14. ASSIGNMENT TOPICS WITH MATERIALS

Unit-1

1. Explain the management, Nature and features of management

Definition: “Management is knowing exactly what you want men to do and then seeing that they do it the best and cheapest ways”. F.W.Taylor

Nature and Features of Management: The study and application of management techniques in managing the affairs of the organization have changed its nature over the period of time.

Multidisciplinary: Management is basically multidisciplinary. This implies that, although management has been developed as a separate discipline, it draws knowledge and concepts from various disciplines. It draws freely ideas and concepts from such disciplines as psychology, sociology, anthropology, economics, ecology, statistics, operations research, etc. Management integrates the ideas and concepts taken from these disciplines and present newer concepts which can be put into practice for managing the organization.

a) Management is an inexact Science: Management principles are not like those in science where things are fairly clear or exact.

b) Management as profession: Management has been regarded as profession by many while many have suggested that it has not achieved the status of a profession.

c) Management is universal: The principles and techniques of management are universally applicable to all group activities performed at any level of organization.
Management is decision making: The managers are decision makers the marketing manager decides about how to market, when to market, where to market how to collect funds for organization.

Management is an art and also a science: Management is not only a science but also an art. Art means managers have to handle the person and things tactfully. Science means achieving objectives through procedures.

Importance of Management

1. Effective utilization of resources: Management tries to make effective utilization of various resources. The resources are scarce in nature and to meet the demand of the society, their contribution should be maximum for the general interests of the society. Management not only decides in which particular alternative a particular resource is used but also takes actions to utilize it in that particular alternative in the best way.

2. Development of resources: Management develops various resources. This is true with human as well as non-human factors. Most of the researches for resource development are carried on in an organization way and management is involved in those activities.

3. To incorporate innovations: Today changes are occurring at a very fast rate in both technology and social process and structure these changes need to be incorporated to keep the organizations alive and efficient. Therefore, they require high degree of specialization, high level of competence, and complex technology. All these require efficient management so that organizations work in the most efficient way.

4. Integrating various interest groups: In the organized efforts, there are various interest groups and they put pressure over other groups for maximum share in the combined output. For example, in the case of business organization, there are various pressure groups such as shareholders, employees, government etc. These interest groups have pressure on an organization.

5. Stability in the society: Management provides stability in the society by changing and modifying the resources in accordance with the changing environment of the society. In the modern age, more emphasis is on new inventions for the betterment of human beings.

2. Explain Douglas McGregor Theory:

He divides leadership is two styles labeled theory “X” and theory “Y”. The traditional styles of leadership and controls stated in theory ‘X’ by McGregor, is exercised to managers on the basis of his assumptions about human beings. These assumptions as laid down or observed by McGregor for theory ‘X’ are

Theory “X”: 
1. An average human being does not like to work and he tries to avoid it as far as possible.
2. He avoids accepting responsible and challenging tasks, has no ambition but wants security above all.
3. Because of this, the employees are to be forced, concerned and threatened with punishments to make them put their best efforts.
4. These people would not work sincerely and honestly under democratic conditions.

Theory of “Y”:

It focuses a totally different set of assumptions about the employees

1. Some employees consider work as natural as play or rest.
2. These employees are capable of directing and controlling performance on their own
3. They are much committed to the objectives of the organization
4. Higher rewards make these employees more committed to organization.
5. Given an opportunity they not only accept responsibility but also look for opportunities to outperform others.

3. Explain the Functions of Management:

1. Planning: Involves selecting the objectives and actions to achieve them. Planning stage involves decision making and choosing future courses of action from the various alternatives
2. Organizing: Role of each person in any organization is fixed. The concept of role is who will be doing what should be known, to achieve organizational targets efficiently. It is intended that all the tasks necessary to achieve targets are assigned to people who can do the best.
3. Staffing: Staffing function includes keeping the various organizational position fixed. This activity is done by identifying work force requirements, keeping the records of the performance of people working with the organization. So that suitable people can be prompted and at the same time people performing not up to the mark could be send for training. If all the above activities are taking place in nice way in any organization, it will give rise minimum work force turnover.
4. Directing: Directing means influencing people, so that they will contribute to the organization targets directing involves motivation, leadership styles and proper communication.
5. Controlling: It is the process of comparing the plans with the results. If there is deviation attain taken to be bridge the gap between plan and actual results.
6. Coordinating: The essence of management is the achievement of coordination among people coordination is a complex process following the principles by which organization activity can be accomplished.
4. **What is Boundary less Organization?**

