

DHANALAKSHMI COLLEGE OF ENGINEERING, CHENNAI

DEPARTMENT OF MECHANICAL ENGINEERING

IE6605 - PRODUCTION PLANNING AND CONTROL

UNIT- I: INTRODUCTION

PART A (2 Marks)

1. **What is production?**

Production consists of a series sequential operation to produce a desirable product acceptable to customer and meets the customer demand, with respect to the quality and intendedfunction.

2. **Define – Production Planning and Control**

Production planning control defined as Direction and coordination of firm's resources towards attaining the prefixed goals.

3. **What are the objectives of production planning and control?**

- a. Systematic planning of production activities to achieve the highest efficiency in production of goods/services.
- b. To organize the production facilities like machines, men, etc., to achieve stated production objectives w.r.t. quantity and quality time cost.
- c. Optimum scheduling of resources.
- d. To conform to delivery commitments.
- e. Materials planning and control.

4. **What are the functions of production planning and control?**

- a. Material function, b. Machines and equipment, c. Methods, d. Routing,
- e. Estimating f. Loading and scheduling, g. Dispatching, h. Expediting, i. Inspection.

5. **Define – Durability**

Durability refers to the length of the active life of the product under given working condition.

6. **Define – Dependability**

Dependability refers to the reliability with which the product serves its intended function.

7. **Define –Standardization**

Standardization is a process of defining and applying the conditions necessary to ensure that given range of requirements can normally be met with a minimum of variety and in a reproducible and economic manner on the basis of the best current techniques.

8. **What are the objectives of Standardization?**

- i) Interchangeability of parts, components, etc.
- ii) Keeping the variety minimum.
- iii) Helps to achieve a better control due to reduced variety.

9. **What are the advantages of Standardization?**

- i) Reduction of waste and obsolescence.
- ii) Reduction in inventory
- iii) Reduced efforts in book keeping and accounting.
- iv) Standardization reduces the price because of economy of scale.
- v) Ease in procurement because of availability.

10. **What is simplification?**

It is a process of reducing types of products within a definite range.

11. **What is specialization?**

It is a process where in particular firms concentrate on the manufacture of limited number of product types.

12. **What are the disadvantages of simplification?**

- i) Not able to meet the needs of wide range of customer preferences.
- ii) Possibility of losing orders to competitors
- iii) Creates a constant source of conflict between marketing and production.

13. **Define – Break-Even Point**

Break-even point refers to the level of sales at which the sale income equal the total costs.

14. **What is margin of safety?**

It is the difference between the existing level of output and the level of output at BEP.

15. **What are the phases of PPC?**

- i. Preplanning Phase
- ii. Planning Phase
- iii. Control phase

16. **What are the main functions of PPC?**

- 1. Materials planning
- 2. Methods Planning
- 3. Facility planning
- 4. Process Planning
- 5. Estimating Planning
- 6. Scheduling and Loading
- 7. Dispatching
- 8. Expediting (Follow-up)
- 9. Inspection and testing
- 10. Evaluation

17. **What are the types of production?**

- 1. Job shop production
- 2. Batch Production
- 3. Mass Production

18. What are the two types of continuous production?

- a) Mass Production
- b) Flow Production

19. What is the use of break-even point analysis?

It is used to make a choice between two machines tools to produce a given component.

20. Define – Contribution

The difference between selling price and variable cost per unit is known as contribution or contribution margin.

Contribution = Selling price - Variable cost

21. What is break even chart?

It is a graphical representation of the relationship between costs and revenue at a given time.

22. What is product Design?

Design is the conversion of knowledge and requirement into a form, convenient and suitable for use of manufacture.

23. What are the various aspect of product?

- a) Functional aspect
- b) Operational aspect
- c) Durability and Dependability
- d) Aesthetic aspect

24. What is angle of incidence?

The angle at which sales revenue line cuts the total cost line.

