiclass Classification and Coding System

Digit	*Function*
0	Code system prefix
1	Main shape category
2, 3	External and internal configuration
4	Machined secondary elements
5, 6	Functional descriptors
7–12	Dimensional data (length, diameter, etc.)
13	Tolerances
14, 15	Material chemistry
16	Raw material shape
17	Production quantity
18	Machined element orientation

MultiClass Coding System example – the rotational part design

MultiClass code number for the rotational part



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

- Parts classification and coding
- PFA
- Machine cell formation

6. Explain three structures used in classification and coding system.

Three structures used in classification and coding schemes

☐ Hierarchical structure, known as a mono-code, in which the interpretation of each successive symbol depends on the value of the preceding symbols

☐ Chain-type structure, known as a polycode, in which the interpretation of each symbol in the sequence is always the same; it does not depend on the value of preceding symbols

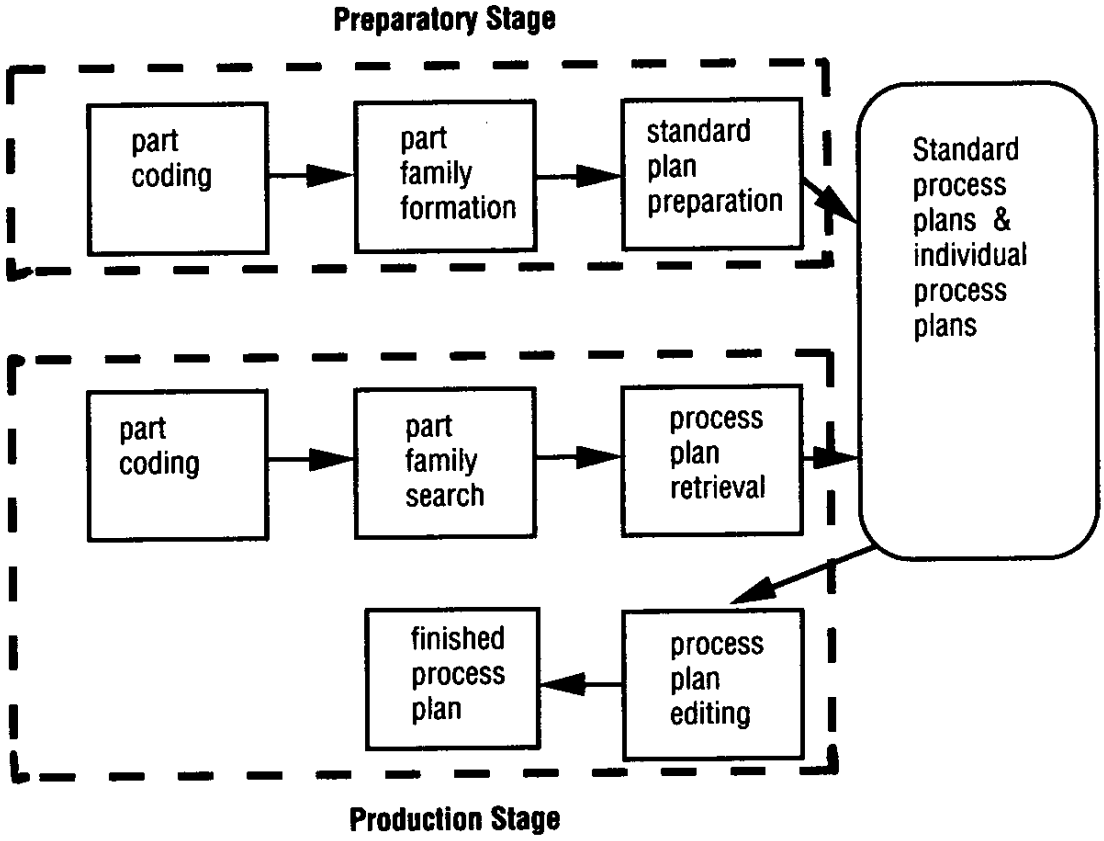
☐ Mixed-mode structure, which is a hybrid of the two previous codes

7. Explain cellular manufacturing in detail.

- Composite part
- PFA
- SLCA
- Similarity coefficient.
- ROCA

8. Explain the two approaches commonly used in CAPP systems bringing out their advantages and limitations.

VARIANT CAPP.



