

PRODUCTION MANAGEMENT

1. Define production:

According to Elwood Butta “production is a process by which goods or services are created”.

Production involves the step by step conversion of one form of material into another through chemical or mechanical process with a view to enhance the utility of the product or services.

2. Characteristics features of production system?

1. Production is an organized activity.
2. The system transforms the various inputs into useful outputs.
3. Production system does not operate in isolation from the other organizational systems.
4. There exists a feed back about the activities which is essential to control and improve system proformation.

3. Define production management:

“Production management deals with the decision making related to production process of that the resulting goods and service is produced according to specifications in the amounts and at the scheduled demanded and at minimum cost” – Elwood Butta.

4. What are the difference between production management and operation management?

Production mgmt	Operation mgmt
1. It is concerned with manufacturing	1. It is concerned with services
2. Out put is tangible	2. Output is intangible
3. In this, job useless labour and more equipment	3. In this, job use more labour and less equipment
4. There is no customer participation	4. Frequent customer participation

5. What are the functions of production mgmt?

1. Production planning
2. Production control

3. Factory building
4. Provision of plant services
5. Plant layout
6. Physical Environment
7. Method study
8. Inventory control
9. Quality control
10. Product department

6. Different classification/types of production:

1. Intermittent production
 - 1.1. Job or unit production
 - 1.2. Batch or quantity production
2. Continuous or mass production
3. Flexible manufacturing system (FMS)
4. Computer Integrated manufacturing (CIM)

7. Difference between job or unit production and batch production:

Job Pdn	Batch Pdn
1. Job shop production are characterized by manufacturing of one or few quantity of products	1. This production is characterized by the manufacture of limited number of products produced at regular intervals.

8. What are the characteristics of batch productions

1. Shorter production runs.
2. More number of set ups and hence set up cost.
3. Amount of supervision required is less compared to job order.
4. Plant and machinery are flexible.
5. Higher level of work in process inventory.

9. What is meant by batch production?

Batch production is as a form of manufacturing in which the jobs pass through the functional department in lots or batches and each lot may have a different routing.

10. What is meant by job production?

Job production are characterized by manufacturing of one or few quantity of product is designed and produced as per the specification of customers with in prefixed time and cost.

11. What are the characteristics of job production:

1. High variety of product and low volume.
2. Use of general purpose machines. And facilities.
3. Frequently changing set ups.
4. Process type layouts for arrangement of facilities.
5. Large inventory of materials, tools and parts.

12. What is meant continuous / mass production?

Manufacture of discrete parts or assemblies using a continuous process are called mass production. The machineries are arranged in a line or product layout.

13. Advantages of mass production:

1. Higher rate of production with reduced cycle time.
2. Higher capacity
3. Less skilled operator can manage the process
4. Low in process inventory
5. Production cost per unit per unit will come down due to economies of scale.

14. Define Flexible manufacturing system (F M S)

A Flexible manufacturing system is a configuration of computer. Controlled, semi-independent workstations where materials are automatically handled and machine loaded. An FMS is a type of flexible manufacturing system that builds on the programmable automation of NC and CNC machines.

15. Characteristics of FMS

1. It contains several work station, each does different operations.
2. The work station and machines are automated.
3. FMS is a computer control system.
4. Three program machine, select position and activities the specific tool for each job.

16. What are the classification of production based on type of production & strategy:

1. Make to stock (eg) books, television, airline flight.
2. Make to order (eg) wedding invitations, customer built homes.
3. Assemble to order (eg) computer system, corporate training.

17. What is meant by make to stock?

Make to stock products and services are designed and produced for “standard” Customers in anticipation of demand. This system ensures immediate delivery of good quality, reasonably priced, off the shelf standard products (eg) Books, Televisions, airline flights etc.

18. What is meant by make to order?

Make to order products and services are designed, products and delivered to customer specification in response to customer order.

(eg) wedding invitations, custom – built homes.

19. What is meant by assemble to order?

Assemble to order products and services are produced in standard modules to which options are added according to customer specification.