Part - B (16 marks)

1. What do you understand by production planning and control? Discuss its main elements.
2. Explain different types of production systems. Differentiate between them.
3. Explain in detail the production aspects of product design.
4. Write detailed notes on:
 - i) Standardisation
 - ii) Simplification
 - iii) Specialisation
5. Give detailed account of the various factors considered while designing a product.
6. Discuss in detail:
 - i) Breakeven Analysis
 - ii) Samuel Eilon model
7. Explain the characteristic features of (i) batch production and (ii) mass production system.
8.
 - a. Discuss the benefits of PPC.
 - b. Differentiate between product design and product development.
 - c. A manufacturer sells an item for Rs. 13 per unit. He incurs a fixed cost of Rs. 60,000 and a variable cost of Rs. 8 unit. Find the break even production quantity and also the no. of units to be produced to get a profit of Rs. 12000.
9. Explain the different aspects of product design and development.
10.
 - a. What are the objectives of product analysis?
 - b. List the various factors that influence the product design.

UNIT-II WORK STUDY

PART – A (2 Marks)

1. What is method study?

It is the systematic recording and critical examination of existing and proposed ways of doing work, as a means of developing and applying easier and more effective method reduced costs.

2. What are the objectives of method study?

- i) To present and analyze true facts concerning the situation.
- ii) To examine those facts critically.
- iii) To develop the best answer possible under given circumstances based on critical examination of facts.

3. What are the charts used for method study?

- i) Operation process chart, ii). Flow process chart. iii). Multiple activity chart,
- iv) Two handed process chart, v). Travel chart, vi). Simo chart.

4. What are the diagrams used for method study?

- i) Flow and string diagram, ii). Models and templates, iii). Cycle graph and chronocycle graph.

5. What is outline process chart?

The chart gives the bird's-eye view of the whole process by recording only the major activities and inspections involved in the process.

6. What is time study?

The application of techniques designed to establish the timer for a qualified worker to carry out a specified job at a defined level of performance.

7. What is work sampling?

A technique in which a statistically competent number of instantaneous observations are taken, over a period of time, of group of machines, process or workers. Each observations recorded for a particular activity or delay is a measure of the percentage of time observed by the occurrence.

8. What is multiple activity chart?

It is a chart on which the activities of more than one subject are each recorded on a common time scale to show their interrelationship.

9. What is Simo chart?

It is used to record simultaneously on a common time scale the activities of two hands or other parts of worker's body during the performance of single cycle of operation being investigated.

10. **What are therbligs?**

Therbligs are the symbols used to denote the various activities and movements done for different purposes.

11. **What is memo motion study?**

Memo motion study is a form of time-lapse photography which records activity by the use of cine camera adapted to take picture at longer intervals than normal.

12. **What is PMTS?**

A work measurement technique whereby times established for basic human motions are used to build up the time for a job at the defined level of performance.

13. **Define – Work-Study**

It is a term used to embrace the techniques of method study and work measurement which is employed to ensure the best possible use of human and other resources in carrying out a particular activity.

Work study=Method study+Workmeasurement

14. **Define – Productivity**

It is the ratio of output produced to the input resources utilized in the production.

15. **What is the various procedure of method study?**

1. Select
2. Record
3. Examine
4. Develop
5. Define
6. Install
7. Maintain

16. **What are the various techniques used for work Measurement?**

1. Stopwatch time study
2. Work sampling

17. **Define – Outline Process Chart**

An outline process chart is a process chart given an overall picture by recording in sequences only the main operations and inspections.

18. **What is flow process chart?**

It is a process chart setting out the sequence of the flow of a product (Or) a procedure by recording all events under review using the appropriate process chart symbols.

19. **What are the types of flowchart?**

- (i) Man Type
- (ii) Material Type
- (iii) Equipment Type

20. **What is two handed process Chart?**

It is a process chart in which the activities of a workers hand (or limbs) are recorded in the irrelation ship to one another.

21. **Define – Multiple Activity Charts**

It is a chart on which the activities of more than one subject are each recorded on a common time scale to shoe their inter relation ship.

22. **What is string diagram?**

It is a scale plan or model on which a thread is used to thread is used to trace and measure the path of workers, material or equipment during a specified sequence of events.

23. **What is cycle graph?**

It is a record of path movement, usually traced by a continuous source of light on a photograph.