At the name indicates, a boundary less organization eliminates internal boundaries among subsystems and external boundaries with external environment. It is a combination of team and network structures with the addition of temporariness. Such type of organization structure is characterized by spontaneous teamwork and communication. This replaces formal chain of command. It is a dynamic organization structure wherein organizational needs are met through a judicious mix of outsourcing contracts and alliances as and when needed. The key features of boundary less organization include knowledge-sharing, absence of hierarchy and bureaucracy, empowerment voluntary participation of expert members, technology utilization and temporariness.

5. **Explain Hertzberg motivation factors in detail.**

Ederick Hertzberg conducted a structured interview programme, the analyses, the experience and feelings of 200 engineers and accountants in nine different companies in Pittsburg area, U.S.A during the structured interview, they were asked to describe a few previous job experiences in which they felt exceptionally good or exceptionally bad about jobs. In his analysis, he found that there are some job conditions which operate primarily to dissatisfy employees when the conditions are absent, however their presence does not motivate them in a strong way. Another set of job conditions operates primarily to build strong motivation and high job satisfaction, but their absence rarely proves strongly dissatisfying. The first set of job conditions has been referred to as maintenance or hygiene factors and second set of job conditions as motivational factors.

**Hygiene Factors:** According to Hertzberg, there are 10 maintenance factors. These are company policy and administration, technical supervision, salary, jobsecurity, personal life, status, working conditions, interpersonal relationship with superiors, interpersonal relationship with peers and interpersonal relationship with subordinates. These maintenance factors are necessary to maintain at a reasonable level of satisfaction in employees. Any increase beyond this level will not produce any satisfaction to the employees; however, any cut below this level will dissatisfy them.

**Motivational Factors:**

These factors are capable of having a positive effect on job satisfaction often resulting in an increase in one's total output. Hertzberg includes six factors that motivate employees. These are achievement, recognition, advancement; work itself, possibility of growth and responsibility.
Most of the above factors are related with job contents. An increase in these factors will satisfy the employees; however, any decrease in these factors will not affect their level of satisfaction. Since, these increased level of satisfaction in the employees, can be used in motivating them for higher output.

6. LEADERSHIP STYLES:

Leadership styles are the patterns of behaviour which a leader adopts in influencing the behaviour of his subordinates. Based on the degree of authority used by the supervisors, there are three leadership styles.

1) Autocratic Leadership: It is also known as authoritarian, directive or monothetic style. In autocratic leadership style, a manager centralizes decision-making power in him. He structures the complete situation for his employees and they do what they are told. Here the leadership may be negative because followers are uninformed, insecure, and afraid if the leader’s authority.

Advantages:-

a) It provides strong motivation and reward to a manager exercising this style.
b) It permits very quick decisions as most of the decisions are taken by a single person.
c) Strict discipline will be maintained.
d) Less competent subordinates also have scope to work in the organization under his leadership style.

Disadvantages:-

a) Employees lack motivation; Frustration, low morale and conflict develop in the organisation.
b) There is more dependence and less individuality in the organisation. As such future leaders in the organisation do not develop.
c) People in the organisation dislike it especially when it is strict and the motivational style is negative.

1. Participative Leadership:-

This style is also called democratic, consultative or ideographic. A participative is defined as mental and emotional involvement of a person in a group situation which encourages him to contribute to group goals and share responsibility in them. A participative manager decentralizes his decision-making process, instead of taking unilateral decisions, he emphasis on consultation and participation of his subordinates.
2. Free Rein Leadership:-

Free Rein or lassie - faire technique means giving complete freedom to subordinates. In this style, manager once determines policies, programmes and limitations for action and the entire process is left to subordinates. Group member's person everything and the manager usually maintains contact with outside persons to bring the information and materials which the group needs in many situations. Some like to work under strong authority structure and they drive satisfaction by this leadership. Decision he emphasizes consultation and participation of his subordinates. He can win the cooperation of his group and can motivate them effectively and positively group entirely to itself as shown in the following figure. In this style, manager once determines policy, programmes, and limitations for action and the entire process is left to subordinates. Group members perform everything and the manager usually maintains contact with outside persons.