(eg) Computer Systems, corporate training etc.

20. Interration between production and marketing?

- Needs of customer with respect to the company’s products and services.

- The demand for the products and the likely market trend for the future period.
- Special features required by customer regarding the products like feedback, performance etc.
- Delivery requirement of the products. Market department requires the following information.
- Production status of the production.
- Performance characteristics of products.
- Delivery schedules.
- Product features and specification.

21. Interrelation between production and Finance?

The product department has to invest in physical facilities, requires raw materials and components parts, etc. Thus Finance department has to make provisions for both long term and short term requirements.

The production department has to furnish the detailed production budgets to finance department.

22. Interrelation between production per and personnel?

The personnel department has to keep records of the development of workers, identify their training needs, man power utilization etc.

In order to achieve production goals in particular and organisational goals in general, personnel department has to channelise the skills and efforts of the work force into constructive outlets to achieve the set objectives.

23. Define CIM:

Computer Integrated manufacturing is an interdisciplinary science applied to manufacturing. It involves the amalgamation of information science with automated manufacturing.

1. State any four principles of material handling?

- i. Heavy loads must be handled mechanically.
- ii. As far as possible use gravitational force.
- iii. Move the material at constant speed.
- iv. Use trained people at constant speed.

2. What are the advantages of using industrial robots in manufacturing?

- i. Speed of manufacturing is high
- ii. Accurate
- iii. Hazardous materials can be handled easily.
- iv. Complex jobs can be done easily.

3. What are the costs of inventory?

- i. Ordering cost: The cost incurred in placing the order and receiving the order.
Eg: Postage charges, telephone charges
- ii. Carrying cost: The cost incurred in storing or holding the material.

4. What is the need for keeping buffer stock?

Buffer stock is maintained to avoid following,

- i. Price hike
- ii. Strike at supplier side,
- iii. Scarcity of raw material

5. What are the objectives of MRP-I?

- i. To improve customer service by meeting delivery schedules
- ii. To reduce inventory cost by reducing inventory levels.
- iii. To improve plant operating efficiency.

6. Define BOM?

BOM contains the information to identify each item and the quantity used per unit of the item of which it is a part. It contains not only complete product

descriptions, listings, materials, parts and components but also the sequence in which the product is created.

7. What are the components of JIT philosophy?

- i. People participation and involvement
- ii. Total quality control
- iii. Just In Time flow

8. Define kanban system?

Kanban system is a kind of production system which operates based on the information contained in cards called “kanbans”. There are two types of kanbans namely, Withdrawal kanban and production order kanban.

9. What is BOR?

Bill of Resource is a record of all the required materials. It can met stock and other resources needed for manufacturing. It is prepared based on Master Production Schedule (MPS).

10. What is ABC analysis?

ABC analysis is a technique which is used to classify the items in store into A, B and C class items based on demand of the stock. If the stock on hand of a particular item becomes less than or equal to its reorder level, immediately an order is placed for its economical quantity.

11. What is Pareto analysis?

Italian scientist Wilfredo Pareto made a study on concentration of wealth. Among the total wealth of the country, 80% of the wealth is concentrated on 20% of the population. This 80/20 relationship is called Pareto analysis.

12. What is ROL?

Re Order Level deals with when to order to replenish the inventory. ROL is a predetermined point and when the existing stock of inventories reaches this point or falls below it the purchase option is initiated to replenish it.

13. What are the techniques related to ABC analysis?

- i. HML
- ii. FSN
- iii. SDE
- iv. VED

14. What is lead time?

Lead time is the time gap between order placing and material receiving. Based on the lead time the inventory can be kept under control.

15. What are the principles of inventory control?

- i. Right time
- ii. Right quantity
- iii. Right Quality
- iv. Right place
- v. Right people

16. Define materials management?

Materials management is the process of planning, purchasing, receiving, storing of inventory control and scrap and surplus disposal of materials which are required for the production in an organization.