24. **What is chronocycle graph?**

It is a special form of cycle graph in which the light source is suitably interrupted so that the path appears as a series of pear-shaped dots.

25. **What is micro motion study?**

It is used to make a detailed motion study employing either videotapes or motion pictures operating at a constant and known speed, when picture camera is utilized for study, then the procedure is known as micro motion study.

Part - B (16 marks)

1. Explain briefly the various steps involved in conducting the work study.
2. State and explain in brief the steps involved in conducting the method study procedure.
3. Briefly explain the various techniques of work measurement.
4. Define time study. List down the various steps in conducting a stopwatch time study.
5. Write short notes on:
 - a) Micro motion study
 - b) Memo motion study
6. Briefly explain the different tools and techniques used in the recording phase of method study.
7. Explain the procedural steps involved in the work sampling study and illustrate how work sampling is used for the computation of standard time for an operation which involves both manual and machine elements.
8. Discuss two types of each of the charts and diagrams used in the recoding phase of the method study.
9. List the principles of motion economy as applied to the use of human body, arrangement of workplace and design of tools and equipment.
10. a. Write short notes on (i) Symbols of process chart (ii) Therbligs
b. Distinguish between cumulative timing and fly back timing.

UNIT-III PRODUCTION PLANNING AND PROCESS PLANNING

PART – A (2 Marks)

1. What is production planning?

It is the determination, acquisition and arrangement of all facilities necessary for future production products.

2. What are the factors affecting production planning?

- i. Non-availability of materials
- ii. Plant, equipment and machine breakdown
- iii. Changes in demand and rush orders.
- iv. Absenteeism of workers.
- v. Lack of coordination and communication between various functional areas of business.

3. What is value analysis?

Value analysis is the systematic application of recognized techniques which identify the function of a product or service, establish a monetary value for the function and provide the necessary function reliably at that lowest overall cost.

4. When to apply value analysis?

- i. Company's products are losing in the market and there is a decline in sales.
- ii. Company's products are priced higher than the competitors.
- iii. New design of products being undertaken.
- iv. Symptoms of disproportionate increase in cost of production.
- v. Decreasing profitability and return on investment.
- vi. Company failing to meet its delivery commitment.

5. What is process planning?

It is defined as the systematic determination of methods by which a product is to be manufactured economically and competitively.

6. What are the activities associated with process planning?

1. List of operations to be performed and their sequence.
2. Specifications of the machines and equipment required.
3. Necessary toolings jigs and fixtures.
4. Gives the manufacturing details with respect to feed, speed, and depth of cut for each operation to be performed. It gives the estimated or processing times of operations.

7. What is the information required for process planning?

- a. Assembly and component drawings and bill of materials.
- b. Machine or equipment details.
- c. The standard times for operation and details of set-up time for each job.
- d. Availability of toolings.

8. What are the factors affecting process planning?

- i. Volume of production
- ii. Delivery dates for components
- iii. Accuracy and process capability of machines.
- iv. The skill and expertise of manpower.
- v. Material specifications
- vi. Accuracy requirements of components or parts.

9. What are the steps in process planning?

- a. Detailed study of the component drawings, process and machine selection, inspection stages and toolings required.
- II. List the surfaces to be machined.
 - b. Determine the work centre, tools, cutting tools, jigs and fixtures and inspection stages and equipment required.
- III. equipment required.
 - a. Determine the speed, feed and depth of cut for each operation.
 - b. Estimate the operation time.
 - c. Find the total time to complete the job.
 - d. Represent the details on the process sheet.

10. What is machine capacity?

MC- Machine capacity

MP-Max production

UC-Utilization capacity

N – Number of machines

ST-Standard time

$MC = ST \times MP/N \times UC.$

11. What is meant by balancing?

It refers to the procedure of adjusting the times at work centres to conform as much as possible to the require cycle time.

12. Define – Machine Loading

It is the process of assigning specific jobs to machines, men (or) work centres based on relative priorities and capacity utilization.