7. Explain the Line and staff organization

It refers to a pattern in which staff specialists advise line managers to perform their duties. When the work of an executive increases its performance requires the services of specialists which he himself cannot provide because of his limited capabilities on these matters. Such advice is provided to line managers by staff personal who are generally specialists in their fields. The staff people have the right to recommend, but have no authority to enforce their preference on other departments.

Merits

a) It enhances the quality of decision
b) Greater scope for advancement
c) It relieves the line managers.
d) Reduction of burden

Demerits

a) It may create more friction or Conflict between line and staff
b) It is expensive
c) It creates confusion

SUITABILITY: -

- It can be followed in large organizations where specialization of activities is required
8. **Explain the Functional organizational structure**

It is the most widely used organization structure in the medium and large scale Organizations having limited number of products. This structure emerges from the idea that the organization must perform certain functions in order to carry on its operations. Functional structure is created by grouping the activities on the basis of functions required for the achievement of organizational objectives. For this purpose, all the functions required are classified into basic, secondary and supporting functions according to their nature & importance.

**Merits**

a) Planned specialization  
b) Facilitates large scale production  
c) Disciplinary controls are well  
d) Offers clear career paths

**Demerits**

a) calls for more coordination  
b) no clear line of authority  
c) slow decision making

9. **Explain the need of Maslow’s Theory in Human needs**

Maslow’s level of hierarchy about human relations and behavioral science approach, his assumptions are based mainly on theory of ‘Human Needs’, he has defined five level of hierarchy of needs starting from the biological need and then coming to more intangible ones.

- Physical needs like food, clothes and shelter  
- Safety needs freedom from fear of insecurity  
- Social needs include a sense of being accepted in the society or environment one finds himself in  
- Ego needs include feeling of important and recognition  
- Self-actualization needs include need or desire for personal fulfillment of individual potential and activity
10. Explain about the Cellullssar Organization:

Organizations structured around the units/cells that complete the entire assembly process are called cellular organizations. In the modern organizations, cellular organizations have been replacing the continuous line or linear production process system. In cellular organizations, workers manufacture total product or sub-assemblies in teams (cells). Every team (cell) of workers has the responsibility to improve or maintain the quality and quantity of its products. Each team is free to recognize itself to improve performance and product quality. These cells comprise self-managed teams. They monitor themselves and also correct where necessary on their own. Cellular organizations are characterized by much smaller staff all over the organization with middle management positions reduced and lean management members at the top. It is both a lean and flat structure.

SHORT QUESTIONS:

1. Define Management
   Management is defined as the creation and maintenance of an internal environment in an enterprise where individuals working together in groups, can perform efficiently and effectively towards the attainment of group goals”.

2. What are the 3 Levels of Management
   - Top Management
   - Middle Management
   - Lower Management

3. Define Planning
   Involves selecting the objectives and actions to achieves them planning stage involves decision making and choosing future courses of action from the various alternative

4. What do you mean by System approach
   Modern approaches to understand management is the systems approach. Here the organization is viewed as a system. Every department is considered as a sub-system, it is also possible that every department can be viewed as a system and every section in the department can be viewed as a sub-system, system approach helps to study the basic feature and functions of the organization its minutest details
5. **Define Leader**
   One who leads a given group or team of people is called leader. If you can influence people to perform better in a given organizational setting, that means you are a leader.

6. **Define Organization**
   Organization are collectivities of people that have been established for the pursuit of relatively specific objectives on a more or less continuous basis”.

7. **Define formal organization**
   An organization is formal when the activities of two or more persons are consciously coordinated towards common objectives.

8. **Define informal organization**
   Informal organization brings cohesiveness to a formal organization, it brings to the members of formal organization a feeling of belonging of status, of self-respect and of gregarious satisfaction.

9. **What is a Team structure**
   A structure in which the entire organization is made up of work groups or teams is known as team structure. Team structures are both permanent and temporary in nature as situation demands.