Generative Process Planning:

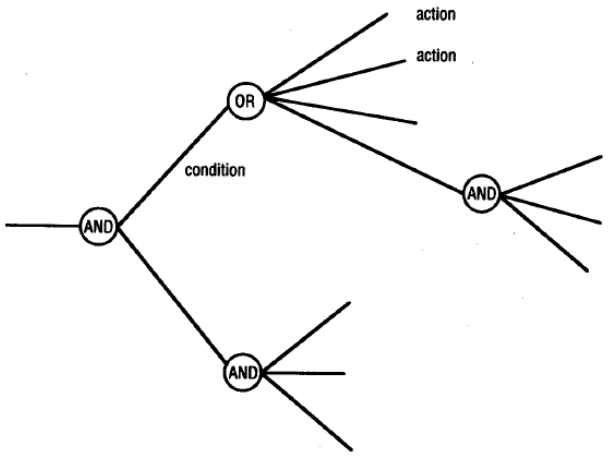
"a system which automatically synthesizes a process plan for a new component"

Requires

- Part description
  - Part to be produced must be clearly and precisely defined in a computer compatible format (OPITZ,AUTAP)
- Manufacturing databases
  - Logic of manufacturing must be identified and captured
  - The captured logic must be incorporated in a unified manufacturing database

Generative Process Planning

- Decision making logic and algorithms
  - Decision trees
  - Expert Systems:
  - AI based approaches



9. Write short notes on CMPP/ In what ways, CMPP is considered very significant.

- Generate sequence of operations
- Determine reference surfaces
- Calculate dimensions, tolerances
- Produce process plan documents

10. Explain role of GT and CAPP in CAD/CAM integration.

The role of Process Planning in CAD/CAM Integration

With the emergence of CAD/CAM integration as a predominant thrust in discrete parts industries, the communication between design engineering and manufacturing engineering
has become a very important consideration. Most firms are using CAD techniques extensively to design their products; similarly, they are using some CAM techniques, such as
computerized numerical control (CNC) machines, to manufacture products. However, in many of these firms there is very little communication between design and manufacturing. As
was noted in the previous chapter, the norm is well described by engineering designs the product and then throws the drawings over the wall for manufacturing to make the product."
Process planning emerges as a key factor in CAD/CAM integration because it is the link between CAD and CAM. After engineering designs are communicated to manufacturing, either on paper or electronic media, the process planning function converts the designs into
instructions used to make the specified part. CIM cannot occur until this process is automated; consequently, automated process planning is the link between CAD and CAM. As discussed in Chapter 6, group technology is an important element in CAD/CAM integration, because it provides a basis and a methodology for engineering and manufacturing communications. Automated process planning provides a means to facilitate this communication and remove the "wall" between engineering and manufacturing. The significance of group technology to this integration will be reinforced in this chapter with the realization that most CAPP systems utilize group technology

concepts. As a result, it is easy to understand why process planning and group technology has received a great deal of attention as CAD and CAM technologies are implemented and integrated.

UNIT- IV

1. Explain the component of FMS and FMS layout configuration.

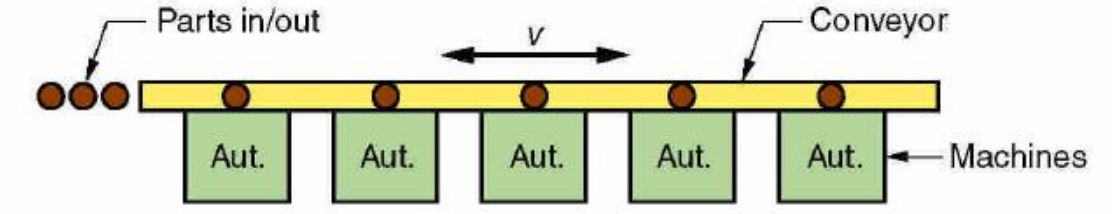
The basic components of FMS are:

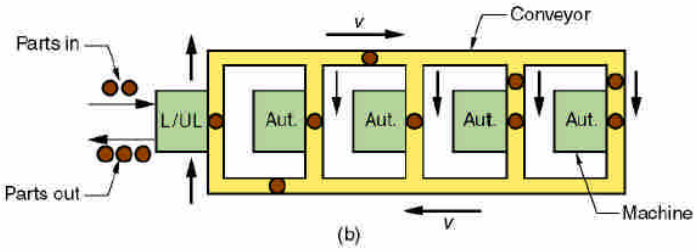
1. Workstations
2. Automated Material Handling and Storage system.
3. Computer Control System