13. Define – Process

It is defined as any group of actions instrumental to the achievement of the output of an operations system in accordance with a specified measure of effectiveness.

14. What are the purposes of process planning?

- a. Specific requirements are established for which machines, tools and other equipment can be designed or selected.
- b. The efforts of all engaged in manufacturing the product is coordinated.
- c. A guide is furnished to show the best way to use the existing or the providing facilities.

15. What are the factors used for selection of machine and equipment?

- a. Accuracy
- b. Rate of output
- c. Cost of product

16. **What is the main function of process planning?**

'Make or buy' decision is the main function of process planning. Here decision is made about which parts are to be made in the factory and which parts are to be bought from outside. Decision on whether to make or buy is taken by break even analysis.

17. **How the process selection is determined?**

Process selection determine how the product(Or service) will be produced, It determines the most economical method of performing an activity.

18. **What are the types of process planning?**

- a) Generative process planning
- b) Retrieval process planning

19. **What is the function of CAPP?**

A computer aided process planning (CAPP) system offers the potential for reducing the routine work of manufacturing engineers. It provides the opportunity to generate production routings which are rational, consistent and optimal.

20. **What are the advantages of generative process planning?**

- a. Generate consistent process planning rapidly.
- b. New components can be planned easily.

PART- B (16 marks)

1. What is value analysis? Describe the basic steps involved in the value analysis.
2. Explain the importance of process planning with reference to production control. Discuss the activities in process planning.
3. a. Compare and contrast the manual process planning with CAPP.
b. Explain the steps involved in product planning.
4. What is meant by machine loading? Also enumerate the various methods to the cycle time to a minimum.
5. What do you mean by machine balancing? Also explain the effect of balancing on number of machines required with an illustration.
6. Write short notes on analysis of process capacities in a multiproduct system.
7. Write short notes on:
 - a) Quantity determination in batch production
 - b) Analysis of process capability in a multi-product system
8. A gear manufacturer has gear shaper and gear hobbers. The gear can be processed on gear shaper as well as gear hobber. The following is given. Which of the two machines will you choose to do the job if the order quantity is (i) 1000 numbers and order is unlikely to repeat and (ii) 1000 numbers and the order is likely to repeat for 3 years?

Gear shaper	Gear hobber	
Machine time per piece (min)	12	04
Machine cost per hour	45	120
Set up time (min)	60	90
Tooling up cost (Rs)	400	200
9. What is meant by product planning? Explain, in detail, the various steps involved in the product planning process.
- 10 a. Explain the various phases of value engineering.
b. What are commandant of value analysis?

UNIT-IV PRODUCTION SCHEDULING

PART – A (2 Marks)

1. What is loading?

It is defined as the assignment of work to a facility. The facility may be men, machine, a department, a group of men, group of machines of a plant.

2. What is scheduling?

It is time phasing of loading. It is defined as the assignment of work to a facility specifying the particular sequence of the work and the time of actual performance.

3. What are the different techniques of loading and scheduling?

- a. Master scheduling
- b. Perpetual loading
- c. Order scheduling
- d. Loading by schedule period

4. What is master scheduling?

It gives an overall picture of the jobs. It is mainly used for small corners such as research and development laboratories, computer centre, foundries, repair shop etc.

5. What are the advantages of master scheduling?

- i) The overall cost of operating is minimum than any other loading and scheduling systems.
- ii) This method is very simple to understand.
- iii) This could be even maintained by clerical staff.
- iv) It could be easily kept current.

6. What are the disadvantages of master scheduling?

- i) The detailed information cannot be obtained.
- ii) It is efficient for small units only.

7. What is line balancing?

Assembly line balancing is associated with a product layout in which products are processed as they pass through a line of work centres. An assembly line can be considered as a production sequence where parts are assembled together to form an end product. The operations are carried out at different workstations situated along the line.

8. What are the advantages of assembly line?

- i) Uniform rate of production.
- ii) Less material handling
- iii) Less work-in-process.
- iv) Easy production control.
- v) Effective use of facilities/labour.
- vi) Less congesting.

9. What are the disadvantages of assembly line?

- i) More capital intensive.
- ii) Low flexibility.
- iii) Monotony of work for operators.

