UNIT-II PRODUCTION PLANNING AND CONTROL AND COMPUTERISED PROCESS PLANNING

1. Define – Process Planning

Process planning involves determining the sequence of processing and assembly steps that must be accomplished to make the product.

2. Define – Route Sheet

The processing sequence is documented on a form called a route sheet or operation sheet.

3. Define – Concurrent Engineering

Concurrent Engineering is an approach used in product development in which the functions of design engineering, manufacturing engineering and other functions are integrated to reduce the elapsed time required to bring a new product to market.

4. Write the benefits of CAPP.
   1. Process rationalization and standardization
   2. Increased productivity of process planners
   3. Reduced lead time for process planning
   4. Improved legibility
   5. Incorporation of other application programs

5. Write the types of process planning.
   1. Manual process planning
   2. Computer Aided Process Planning
      (a) Retrieval CAPP systems
      (b) Generative CAPP systems

6. What is meant by retrieval CAPP systems?

A retrieval CAPP system, also called a variant CAPP system, is based on the principles of GT and parts classification and coding. A standard process plan is stored in computer files for each part family. Developing the database of these process plan requires substantial effort.

7. What is meant by generative CAPP systems?

The process sequence is planned without human assistance and without a set of predefined standard plans.

8. Define – Production Planning and Control

PPC is concerned with the logistics problems that are encountered in manufacturing, that is, managing the details of what and how many products to produce and when, and obtaining the raw materials, parts and resources to produce those products.

9. What are the activities within the scope of production planning?
   1. Aggregate production planning

2. Master Production Schedule (MPS)
3. Material Requirement Planning (MRP)
4. Capacity Planning (CP)

10. What is the difference between the aggregate production planning and master production schedule?

Aggregate production planning involves planning the production output levels for major product lines produced by the firm. Aggregate planning involves planning six months or more into the future.

MPS which is a specific plan of the quantities to be produced of individual models within each product line. MPS is concerned with shorter term.

11. What is meant by MRP?

MRP is a planning technique that converts the master schedule for end products into a detailed schedule for the raw materials and components used in the end products.

12. What are the main inputs to the MRP processor?

1. Master production schedule
2. Bill of materials
3. Inventory record file

13. What are the outputs to the MRP system?

1. Planned order release
2. Reports of planned order release in future periods
3. Rescheduling notices, indicating changes in due dates for open orders
4. Reports on inventory status
5. Exception reports
6. Performance reports

14. Write the benefits of MRP system.

1. reduction in inventory
2. quicker response to changes in demand
3. reduced setup and product changeover costs
4. better machine utilization
5. improved capacity to respond to changes in the master schedule

15. What is meant by capacity planning? And write the two stages of capacity planning.

Capacity planning consists of determining what labor and equipment resources are required to meet the current MPS as well as long-term future production needs of the firm.

Stages of Capacity planning:
  (a) rough cut capacity planning (RCCP)
  (b) Capacity requirements planning (CRP)

16. Define – Shop Floor Control

SFC is the set of activities in production control that is concerned with releasing production orders to the factory, monitoring and controlling the progress of the orders through the various work centers, and acquiring current information on the status of the orders.

17. Write the three phases of shop floor control.

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

18. Define – Shop Packet

The collection of documents through the factory called shop packet. It consists of

1. the route sheet
2. material requisitions to draw the raw materials from inventory
3. job cards means to report direct labor time devoted to the order
4. move tickets to authorize the material handling personnel to transport parts between work centers
5. the part list

19. Define –Factory Data Collection System

The FDC system consists of the various paper documents, terminals and automated devices located throughout the plant for collecting data on shop floor operations

20. Define – MRP II

Management Resource Planning (MRP II) can be defined as a computer based system for planning, scheduling and controlling the materials, resources and supporting activities needed to meet the master production schedule.

21. Define – ERP

Enterprise Resource Planning (ERP) is a computer software system that organizes and integrates all of the data and business functions of an organization through a single, central data base.

1. Explain Generative CAPP?

Generative process planning is a system that synthesizes process information in order to create a process plan for a new component automatically. In a generative planning system, process plans are created from information available in manufacturing data base without human intervention. Upon receiving the design model, the system can generate the required operations and operation sequences for the component. Knowledge of manufacturing must be captured and encoded into efficient software. By applying decision logic, a process planner's decision making can be imitated. Other planning functions, such as machine selection, tool selection, process optimization, and so on, can also be automated using generative planning techniques. The generative planning has the following advantages:

i. It can generate consistent process plans rapidly.

ii. New process plans can be created as easily as retrieving the plans of existing components.