10. **What is Inverted Pyramid**
    This is an alternative to the traditional chain of command. This is a structure, which is narrow at the top and wide at the base. It includes a few levels of management.
1. **Explain Economic Order Quantity?**

Every organization that is engaged in production, sale or trading of products holds inventory in one or the other form. While production and manufacturing organizations hold raw material inventories, finished goods and spare parts inventories, trading companies might hold only finished goods inventories depending upon the business model.

When in case of raw material inventory management function is essentially dealing with two major functions. First function deals with inventory planning and the second being inventory tracking. As inventory planners, their main job consists in analyzing demand and deciding when to order and how much to order new inventories.

Traditional inventory management approach consists of two models namely:

- **EOQ - Economic Order Quantity**
- **Continuous Ordering**
- **Periodic Ordering**
EOQ: Economic Order Quantity Method determines the optimal order quantity that will minimize the total inventory cost. EOQ is a basic model and further models developed based on this model include production Quantity Model and Quantity Discount Model.

Continuous Order Model: works on fixed order quantity basis where a trigger for fixed quantity replenishment is released whenever the inventory level reaches predetermined safety level and triggers re ordering.

Periodic System Model: This model works on the basis of placing order after a fixed period of time.

EOQ Model

Example: Biotech.Co produces chemicals to sell to wholesalers. One of the raw material it buys is sodium nitrate which is purchased at the rate of $22.50 per ton. Biotech’s forecasts show a estimated requirement of 5,75,000 tons of sodium nitrate for the coming year. The annual total carrying cost for this material is 40% of acquisition cost and the ordering cost is $595. What is the Most Economical Order Quantity?

D = Annual Demand C = Carrying Cost
S = Ordering Cost

2. Explain Purchase Procedure?

The procedure describes the sequence of steps leading to the completion of an identified specific task. Thus purchasing procedure describes the sequence of steps by which a purchase function is carried through from its inception to its completion.

The purchasing procedure starts with the realization that something is required, the need is then spelt out either in the form of requisition or in a bill of materials, then attempts are made to identify their sources, the appropriate supplier is selected on the basis of some scientific analysis, the purchase order is placed with the selected supplier, it is checked to ensure that the delivery is made as per the agreed terms, the invoice of the vendor is checked and paid out and finally all relevant records are filed and maintained.

Generally the professionally managed organizations prepare their own Purchase Manual which details out the purchase procedure. It is not desirable to prescribe any standard purchasing procedure due to the existence of wide range of variations that exist among industries, companies, products, personnel etc. Generally organizations should devise their own procedure
on the basis of their specific needs. However, the following basic steps are considered while prescribing the full proof purchasing procedure.

Steps of purchasing procedure: The purchasing generally comprises the following steps:

a. Recognition of the need
b. Selection of the supplier
c. Placing the purchase order
d. Follow up of the order
e. Receiving and inspection of the materials
f. Payment of the invoice
g. Maintenance of the records
h. Maintenance of the vendor relations.

3. Explain the Concept of Marketing?

a. Production Concept: Those companies who believe in this philosophy think that if the goods/services are cheap and they can be made available at many places, there cannot be any problem regarding sale. Keeping in mind the same philosophy these companies put in all their marketing efforts in reducing the cost of production and strengthening their distribution system. In order to reduce the cost of production and to bring it down to the minimum level, these companies indulge in large scale production. This helps them in effecting the economics of the large scale production. Consequently, the cost of production per unit is reduced. The utility of this philosophy is apparent only when demand exceeds supply. Its greatest drawback is that it is not always necessary that the customer every time purchases the cheap and easily available goods or services.

b. Product Concept: Those companies who believe in this philosophy are of the opinion that if the quality of goods or services is of good standard, the customers can be easily attracted. The basis of this thinking is that the customers get attracted towards the products of good quality. On the basis of this philosophy or idea these companies direct their marketing efforts to increasing the quality of their product.