17. What are the reasons for making inventory control?

- i. Lead-time
- ii. Some products are not available at all time
- iii. Benefits while purchasing in bulk.
- iv. Price fluctuation

18. What are the inputs or MRP-I?

- i. Demand for the products
- ii. Master production schedule
- iii. Bill of material files
- iv. Inventory record file
- v. Inventory transaction file

19. Define Inventory control?

Inventory control is a systematic procedure for ensuring the availability of items necessary to meet the production requirement at optimum cost. It is concerned with the procurement of raw materials and components and their supplies to the production department.

20. What are AGVs?

An automated guided vehicle is a small, driverless, battery-driven truck that moves Materials between operations following instructions from either an on-board or a central computer.

21. What are AS/RS?

An Automated Storage and Retrieval System is a computer controlled method of storing and retrieving materials and tools using racks, bins and stackers.

22. What do you meant by e-manufacturing?

E-manufacturing is sharing real-time data with trading partners and customers and making decisions about production, through the internet.

23. Define EOQ?

Economic Order Quantity is the quantity at which the total inventory cost is minimum. EOQ can be calculated using the average inventory, carrying cost and ordering cost.

24. What is Q-system of inventory?

In this system of inventory, whenever the stock level touches the reorder level, an order is placed for a fixed quantity which is equal to EOQ. It is otherwise called as fixed order quantity system.

25. What is P-system of inventory?

Periodic review system is a system of inventory, the stock position is reviewed once in a fixed period and an order is placed depending on the stock position, unlike the fixed quantity in the Q system of inventory.

26. Compare P-system and Q-system?

Q-System	P-System
1. The quantity to be ordered each time is fixed and normally it is equal to EOQ.	1. Period of ordering the inventory is fixed and the order quantity depends on the stock on hand.
2. It is suitable for low unit cost high volume items.	2. Suitable for high unit volume and less in number items.
3. Normally preferred when supplier puts minimum quantity restriction.	3. Preferred when supplier delivers at fixed periods.

PLANNING AND FORECASTING

1. What is strategic planning?

Strategic planning is the process by which top management determines overall organizational purposes and objectives and how they are achieved.

Eg. Defining goal and policy, how will we make the product.

2. What is tactical planning?

Tactical planning is done over an intermediate term or medium range time horizon by middle management in each function area of management.

Eg. How many workers we need should be work overtime.

3. What is operational planning?

The lower level management develops operational plans and the planning horizon is (maximum) one year. These plans establish actions that are necessary to achieve operation goals.

Eg. What jobs have priority

Who do we assign to what task.

4. What is capacity?

Capacity refers to the maximum load an operating unit can handle. The operating unit might be a plant, a department, a machine, a store or a worker. Capacity of a plant is the maximum rate of output the plant can produce.

5. Why capacity planning is needed?

Capacity planning is necessary when an organization decides to increase it production or introduce new product into the market or to increase the volume of production to gain the advantages of economics scale.

6. Define the term aggregate planning?

Aggregate planning involves planning the best quantity to produce during time periods in the immediate range horizons (3m to 1 yr) and planning the lowest cost method of providing the adjustable capacity to accumulate the production requirements.

7. What is product planning and development?

Product planning and development is the process of searching ideas for new products, screening them systematically, converting them into tangible products and introducing the new products into markets. It also involves formulation of product strategies and policies.

8. State the objectives of aggregate planning?

- To establish a company wide gain plan for allocating resources.
- To develop an economic strategy for meeting demand.

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9. What are the inputs and outputs of aggregate planning?

The inputs for aggregate planning are demand forecast, capacity constraints, strategic objectives, company policies, financial constraints.

The output for aggregate planning are size of workforce, production per month inventory levels that support the production plan and the number of units subcontracted or cost.

10. What are the steps involved in aggregate planning

- i. Prepare the sales forecast for each product.
- ii. Sumup the individual product or service forecast into one aggregate demand for the factory.
- iii. Transform the aggregate demand for each time period into labor, material machines and other elements.
- iv. Develop alternative resource schemes for supplying the necessary production capacity to support the cumulative aggregate demand.
- v. Select the capacity plan from among alternative consider that satisfy aggregate demand and best meets the objectives of the organization.