10. What are the steps in solving line balancing problems?

- i) Define task
- ii) Identify precedence requirements.
- iii) Calculate minimum number of workstations required to produce desired output.
- iv) Apply heuristics to assign task to each station.
- v) Evaluate effectiveness and efficiency.
- vi) Seek further improvement.

11. What are the advantages of Gantt load chart?

- i) This system is quite simple.
- ii) This could be maintained even by electrical staff after some training.
- iii) Overall cost of operation is small.

12. What are the disadvantages of Gantt load chart?

From the load chart it is not possible to learn the exact time of a work. It tells only the total load ahead of a department or a facility.

13. What is Kanban system?

Kanban system is a simple information system used by a work centre to signal its supplier work centre to request a replacement container and to authorize production of another container of that particular item.

14. What is production sequencing?

Determining the order of processing of all jobs at each work centre.

15. What is expediting?

Monitoring progress, taking corrective actions to minimize deviations.

16. What are the main objectives of loading?

- i. To check the feasibility of production programmes
- ii. To assist in the efficient planning of new work
- iii. To assist in balancing the plant to the existing load
- iv. To assist in fixing of reliable delivery promises.

17. Define – Capacity

It can be defined as the time available for work at work centres expressed in machine hours or in man hours

18. What is Gantt chart?

Gantt chart is simple bar graphs that can be used to schedule any type of operation.

19. **What is Gantt Work load chart?**

It is used to depict workload levels for equipment, workstations (Or) departments.

20. **What is MRP?**

It is a computational technique that converts the master schedule for final product into a detailed schedule for the raw material and parts used in the final product.

21. **What is MPS?**

It is a detailed plan that states how many end items will be available for sale (Or) distribution during specific periods.

22. **What is dispatching?**

It is the routine of setting productive activities in motion through the release of orders and instructions in accordance with previously planned times and sequences embodied in route sheets and schedule charts.

23. **Define – Priority Sequencing**

It is a systematic procedure for assigning priority to waiting jobs thereby determining the sequence in which the jobs will be performed.

24. **What is bill of materials?**

It designates what items and how many of each are used to make up a specified final product.

Par t- B (16 marks)

1. Explain the procedure by which scheduling 2 jobs in m machines can be done with suitable example

2. Write short notes on:

- a) Aggregate run-out method of batch scheduling.
- b) Line of balance method

3. Discuss the concepts, inputs, characteristics, working, outputs, and benefits of MRP.

4. What are the functions of dispatching? Explain the various documents raised by dispatching department.

5. What is progressing? Explain its function and recording.

- 6. a. Describe the information flow for master scheduling.
- b. With an example explain Gantt chart.

7. Discuss in detail about the various factors that affect scheduling. Explain any one technique used in loading and scheduling process.

- 8. a. Explain the common methods adopted in industries for progress reporting.
- b. Explain the priority rules used for job sequencing.

9. Discuss the scheduling approaches followed in job and flow shops along with their merits and demerits.

10. a. What are the common causes for delay? How can they be avoided? Explain.

b. Explain the various techniques adopted for aligning completion time and due dates.

UNIT- V INVENTORY CONTROL AND RECENT TRENDS IN PPC

PART – A (2 Marks)

1. What are the types of inventories?

i) Raw materials, ii) Bought out parts, iii) Work-in-process inventories, iv) Finished goods inventories v) Maintenance, repair and operating stores.

2. What are the benefits of inventory control?

i) Improvement in customer's relationship because of the timely delivery of goods and services.
ii) Smooth and uninterrupted production and hence no stock out.
iii) Efficient utilization of working capital.
iv) Helps in minimizing loss due to deterioration, obsolescence damage and pre-liferage.
v) Economy in purchasing.
vi) Eliminates the possibility of duplicate ordering.

3. What is inventory turnover?

If the company maintains inventories equal to 3 months consumption. It means that inventory turnover is 4 times a year, i.e., the entire inventory is used up and replaced 4 times a year.