It is a firm belief of the followers of the product concept that the customers get attracted to the products of good quality. This is not the absolute truth because it is not the only basis of
buying goods. The customers do take care of the price of the products, its availability, etc. A good quality product and high price can upset the budget of a customer. Therefore, it can be said that only the quality of the product is not the only way to the success of marketing.

c. **Selling Concept:** Those companies who believe in this concept think that leaving alone the customers will not help. Instead there is a need to attract the customers towards them. They think that goods are not bought but they have to be sold. The basis of this thinking is that the customers can be attracted. Keeping in view this concept these companies concentrate their marketing efforts towards educating and attracting the customers. In such a case their main thinking is ‘selling what you have’. This concept offers the idea that by repeated efforts one can sell-anything to the customers. This may be right for some time, but you cannot do it for a long-time. If you succeed in enticing the customer once, he cannot be won over every time. On the contrary, he will work for damaging your reputation. Therefore, it can be asserted that this philosophy offers only a short-term advantage and is not for long-term gains.

d. **Marketing Concept:** Those companies who believe in this concept are of the opinion that success can be achieved only through consumer satisfaction. The basis of this thinking is that only those goods/service should be made available which the consumers want or desire and not the things which you can do. In other words, they do not sell what they can make but they make what they can sell. Keeping in mind this idea, these companies direct their marketing efforts to achieve consumer satisfaction. In short, it can be said that it is a modern concept and by adopting it profit can be

4. **Explain ABC ANALYSIS?**

The main objective of inventory control is to minimize the carrying costs of inventory. Very often all kinds of inventory are not equally important. A small number of important items account for the dominant part of total inventory investment while a large number of items constitute so small a value that they have little effect on the results.

Therefore, much greater control is required on the first type of items than on the others. The stock of items which are expensive has to be kept at the minimum. Items which are voluminous but relatively inexpensive are kept in large stocks as frequent ordering of such items is costlier.

The two types of items are categorised as —A1 and —C1, the items falling midway between these are put into —B1 category. Maximum attention is focused on items in category A as they constitute the most important class of inventory; items in class B receive moderate attention as they constitute an intermediate position.

Items in category C have negligible importance and; therefore, minimum attention is paid to them. This selective inventory control is called ABC analysis. The following table gives a hypothetical example of ABC classification.
Thus, the ABC analysis yields a saving of 22.5 per cent. The ABC analysis helps to focus control efforts in areas where it is most needed. It must be remembered that ABC analysis does not prohibit more than three categories of inventory.

The basis of classification is usage value of the items and not their physical quantities. An item in category C may be critical in the sense that its non-availability may hamper production. Therefore, management should be vigilant.

Steps in ABC analysis:

The steps involved in ABC analysis are as follows:

1. Calculate the annual usage value of each item by multiplying the number used with the price of the item.
2. Arrange the items in descending order according to the usage value.
3. Compute percentage of total usage value for each item.
4. Find out the average inventory of each item by dividing the usage value with 2 and number of orders.

The ABC analysis can be shown on a graph too. For this purpose the cumulative percentages of the number of items are shown on X-axis and percentage of values on F-axis. Where the plotted curve takes a sharp turn a point is marked.

Each such point indicates one category of items. For example, in Fig. 6.1 point P on the curve indicates 20% of item; with 60% usage value. This category can be called A. Point Q shows 30% items with 20% usage value. This category is B. Point R reflects 50% items with 20% usage value which is category C be earned on a long-term basis. The drawback of this concept is that no attention is paid to social welfare.

5. Marketing Mix

Marketing Mix - A mixture of several ideas and plans followed by a marketing representative to promote a particular product or brand is called marketing mix. Several concepts and ideas combined together to formulate final strategies helpful in making a brand popular amongst the masses form marketing mix.

Elements of Marketing Mix

The elements of marketing mix are often called the four P’s of marketing

Product

Goods manufactured by organizations for the end-users are called products.
Products can be of two types –

a. Tangible Product and

b. Intangible Product (Services)

a. **Tangible Product:** An individual can see, touch and feel tangible products as compared to intangible products.

b. **Intangible Product:** A product in a market place is something which a seller sells to the buyers in exchange of money.

**Price**

The money which a buyer pays for a product is called as price of the product. The price of a product is indirectly proportional to its availability in the market. Lesser its availability, more would be its price and vice versa.

Retail stores which stock unique products (not available at any other store) quote a higher price from the buyers.

**Place**

Place refers to the location where the products are available and can be sold or purchased. Buyers can purchase products either from physical markets or from virtual markets. In a physical market, buyers and sellers can physically meet and interact with each other whereas in a virtual market buyers and sellers meet through internet.

**Promotion**

Promotion refers to the various strategies and ideas implemented by the marketers to make the end - users aware of their brand. Promotion includes various techniques employed to promote and make a brand popular amongst the masses.