iii. It can be interfaced with an automated manufacturing facility to provide detailed and up-to-date control information.
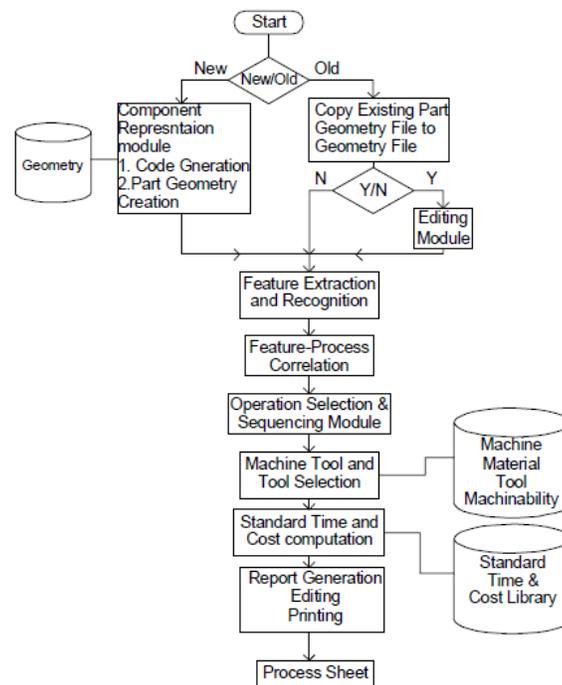
The generative part
• Component representation module
• Feature extraction module
• Feature process correlation module
• Operation selection and sequencing module
• Machine tool selection module
• Standard time / cost computation module
• Report generation module

2. Explain Retrieval CAPP?

The variant approach is comparable with the traditional manual approach where a process plan for a new part is created by recalling, identifying, and retrieving an existing process plan for similar part, and making necessary modification making it suitable for the new part. In general this system has two operational stages.

i. Preparatory stage: in this stage the parts are coded and families are formed based on group technology (GT) principles. Standard process plans are prepared for each family and stored in database.

ii. Production stage: Process plan for a new part can be made in this stage. Whenever a new part comes for process planning, it's code and family will be identified and the standard processing plane for that family is retrieved. Necessary modifications are made by the process planner to satisfy the component design.

The CAPP system may be either semiautomatic or automatic. In the semiautomatic there is a need for manual input of the required data. Inputting the feature details, finished material details and raw material details to the computer is time consuming and tedious. This is a form of under utilization ofmanpower and here are also chances that the user may input the data wrongly. These drawbacks can be avoided by providing a bridge between the generated automatically from CAD model or drawings. This will also help in enhancing the role of computers in industry. This helps to move towards computer integrated manufacturing whose is a paper less industry.

The majority of existing CAPP systems is of variant approach. Some of the process planning systems that follow this approach are CAM-I CAPP, MIPLAN, MITURN, MIAPP, ACUDATA. The disadvantages of this approach are that the quality of process plan still depends on the knowledge of process planner because of editing. Process planning for an entirely new type of component is not possible.

Retrieval CAPP system
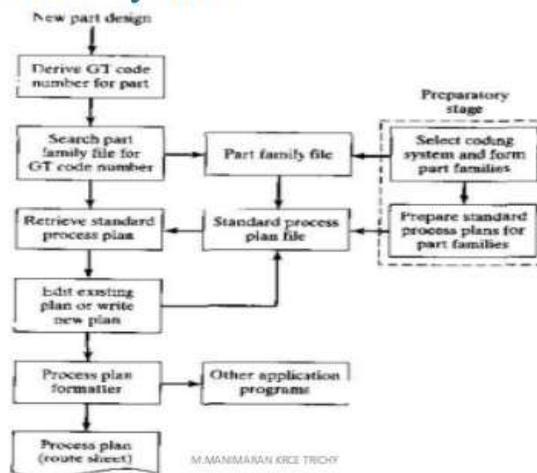
3. Explain Logical Steps in CAPP.

Computer-aided process planning (CAPP) helps determine the processing steps required to make a part after CAP has been used to define what is to be made. CAPP programs develop a process plan or route sheet by following either a variant or a generative approach. The variant approach uses a file of standard process plans to retrieve the best plan in the file after reviewing the design. The plan can then be revised manually if it is not totally appropriate. The generative approach to CAPP starts with the product design specifications and can generate a detailed process plan complete with machine settings. CAPP systems use design algorithms, a file of machine characteristics, and decision logic to build the plans. Expert systems are based on decision rules and have been used in some generative CAPP systems.