4. Define – Re-order level

It is the point at which the replenishment action is initiated. When the stock level reaches R.O.L., the order is placed for the item.

5. Define – Re-order quantity

This is the quantity of material to be ordered at the re-order level. Normally this quantity equals the economic order quantity.

6. What is demand?

It is the number of items required per unit of time. The demand may be either deterministic or probabilistic in nature.

7. Define – Order Cycle

The time period between two successive orders is called order cycle.

8. What is lead time?

The length of time between placing an order and receipt of items is called lead time.

9. What are the various costs associated with inventory?

i) Purchase cost, ii) Capital cost, iii) Ordering cost, iv) Holding costs, v) Shortage cost.

10. What is an Economic order quantity?

It is the quantity to be ordered is one that strikes a balance between the inventory carrying

cost and the inventory carrying cost. This quantity is referred to as Economic order quantity.

11. **What is safety stock?**

The additional stock of material to be maintained in order to meet the unanticipated increase in demand arising out of uncontrollable factors.

12. **What are the advantages of ABC analysis?**

This approach helps the manager to exercise selective control and focus his attention only on a few items.

13. **What are the limitations of ABC analysis?**

ABC analysis is a fundamental tool for exercising selective control over numerous inventory items but in present for do not precise consideration of all relevant problems of inventory management.

14. **What is inventory?**

An inventory is a stock of an item (or) idle resource held for future use.

15. **What is inventory control?**

It may be defined as the scientific method of determining what to order, when to order & how much to order and how much to stock so that costs associated with buying and storing are optimal without interrupting production and sales.

16. **Define – Ordering costs**

It is the cost associated with the placement of an order for the acquisition of inventories.

17. **What is holding (Or) inventory carrying costs?**

The cost associated with holding a given level of inventory on hand.

18. **What is shortage (Or) stock out costs?**

When the stock of an item is depleted and there is a demand for it, then the shortage cost will occur.

19. **What is demand?**

It is nothing but the no of items required per unit of time.

20. **What is order cycle?**

The time period between two successive orders is called order cycle .When orders are placed at equal time intervals it is known as fixed order interval system (Or) cycle review system.

21. **Define – Lead Time**

The time gap between placing of an order and its actual arrival in the inventory is known as lead time.

22. **What is Re-order point (Or reorder level)?**

The level of inventory at which an order is placed is known as reorder point or reorderlevel.

23. **What is safety stock?**

This represents the minimum stock which must be maintained at all times.

24. **What is Re-order Quantity?**

The quantity of items to be ordered at the re-order level is known as re-order quantity.

25. **What is inventory turn over?**

It is defined as the ratio of the value of materials consumed to the average investment in inventories for the same period.

Inventory turn over= $\frac{\text{Value of the material consumed}}{\text{Value of average inventory}}$

Part - B (16 marks)

1. What do you understand by inventory control? Explain the purpose of maintaining inventory in any production unit.
2. What is EOQ? Derive the expression for EOQ when the demand of the item is uniform, the production rate is infinite and no stock-outs are allowed.
3. a) Explain the terms: lead time, stock out, buffer stock, inventory carrying cost.
b) Distinguish between in-process inventory, safety stock inventory and seasonal inventory.
4. Describe the fixed period quantity inventory model? Also compare and contrast P-system with Q- System.
5. What is selective control of inventory and explain various selective control techniques.
6. What is ABC analysis? Explain its significance in the inventory control with suitable example.
7. Discuss in detail: a) JIT b) ERP
8. Discuss in detail about the P and Q systems of inventory replenishment along with their merits and demerits.
9. a. Explain the various costs associated with the inventory control with suitable examples.
b. A manufacturer has to supply his customers 3600 units of his product per year. Shortages are not permitted. Inventory carrying cost amounts Rs. 12 per unit per annum. The set up cost per run is Rs. 80. Find (i) Economic order quantity (ii) Optimum number of orders per annum (iii) Average annual inventory cost (iv) Optimum period of supply per optimum order.
10. Write short notes on (i) ABC analysis (ii) Computer integrated production planning systems (iii) Manufacturing resource planning (iv) Enterprise resource planning.