Promotion can be through any of the following ways:

Advertising, Print media, Television, radio are effective ways to entice customers and make them aware of the brand's existence. Billboards, hoardings, banners installed intelligently at strategic locations like heavy traffic areas, crossings, railway stations, bus stands attract the passing individuals towards a particular brand.

Taglines also increase the recall value of the brand amongst the customers. Word of mouth, one satisfied customer brings ten more customers along with him whereas one dis-satisfied customer takes away ten more customers. That's the importance of word of mouth. Positive word of mouth goes a long way in promoting brands amongst the customers.
6. **Product mix:**

The term Product Mix implies all the products offered by a firm for sale. It may consist of one line products or several allied product lines.

Product line refers to an assortment or class of similar or related products and services. They may be similar in technology, customers needs, channel used, market served or in some other respect. An individual product in a line is known as a product item. There are several product items in a product line.

Product mix has three important aspects - width, depth and consistency. Width of the product mix is measured by the number and variety of product lines offered by a firm. It shows the degree of diversification of a firm’s activities. The depth of product mix is determined by the number of items in a product line.

By offering several brands of a product, a firm can cater to widely varying needs and tastes of customers and thereby beat its competitors. For instance, the range of bathing soaps (Lifebouy, Lux, Rexona, Liril, etc.) offered by Hindustan Lever Ltd. shows the depth of its product line while the width of its product mix consists of DaldaVanaspati, Close-up Toothpaste, Talcum powder, etc. in addition to the soaps.

The consistency of product mix refers to the degree of similarity between product lines in terms of their end-use, production requirements, price ranges, distribution channels, advertising media, etc.

These dimensions of the product mix serve as guides to decisions regarding the additions and deletions of product items and line. By increasing the consistency of product mix, a firm can reduce its costs of operations and acquire unparalleled reputation in the market.

7. **Define Inventory control. Explain its objectives?**

**Inventory Control:**

The systematic location, storage and recording of goods in such a way the desired degree of service can be made to the operating shops at minimum ultimate cost.

**Objectives of Inventory Control:**

To support the production departments with materials of the right quality in the right quantity, at the right time and the right price, and from the rightsupplier

- To minimize investments in the materials by ensuring economies of storage and ordering costs
To avoid accumulation of work in progress

- To ensure economy of costs by processing economic order quantities
- To maintain adequate inventories at the required sales outlets to meet the market needs promptly, thus avoiding both excessive stocks or shortages at any given time
- To contribute directly to the overall profitability of the enterprise

8. Explain the Purchasing process and Store management?

The following are the logical steps in the purchasing process:

1. Receiving of materials along with the invoice
2. Checking inward invoice
3. Inspecting and testing materials
4. Forwarding the materials to stores
5. Checking invoice and passing of bills for payments
6. Placing purchase order
7. Receiving of materials along with the invoice
8. Checking inward invoice
9. Inspecting and testing materials
10. Forwarding the materials to stores
11. Checking invoice and passing of bills for payments

Stores Management:

It deals with planning, coordination and control of various activities pertaining or effective efficient and economic storage and store keeping.

Store: Generally, unused material is known as store Storage: the store room is the place where stores are housed

Storage: Storage is meant holding in custody all kinds of stores and materials semi-processed and fully processed products.

Store Keeping: It may be defined as that aspect of materials control concerned with physical storage of goods.
9. Explain about Stores Records: process in detail

**Material requisition note:** Whenever the materials are required by a department/section, this form has to be filled in. This note provides information about the job number, description of the items required in terms of number. The head of the department/section should authorize it. Whenever the materials are issued, the receiving person should sign the note.

This is to be entered in the materials issued record, which is to be signed by the storekeeper.

**Purchase order:** The purchasing officer will release the purchase order. The following is the format of a purchase order. Here, we find Vivek enterprises placing a purchase order on Business Solutions Ltd., for the following materials. The terms and conditions of the purchase order such as delivery, payment, and other have to be mentioned clearly.

**Invoice:** Invoice is a statement sent by the seller to the buyer mentioning the particulars of the goods supplied, net amount payable for the goods, and the terms and conditions governing the sale. It is very important document because it shows the net amount payable by the buyer after all the discounts and the taxes, if any.