CAPP has recently emerged as the most critical link to integrated CAD/CAM system into inter-organizational flow. Main focus is to optimize the system performance in a global context. The essentiality of computer can easily be understood by taking an example, e.g. if we change the design, we must be able to fall back on a module of CAPP to generate cost estimates for these design changes. Similarly for the case of the breakdown of machines on shop floor. In this case, alternative process plan must be in
hand so that the most economical solution for the situation can be adopted.

one such representation, where setting of multitude of interaction among various functions of an organization and dynamic changes that takes place in these sub functional areas have been shown. Hence, the use of computer in process planning is essential.
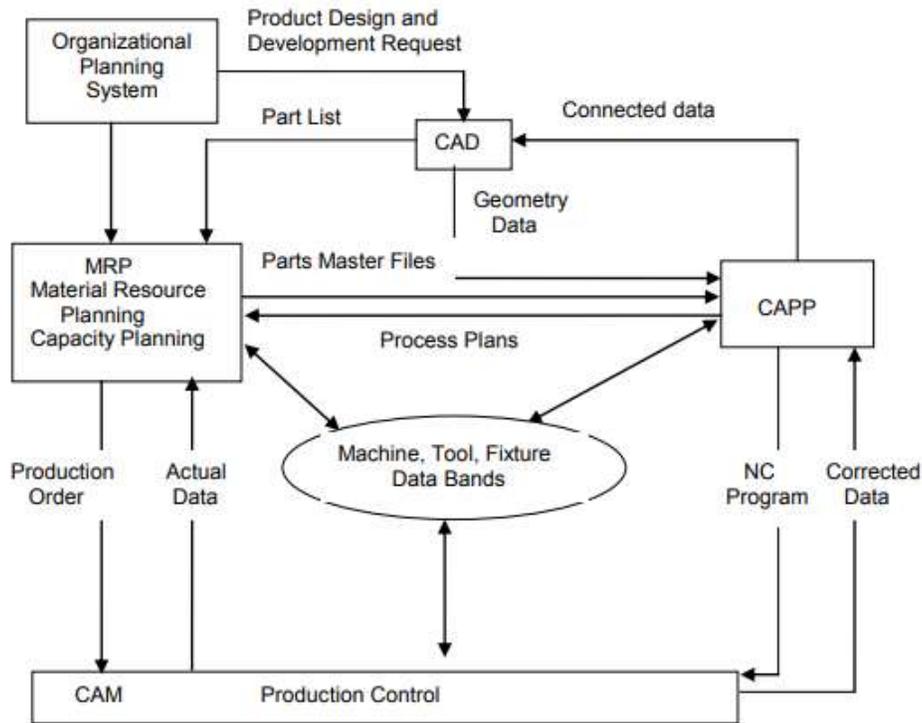

CAPP is the application of computer to assist the human process planer in the process planning function. In its lowest form it will reduce the time and effort required to prepare process plans and provide more consistent process plan. In its most advanced state, it
will provide the automated interface between CAD and CAM and in the process achieve
the complete integration with in CAD/CAM.

4. Explain Aggregate Production Planning.

Aggregate production planning is concerned with the determination of production, inventory, and work force levels to meet fluctuating demand requirements over a planning horizon that ranges from six months to one year. Typically the planning horizon incorporate the next seasonal peak in demand. The planning horizon is often divided into periods. For example, a one year planning horizon may be composed of six one-month periods plus two three-month periods. Normally, the physical resources of the firm are assumed to be fixed during the planning horizon of interest and the planning effort is oriented toward the best utilization of those resources, given the external demand requirements.

ll as the cost associated with them. Typically a firm can cope with demand fluctuations by:

(a) Changing the size of the work force by hiring and firing, thus allowing changes in the production rate. Excessive use of hiring and firing may limited by union regulations and may create severe labor problems.
(b) Varying the production rate by introducing overtime and/or idle time or outside subcontracting.
(c) Accumulating seasonal inventories. The tradeoff between the cost incurred in changing production rates and holding seasonal inventories is the basic question to be resolved in most practical situations.
(d) Planning backorders
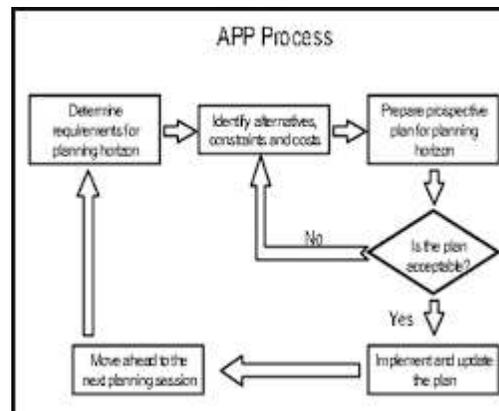
5. Explain Master Production Scheduling.