11. What are the factors to be considered in product development?

- Consumer acceptance
- Protection against copying by competitors through patent, copyright, and trademarks.
- Development cost & manufacturing costs
- Complementary products
- Utilizing the by-products and wastages resulting from manufacturing processes.

12. What are the stages 'involved' in new product development?

- New product strategic development
- Idea generation
- Idea screening and evaluation

- Business analysis
- Product development
- Testing
- Commercialization

13. What is product design?

Product design is concerned with the form and function of a product. Form design involves the determination of what a product would look like (ie) the shape and appearance of the product. Functional design deals with what function the product will perform and how it performs.

14. State the objectives of product design?

- The overall objective is profit generation in the long-run.
- To achieve the desired product quality
- To reduce the development time and cost to the minimum
- To reduce the cost of the product
- To ensure producibility or manufacturability.

15. What are the factors influencing product design?

- Customer requirements
- Type of materials used
- Cost/price ratio
- Product quality
- Process capability

16. State the requirement for an effective design process?

1. Match product or service characteristic with customer requirements.
2. To ensure that customers require
3. Reduce the time required to design a new product or service.
4. Minions the revisions necessary to make a design workable.

17. What is CAD?

CAD is a computer Aided Design. It is a software system that uses computer graphics to assess in the creation, modification and analysis of a design.

18. What are the technologies used in CAD?

The CAD can be used for Geometric modeling, automated Drafting, documentation, Engineering analysis and design analysis.

19. What is CAE?

Computer Aided Engineering retrieves the description and geometry of a part from a CAD database and subjects it to testing and analysis on the computer screen without physically building a prototype model.

20. What are the advantages of CAD?

- ❖ Products can be introduced faster by shortening design and development cycle time.
- ❖ It eliminates prototype model building.
- ❖ Low cost of design.
- ❖ CAD improves every stages of product design and especially useful as a means of integrating design and manufacture.

21. What do you mean by expert system?

Expert systems can be viewed as computerized consultants for decision making that use the collection of facts, knowledge and rules to diagnose the problem and suggest solutions.

22. Define Forecasting

“Estimating the future demand for products and services and the resources necessary to produce these outputs.

23. State the need for forecasting?

- New facility planning
- Production Planning

- Workforce Scheduling
- Financial Planning

24. What are the factors to be considered in selection of forecasting method?

1. Cost & accuracy
2. Date available
3. Time Span
4. Nature of Products & Services

25. What are the techniques used in forecasting?

The techniques used in forecasting are Quantitative and Qualitative techniques.

26. State the technique involved in qualitative forecasting?

1. Jury of executive opinion
2. Sales fore composite method
3. Market Research
4. Delphi Technique

27. What are the techniques used in Quantitative forecasting?

1. Naïve Approach
2. Simple Average Method
3. Simple Moving Average
4. Weighted Moving Average
5. Simple exponential smoothing
6. Adjusted exponential smoothing
7. Linear Regression

SCHEDULING AND PROJECT MANAGEMENT METHOD

1. What are the purpose of Scheduling?

The purpose of scheduling as to optimise the use of resource so that the overall production objectives are met.

2. What are the uncontrollable factors complicates the manufacturing environment?

- Machine breakdown
- Absentism
- Quality problem
- Shortage of row material

3. What are the characteristics of good scheduling approach?

- Simple
- Unambiguous
- Easily understood
- Exactable

4. What are the scheduling techniques?

- Forward Scheduling
- Backward Scheduling

5. What is Forward scheduling?

Forward Scheduling assumes that procurement of materials & operations are start as soon as the requirement as known.

Eg. Steel Mills, Machine tool manufacturers

6. What is Backward Scheduling?

Backward Scheduling is the last operation on the job is scheduled first, then the rest of operation. Eg. Assembly type industries

7. What is Machine loading?

The Process of determining which work center receives which job is known as machine loading.