**Goods received note:** The goods received note furnishes the particulars of the suppliers, purchase order number, purchase requisition number, and the job for which the goods are received. These details are to be certified by a competent authority. On this basis, the accounts department initiates the process of payment for the goods received.

**Goods returned note:** Sometimes, a part or whole of the goods received may not be of acceptable quality, and hence, these have to be returned to the supplier. In this context, the goods received note is prepared. This is also called the ‘debit note’ because the suppliers or creditors’ account has to be debited by the amount mentioned in this debit note for the goods returned.

**Stores ledger account:** This is to be maintained to provide the details of the quantity, price and amount of the receipts, issues, and balance of stocks on a day-to-day basis. At any given time, the physical quantity of stocks should match with the balance as per the stores ledger account. A separate account is maintained for each type of the material in the stores. It should necessarily mention the method such as FIFO or LIFO, followed to value the issues of stocks. It is a valuable tool for the costing department in exercising stores control. It facilitates the valuation of stock from time to time.

**Bin card:** Bin card is the slip or tag attached to the bin where the goods are stocked. Whenever the materials are received or issued, an entry is made on the bin card. The purpose of bin card is to reveal the particulars of the quantities received, issued, and available as on a given date at a glance. Where separate bins are maintained for each item of the store, each bin will have a tag hung to it.
10. Explain about product life cycle in detail

- Products have limited life.
- Products sales pass through distinct stages, each passing different challenges, opportunities and problems to seller.
- Profits rise and fall at different stages of product lifecycle.

**Early growth:** when the results of usage of product start flowing into the market and the results are encouraging, more and more buyers come forward to try. The sales revenue remains very low till this point of time. This is also a very critical stage, as the manufacturer cannot avail scale economies.

**Rapid growth:** A new product enters the stage of rapid growth when it satisfies the needs of the customers. The sales start picking up with repeat purchases and by word of mouth publicity, coupled with continued promotion outlay from the manufacturer’s side. As new
customers get attracted to the product for the first time, sales soar, sales revenues increase faster than costs, and profits start accruing. This trend attracts the attention of the competitors who release a similar product copying the best features of the new product.

**Maturity:** when the product’s sales growth slows down, it is called maturity. Due to this slow down, the industry as a whole suffers from overcapacity. At this stage, firms tend to attract the customers away from their competitors through cheaper prices and larger promotional efforts and outlay. Those who cannot afford such large promotional outlay and woo customers of the competitors

When the sales growth slows down to zero, such a stage is called saturation. This size of the market does not increase beyond this stage. In other words, old customers who have stopped buying the product replace any new customer entering the market Saturation:. All sales are simply replacement sales or repeat purchases by the same customers.

**Decline:** When sales of a product tend to fall, such a stage is called decline. When a product ceases to satisfy the customer’s needs in relation to those available in the market, it is no more preferred. As a result, its competing products offering superior benefits take over the market. This leads to weak

### SHORT QUESTIONS

1. **Define Plant Layout**

   Plant location is a strategic decision several factors influence this decision. The main objective of any business is to optimize its cost and revenue that is, minimize its costs and maximize its returns.

2. **Define Quality.**

   It is defined as customer satisfaction in general and fitness for use in particular. Both the external consumer who buy the product and services and the internal consumers that is, all divisions or departments of the business organization are equally interested in the quality

3. **What is Process control.**

   Process control is a technique of ensuring the quality of the products during the manufacturing process itself. If a process consistently produces items with acceptable or tolerable range of specification.

4. **Define Control Limits**
Control limits are found in the control charts. There are two control limits 1) Upper control limit (UCL) and 2) Lower control limit (LCL). These are determined based on the principles of normal distribution.

5. Define Acceptance sampling

Acceptance sampling is a technique of deciding whether to accept the whole lot or not based on the number of defectives from a random drawn sample.

6. What is Six sigma

It is a set of practices developed by Motorola to systematically improve processes by eliminating defects. A defect is defined as non-conformity of a product or service to its specification. Six Sigma refers to the ability of highly capable processes to produce output within specification. In particular processes that operate with Six Sigma quality produce at defect level below 3.4 defects per million opportunities.

7. Define TQM

In a TQM effort, all members of an organization participate in improving processes, products, services and the culture in which they work.