The Master Production Schedule (MPS) formalizes the production plan and translates it into specific end-item requirements over a short to intermediate planning horizon. The end items are then exploded into specific material and capacity requirements by the Material Requirements Planning (MRP) and Capacity Requirements Planning (CRP) systems. Thus, the MPS essentially drives the entire production and inventory system. The major inputs to the master production schedule are: 1. Forecasts of demand, e.g., of end items and service parts. 2. Customer orders, i.e., including any warehouse and interplant needs. 3. Inventory on-hand from the previous period. Forecasts of demand are the major input for make-to-stock items. However, to be

competitive, many make-to-order firms must anticipate orders by using forecasts for long lead-time items and by matching the forecasts with customer orders as the orders become available. Master Scheduling Planning Horizon:

The time horizon of master scheduling depends upon the type of product, volume of production, and component lead times. It can be weeks, months, or some combination, but the schedule must normally extend far enough into the future so that the lead times for all purchased and assembled components are adequately encompassed. Master schedules frequently have both firm and flexible (or tentative) portions.
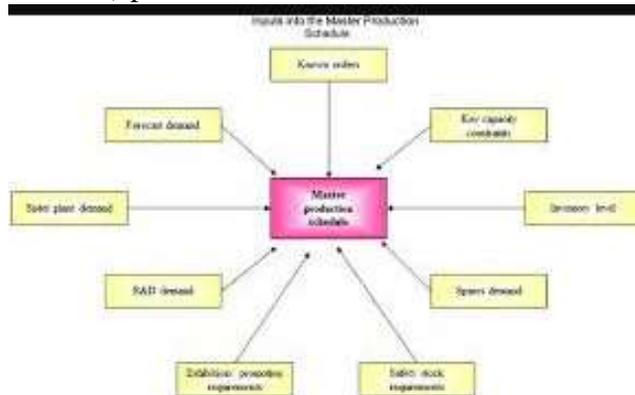

6.Explain Material Requirement Planning?

The important modules of the system are:

i. Computer Aided Engineering

ii. Operations Management

iii. Computer Aided Manufacturing

iv. Intelligent Warehouse System

It can be seen that the systems are linked to a central data storage system to enable different departments to share the manufacturing data. The manufacturing information system ties the activities of several departments together in a closed loop for effective manufacturing control to achieve high productivity. It is necessary to understand the functioning of various segments of a manufacturing system to appreciate the complexities of working of an enterprise. The modules of MRP-II are, therefore, discussed in detail in this chapter. The figure highlights the importance of data as well as materials. The efficiency in manufacturing is dependant on timely access to data and availability of materials. A CIM system serves exactly the same purpose.
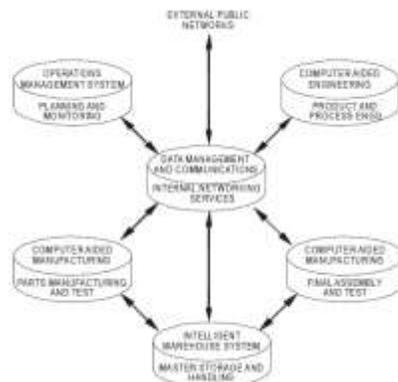
7. Explain the Various Phases of Shop Floor Control.

        The previous modules discussed cover the planning phase of MRP-II. The actual implementation starts with shop floor control (SFC, also called production activity control- PAC). The SFC or PAC module monitors all shop floor activities and communicates status information on manufacturing orders and work centres back to respective managers. SFC determines what orders are released to the floor and when, the routing of a particular order, and when operations are to be started and completed. It also maintains the paperwork and details concerning an order, and handles feedback (either manual or automated) on the status of an order. Dispatch lists are generated, showing the jobs coming into a work centre and the preferred order of their completion. SFC reacts to changes and reschedules the work in response to priority changes. It also interfaces with the Capacity Requirements Planning component to provide input/output data for capacity planning purposed. With this process, overloaded or under loaded work centres can be identified to provide more effective work centre utilization.
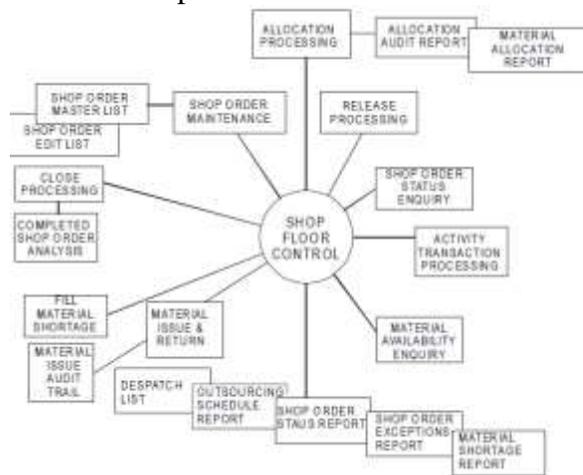
PURCHASE ORDER AND RECEIVING

        Purchasing receives input from the Inventory Control component in the form of current and anticipated inventory levels. Material Requirements Planning also provides input on the planned inventory use and generates planned requisitions for purchased parts. With the increasing trend toward a Just-In-Time (JIT) manufacturing environment, and its emphasis on a reduction of inventory and a more even flow of parts from suppliers, the purchasing component should also accommodate this increased frequency of inventory receipt.