8. What is Gantt load Chart?

Gantt load chart is otherwise called Henry Gantt.

The Gantt Chart is the visual aid that is commonly used in job shops. It is also used in maintenance and service industries. Gantt Chart are simple to device and easy to understand.

The department has 'n' machines/work center and each center may have more than one machine. The accumulative hours assigned to each work center are plotted on the center. When a center is over loaded it is easy to identify the problem areas and to develop corrective actions by reassigning workloads to alternative machines.

9. What are the limitation of Gantt Chart?

- The sequence of operation is not considered in detailed. Since the machine are grouped together the weighted time of individual groups and the idle time of machine are not clearly shown.
- The charts do not reflect maintenance and breakdown times.

10. What is Longest Processing Time? (LPT)

Select first the job with the longest operation time on the machine.

11. What is Shortest Processing Time? (SPT)

Select first the job with the shortest operation time.

12. What is First Come First Served? (FCFS)

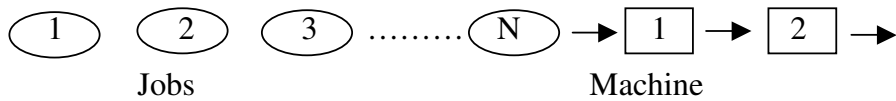
The jobs are scheduled for work in the same sequence as they arrived.

Eg. Beauty Parlor, Tailoring.

13. What is Earliest Due Date? (EDD)

The jobs weighting according to their due date & they are processed in that order. This does not sure that all jobs will be completed on time.

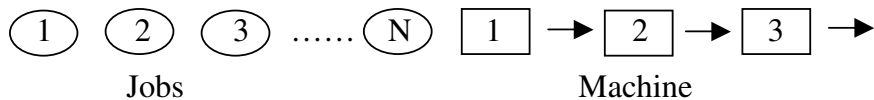
14. What are the steps in “N Jobs, Two Machines in Series”?



Steps

1. Select the Shortest operation duration.
2. If the Shortest duration requires the first machine schedule the job in the first available position in the sequence and if the shortest duration is one the second machine scheduled the job in the last available position in the sequence.
3. Remove the assigned job in the further consideration & return to step. I until all the jobs are assigned.

15. What are the procedure & Conditions in “N Jobs 3 Machines in Series”?



Procedure

If either or both of the following conditions are met the N/3 model can be reduce to N/2 model & the Johnson’s Rule / Johnson’s Algorithm may be applied to sequence the job.

Conditions

1. The Smallest duration of Machine I is atleast as great as the largest duration on Machine II
2. The smallest duration of Machine III is at least as great as the largest duration on Machine III.

16. What is Network?

Network is graphical representation of the project & it consists of series of activities arranged in a logical sequence and show the interrelationship between the activities.

17. What are the basic planning & Control Techniques?

- Critical Path Method (CPM)
- Programme / Project Evaluation and review Technique (PERT)

18. What are the objectives of Network Analysis?

1. A Powerful coordinating tool for planning, scheduling & controlling of projects.
2. Minimization of total project cost and time.
3. Effective utilization of resources & minimization of effective resources.
4. Minimization of delays & interruption during implementation of the project.

19. What are the applications of Network Analysis (PERT & CPM)?

- Research & development projects.
- Equipment maintenance & over hauling.
- Construction projects (Building, Dams, Bridges)
- Setting up new industries.
- Planning & launching of new products.
- Design of plant & machines and system.
- Shifting & manufacturing location from one location to another.
- Control of production in large job shops
- Market penetration programs
- Organization of big programs, conferences.

20. What is a Path?

An unbroken chain of activities between to events in called a Path.

21. What is an Activity?

An effort that is required to complete a part of a Project. “ —▶ ”

22. What is an Event?

An event represents the start or completion of an activity. The beginning and end points of an activity are events.

23. What is Predecessor activity?

An activity that must occur before another activity.