Five Types of FMS Layouts

1.In-line
2.Loop
3.Ladder
4.Open field
5.Robot-centered cell

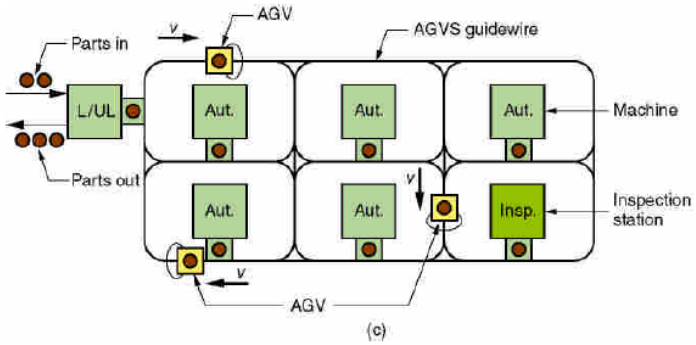
2. with suitable sketches, explain the various FMS layout configurations prevalent today..





Key: Aut = automated station; L/UL = load/unload station;
Insp = inspection station; AGV = automated guided vehicle;
AGVS = automated guided vehicle system

(c) open field



•Key: Aut = automated station; L/UL = load/unload station;
Insp = inspection station; AGV = automated guided vehicle; AGVS = automated guided vehicle system

3. Discuss the applications, advantages and disadvantages of a FMS.

FMS Applications

☐ Machining –most common application of FMS technology

☐ Assembly

☐ Inspection

☐ Sheet metal processing (punching, shearing, bending, and forming)

☐ Forging

Typical FMS Benefits

☐ Higher machine utilization than a conventional machine shop due to better work handling, off-line setups, and improved scheduling

☐ Reduced work-in-process due to continuous production rather than batch production

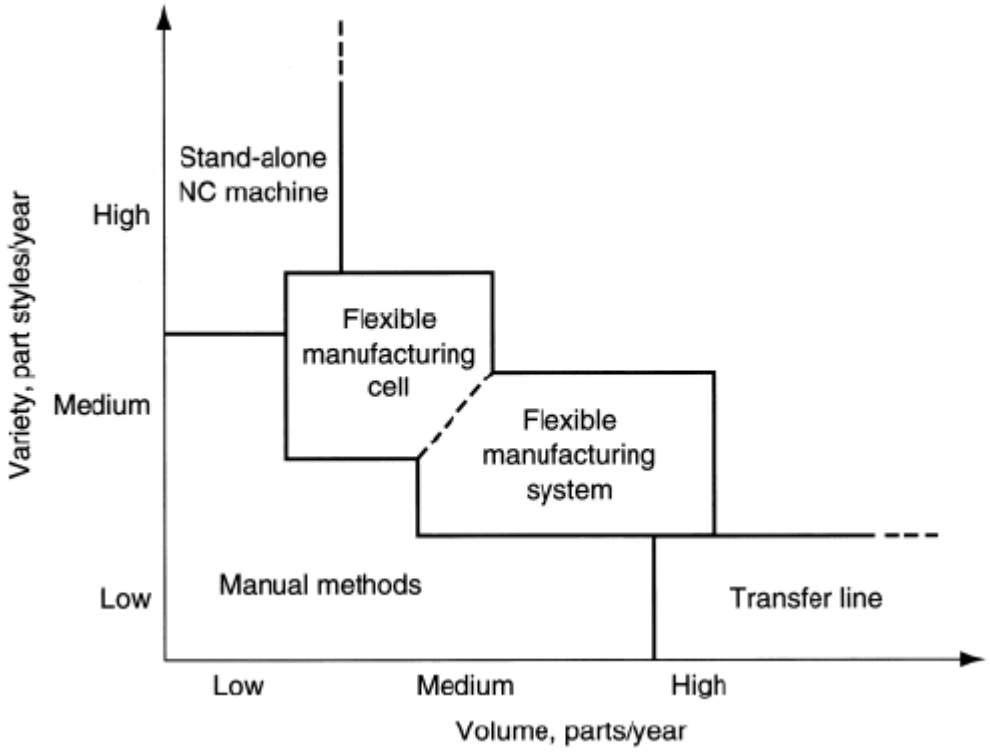
☐ Lower manufacturing lead times

☐ Greater flexibility in production scheduling

Disadvantages

Cost to implement.

4. Distinguish between (a) FMC (b) FMS and (c) SMC



5. Write short notes on various materials handling equipment that are commonly used in a FMS.

Material handling and storage systems

- Primary material handling
- Secondary material handling

6. Write an engineering brief about the various types of automatic identification Technologies.

- Bar codes
- Radio frequency systems
- Magnetic Stripe
- Optical character recognition
- Machine vision.