24. What is Successor activity?

An activity that must occur after another activity.

25. What is Dummy activity?

An activity that consumes no time (Zero time duration) but shows precedence between events.

26. What is Activity Duration?

In CPM, the best estimate of the time to complete an activity. In PERT, the expected time or average time to complete an activity.

27. What is an Optimistic Time? (t_0)

The time for completing an activity, if all goes well.

28. What is Pessimistic Time? (t_p)

The time for completing an activity, if anything goes wrong.

29. What is Most likely Time? (t_m)

The time for completing an activity that is the consensus best estimate.

30. What is Expected Time? (t_e)

The average time for completing an activity.

31. What is Earliest Start? (E_s)

The earliest that an activity can start, from the beginning of the project.

32. What is Earliest Finish? (E_f)

The earliest that an activity can finish, from the beginning of the project.

33. What is Latest Start? (Ls)

The latest that an activity can start, from the beginning of the project, without causing a delay in the completion of the project.

34. What is Latest Finish? (Lf)

The latest that an activity can finish, from the beginning of the project, without causing a delay in the completion of the project.

35. What is Slack?

The amount of time that an activity or group of activities can slip without causing a delay in the completion of the project. It is also known as float.

36. What is Critical activity?

An activity that has no room for schedule slippage, if it slips, the entire project completion will slip. An activity with Zero slack.

37. What is Critical Path?

The chain of critical activities for the project and is the longest path through the network.

38. What is PERT?

- PERT is the name given to in networking approach to planning, monitoring, controlling and evaluation of complex projects.
- PERT consists of a network diagram which is a two dimensional schematic of the relationships between task in a project.
- PERT assumes a probability distribution for the duration of each activity. Thus completion time estimate for all of the activities are needed.
- To perform PERT analysis on a project, the emphasis is given on the completion of a task rather than the activities required to be performed to reach to a particular event or task. Thus, it is also called an event-oriented technique.

- PERT is used for one-time projects involving activities of non-repetitive nature in which time estimate are uncertain such as redesigning an assembly line or installing a new information system.
- PERT helps in identifying critical areas in a project so that necessary adjustment can be made to meet the scheduled completion date of the project.

39. What is Merge Event?

An event which represents the joint completion of more than one activity is known as merge event.

40. What is Burst Event?

An event which represents the initiation (beginning) of more than one activity is known as burst event.

41. What is CPM?

- This technique was developed in connection with a construction & maintenance project in which duration of each activity was known with certainty.
- CPM is suitable for establishing trade off for optimum balancing between schedule time & cost of the project.
- CPM is used for completion of projects involving activities of repetitive nature.

42. What is Total Float?

The amount of time an activity can be delayed beyond its earliest possible starting time without delaying the project completion is called total float.

$$T.F. (i-j) = (L_j - t_{ij}) - E_i$$

43. What is Free float?

Free float is the amount of time on the basis of which an activity can be delayed without delaying the early start of a successor activity.

$$F.F = (E_j - E_i) - t_{ij}$$

44. What is Independent Float?

The time span by which an activity i, j can be expanded or shifted if for the event 'i' the latest & for the event 'j' the earliest time of occur can be maintained is called independent float. Independent float can be negative also.

$$I.F. = (E_j - L_i) - t_{ij}$$

45. Comparison Between CPM & PERT.

CPM	PERT
1. CPM is activity oriented	1. PERT Is Event Oriented
2. CPM is used when the activity times are deterministic	2. PERT Uses A Probabilistic Times.
3. One time estimate	3. Three Time Estimate
4. CPM directly introduces cost concept analysis	4. PERT indirectly for cost
5. CPM is a planning device.	5. PERT is a control device
6. Repetitive in nature.	6. Non-Repetitive in nature.

1. Why facility location decision is important?

The facility location decision is important in case of

- Establishment of a new venture.
- Expansion of existing business.
- Significant change in existing demand, supply and marketing locations.
- Significant change in the cost structure.
- Government policies.