7. Explain SFC in detail.

The three phases of shop floor control

1. Order release
2. Order scheduling
3. Order progress

8. Explain factory data collection system in detail.

Factory Data Collection System

- On-line versus batch systems
- Data input techniques
  - Job traveler
  - Employee time sheets
  - Operation tear strips
  - Prepunched cards
  - Providing key board based terminals
    - One centralized terminal
    - Satellite terminals

9. Explain automate data collection system in detail.

Automated data collection systems

- Data acquisition systems
- Multilevel scanning

10. Write brief introduction to Bar Code Technology.

- Bar code
- Code 39
- Bar code Symbols
- Linear bar code
- 2-D bar code
- Bar code readers / Scanners
- Bar code printers.

UNIT –V

1. What is production planning? Name the activities within the scope of production planning.

Production planning consisits of (i) deciding which products to make in what quantities and when they should be completed (ii) Scheduling the delivery and production of the parts and products and (iii) planning the manpower and equipment resources needed to accomplish the production plan.

Activities; aggregate production planning, Master production planning, Material requirement planning and Capacity planning.

2. What is production control? What is the difference between the aggregate production plan and the master production schedule?

Production control consists of determining whether the necessary resources to implement the production plan have been provided and if not attempting to take corrective action to address the deficiencies. It includes various techniques for controlling the production and inventory in the factory.

Aggregate production plan: This involves planning the production output levels for major product lines produced by the firm. These plans must be coordinated among various functions in the firm, including product design, production, marketing and sales.

Master Production Plan: it is a specific plan of the quantities to be produced of individual models within each product line.

3. Explain MRP in detail.

- MRP: It is a computational technique that converts the master schedule for end products into a detailed schedule for the raw materials and components used in the end products.
- Dependent and Independent demand.
- Inputs to MRP system.
- How MRP works.
- MRP outputs and Benefits.

4. Explain lean manufacturing in detail.

Lean Production (also called lean manufacturing)
• A major assessment of each activity of a company regarding the efficiency and effectiveness of its operations
• The efficiency of the machinery and equipment used in the operation while maintaining and improving Quality
• The number of personnel involved in a particular operation
• A thorough analysis in order to reduce the cost of each activity, including both productive and nonproductive labor
– Goal: continuously improving the efficiency and profitability by reducing all types of waste from its operation
(0-base waste) and dealing with problems asap.

5. Explain agile manufacturing in detail.

Agile Manufacturing
– Ensuring **flexibility (agility)** in the manufacturing enterprise so that it can quickly respond to changes product variety and demand and customer needs
– To be achieved through machines and equipment with **built-in flexibility** (reconfigurable machines) modular components that can be arranged and rearranged in different ways, advance computer hardware software, reduced chargeover time and implementing advanced communication systems.

6. Explain Inventory Management in detail.

- **Inventory:** An idle resource of any kind that has potential economic value
  - raw materials
  - component parts
  - work-in-process
  - finished products, etc.

- **Reasons for carrying inventory**

1) To provide service
   - finished good inventory to meet demand and keep customers happy
   - work-in-progress inventory to increase flexibility by decoupling production stages and keep machines running
   - raw material inventory keeps production moving
   - protection against uncertainty

2) To save money
   - buying in large quantities allows spreading of fixed costs such as ordering costs and obtaining quantity discounts.
   - stocking of seasonal items allow production smoothing or work-load balancing.

- "The aborigine knew nothing of inventory control, and, quite possibly his 20th century corporate counterpart is equally as unenlightened. The changeover from inventory to inventory control bears no date. Some concerns plunged into the healthful waters of scientific management of inventories well before the first world war. Others are still on the shore contemplating on the advisability of wetting their toes. (Benjamin Melnitsky).

General Framework for Inventory management:

- **Demand**

- certainty
- risk, probability distribution of demand
- uncertainty, nothing known

- **Lead time:** The period between the order time and the delivery time

- certainty
- risk, probability distribution of demand
- uncertainty

- **Inside or Outside Procurement**

- purchased from outside; pure inventory problem
- integrated with production smoothing if inside

- **Static and Dynamic Problems**

- Static: one period problem, classic examples are

  Christmas tree and newsboy problem

- Dynamic: decisions over time

- **Behavior of Demand through Time and for Various Items**

- Stationary Demand: EOQ models
- Time-dependent Demand: WW model, Silver/Meal Heuristic
- Dependent Demand: MRP

7. Explain types of production and process monitoring Systems in detail.

- Structure model of manufacturing
- Direct digital control.