2. What are the factors influencing plant location?

- The factors influencing plant location are
- Proximity to markets
- Supply of Raw Material
- Transport Facilities

- Availability
- Labour and Wages
- Law and Taxation
- Suitability of Land and Climate
- Supporting Industries and Services
- Community and Labour Attitudes
- Social Infrastructure

3. What are the objectives of plant layout?

The objectives of plant layout are

- Produce Better quality Product
- Maximum Utilization of Floor area
- Reduce Internal Transport
- Lighting and Ventilating of Areas
- To minimize Scrap and Waste
- Lesser number of Accidents
- Minimize Production Delays
- Avoid unnecessary changes
- To have easy supervision and control
- Neatness

4. What are principles of plant layout?

The principles of plant layout are

- Principles of overall integration
- Principles of minimum distance
- Principles of flow
- Principles of cubic space
- Principles of satisfaction and safety
- Principles of flexibility

5. What are the different types of layout?

Layouts can be classified into

- Process layout
- Product layout
- Group layout
- Fixed position layout

6. What are steps involved in layout design procedure?

The steps involved in layout design procedure are

- Accumulate Basic data
- Analyze and co-ordinate basic data
- Decide the equipment and machinery required
- Sketch plan of the plot to mark building outline, roads etc.
- Determine the general flow pattern
- Design the individual workstation
- Assemble the individual workstation
- Calculate the storage space requirement
- Make flow diagram for workstations
- Plan and locate service area, office, tool room etc.
- Make master layout by using templates and models.
- Check final layout regarding safety, PPC and convenience
- Get official approval
- Implement the approval layout.

7. What is Systematic layout design procedure?

An organized approach to layout planning has been developed by Muther and has received considerable publicity due to the success derived from its Application is solving a large variety of layout problems. This approach is referred to as systematic layout planning or simply SLP.

8. What are Templates?

Templates are used to develop plant layout. Templates are made up of Cardboard or colored paper. They are placed on the scaled outline plan of the building. Templates are cutout show the plan of the various facilities like machinery and fittings. They show the actual floor utilization.

9. What are Models?

Models are prepared on a scale that show the length, breadth and width. Models are easily understood by persons who are not familiar with plant layout Practice. They are made up of wood or plaster of paris. Models are expensive.

10. What is ALDEP?

ALDEP is Automated Layout Design Program. It is a construction type algorithm. This algorithm uses basic data on facilities and builds a design by successively placing the departments in the layout. The basic data required for this algorithm are

- Total number of departments
- Area of each departments
- Length and width of layout
- Number of iterations to be performed
- Location and size of each restricted area in the layout if present.

11. What is CORELAP?

CORELAP is Computerized Relationship Layout Planning. This algorithm is based on Muther's procedure given in Systematic Layout Planning. The input requirements to CORELAP are

- Number of departments and their area.
- Closeness relationship as given by REL-chart
- Weighted ratings for REL-chart entries.

12. What is CRAFT?

CRAFT is Computerized Relative Allocation of Facilities technique. CRAFT algorithm was originally developed by Armour and Buffa. It is more widely used than ALDEP and CORELAP. It starts with an initial layout and improves the layout by interchanging the departments pairwise so that the transportation cost is minimized. The CRAFT requirements are

- Initial layout
- Flow data
- Cost per unit distance
- Total number of departments
- Area of departments

13. What is Line balancing?

Line balancing in a layout means arrangement machine capacity to secure relatively uniform flow of operation. It can also be said as layout which has equal operating times at the successive operations in the process as a whole.

14. What is Cycle time?

Cycle time is directly related to the production rate of the assembly line.

$$\text{Cycle time} = \frac{\text{Productive time}}{\text{Demand per period}}$$

15. What is Time study?

Time study is considered to be one of the most widely used means of Work study. This was proposed by Frederick Taylor. This technique is used for recording the times and rates of working for the elements of a specified job carried out under specified conditions and for analyzing the data so as to determine the time necessary for carrying out the job at the defined level of performance.

16. What is work sampling?

Work sampling is defined as the technique in which a statistically competent number of instantaneous observations are taken over a period of time of a of

machines, processes or workers. Each observations recorded for a particular activity Or delay is a measure of percentage of time observed by the occurrence.

17. What are the objectives of Work measurement or Time study?

The objectives are

- Comparing alternative method
- Assessing the correct initial manning
- Planning and control
- Realistic costing
- Financial incentive schemes
- Delivery date of goods
- Cost reduction and cost control
- Identifying substandard workers
- Training new employees.

18. What are the benefits of Work measurement?

The benefits are

- To develop a basis for comparing alternate methods developed in method study by establishing the work content in each method of doing the job.
- To prepare realistic work schedules by accurate assessment of human work.
- To set standards of performance.
- To compare actual time taken by the worker with allowed time.
- To assist in labour cost estimation.

19. What are Techniques of Work measurement?

The techniques of work measurement are

- Stop watch time study
- Work sampling
- Standard data
- Predetermined Motion Time Study

20. What is Stop watch time study?

It is a technique of Times Study. The steps included in stopwatch Time study is

- Select the job to be studied
- Select the worker to be studied
- Conducting stop watch time study. This includes
 1. Obtain and record all information available about the job.
 2. Record the method of doing the job by breaking down into various elements.
 3. Examine various elements.
 4. Measure actual time taken by the operator to perform each element.
 5. Assess the effective speed of working of the operator and find out the rating factor
 6. Determination of normal time
 7. Determine basic allowance
 8. Determine standard time
 9. Determine allowed time

21. What is Rating factor?

Rating factor is determined by comparing actual speed of worker with the speed of a qualified worker.

$$\text{Rating factor} = \frac{\text{Rating of the observed worker}}{\text{Rating of qualified worker}}$$

22. Who is a Qualified Worker?

A Qualified worker is one who is accepted as having necessary physical attributes possessing the required intelligence and education and having acquired the necessary skill and knowledge to carryout the work in hand to satisfactory standards of safety, quantity, quality.

23. What is PMTS?

PMTS is Predetermined Motion Time System. It is defined as a work measurement technique by which normal or basic times are established for basic

human motions and these time values are used to build up the time for a job at a defined level of performance.

24. What are the advantages of PMTS?

The advantages are

- Affords fine analysis and improvement of work methods
- Offers a precise means of recording time, avoiding subjective judgment or bias of the rater.
- Involves no interference in the normal work routine and hence faces little resistance from workers.
- More effective and economical tool for work measurement for repetitive jobs of short duration.

25. What is the relationship between Plant layout and Material handling?

Plant layout and Material handling are closely inter related. An effective layout involves least material handling and less costly material handling equipments. It permits material handling without any loss of time, with minimum delays and least backtracking. The total number of movements and the distances moved are also considerably reduced in properly design plant layout.

ESSAY QUESTIONS:

1. Explain the Principles & JIT Manufacturing system.
2. Explain to following:
 - a. Re-Engineering
 - b. Cellular Manufacturing
 - c. Work Measurement
3. Explain Automated storage and retrieval system
4. Explain ABC Analysis with pareto's diagram.
5. Describe Product Design and Development
6. Explain MRP – I, MRP – II and ERP
7. Explain undependent and Dependent Demand. Explain how these tow types & inventions are managed in Industry.
8. Explain the different types of forecasting techniques.
9. Explain Integrated Manufacturing?
10. Explain operating characteristics cure with suitable example.
11. Define Quality circles and explain how they are established?
12. Explain tools needed for capacity planning?
13. Explain Business Process Re-Engineering and its and vantages?
14. What is Break even point how it can be determined.
15. What are the different types of production?
16. What are the advantages and criteria for a perfect layout?
17. Explain the different types of forecasting and give their Merits and Demerits?
18. The main problem of inventory control is the problem of when and how much to purchase goods – Explain.
19. Explain MRP and ERP
20. Capacity Planning is the long Range operation strategy of in organization – Explain.