8. Define Marketing

Marketing as a social process by which individuals and groups obtain what they need and want through creating, offering exchanging products and services of value with others.

9. What is product?

A good, idea, method, information, object or service created as a result of a process and serves a need or satisfies a want. It has a combination of tangible and intangible attributes (benefits, features, functions, uses) that a seller offers a buyer for purchase.

10. What is store management
It deals with planning, coordination and control of various activities pertaining or effective efficient and economic storage and store keeping.

**FILL IN THE BLANKS**

1. Plant layout is a -------------- decision
   Ans: strategic

2. Plant layout is a determinant of ---------------------- and profitability
   Ans: product layout

3. For shipbuilding ---------------------- production is used
   Ans: Job

4. The flow chart symbol to record transportation is ---------------------
   Ans

5. The term therblig was coined by ----------------------
   Ans: Gilbert

6. Basic Time is called ----------------------
   Ans: Normal time

7. Work sampling is also called ----------------------
   Ans: Activity sampling

8. The control chart for sample means is called ----------------------
   Ans: x mean

9. The time taken to replenish the stocks is called----------------------
   Ans: Lead time

10. Storage function is called ---------------------- function
Ans: **Equalization**

**OBJECTIVE QUESTIONS**

1. **Which of the following is a strategic decision?** [B]

   A. Facilitates location
   B. Plant location
   C. Plant layout
   D. Resources location

2. **Which is an advantage for product layout?** [D]

   A. Huge capital outlay
   B. Little flexibility
   C. Discontinuity in production
   D. Lower cost of material handling

3. **What is an advantage for process layout?** [C]

   A. Larger production cycle
   B. Higher material handling costs
   C. Interesting to workers
   D. Higher wage bill

4. **Objective of plant layout is** [B]

   A) minimum material handling
   B) minimum equipment utilization
   C) minimum manpower utilization
   D) minimum utilization of floor area

5. “O” type flow pattern used in ____________ industry. [D]

   A) Bottling plant
   B) steel plant
   C) cement plant
   D) paper plant

6. **Which of the following processes most likely uses batch production?** [D]

   A) Sugar Refinery
   B) Plastic Part Manufacturer
   C) Consumer Electronics
   D) Oil Refinery

7. **Which of the following processes most likely uses repetitive or mass assembly lines Production?**[B]

   A) Commercial Printer
   B) Plastic Part Manufacturer
   C) Consumer Electronics
   D) Sugar Refinery
8) All of the following will increase the capacity of process except: [C]

A) The purchase of additional equipment B) scheduled machine maintenance C) Larger production lot sizes D) increasing the backlog before each machine

9. The pattern of plant layout is basically divided by the relationship between the and [D]

A) Commercial Printer B) Plastic Part Manufacturer] C) Consumer Electronics D) Number of products, Production quantity

10. The location of plant should be in such a place where the are available [D]

A) Larger production cycle B) Higher material handling costs C) Interesting to workers D) Large scale economics C) Sophisticated electronic equipment
1. Explain the functions of HRM

   **The Operative Functions of Human Resource Management are as follows:**

1. **Recruitment and Selection** - Recruitment of candidates is the function preceding the selection, which brings the pool of prospective candidates for the organisation so that the management can select the right candidate from this pool.

2. **Job Analysis and Design** - Job analysis is the process of describing the nature of a job and specifying the human requirements like qualification, skills, and work experience to perform that job. Job design aims at outlining and organising tasks, duties, and responsibilities into a single unit of work for the achievement of certain objectives.

3. **Performance Appraisal** - Human resource professionals are required to perform this function to ensure that the performance of employee is at acceptable level.

4. **Training and Development** - This function of human resource management helps the employees to acquire skills and knowledge to perform their jobs effectively. Training and development programs are organised for both new and existing employees. Employees are prepared for higher level responsibilities through training and development.

5. **Wage and Salary Administration** - Human resource management determines what is to be paid for different type of jobs. Human resource management decides employees compensation which includes - wage administration, salary administration, incentives, bonuses, fringe benefits, and etc, generally used interchangeably

2. Explain the Training Methods: On Job Training and Off the Job Training Methods!

   A large variety of methods of training are used in business. Even within one organization different methods are used for training different people. All the methods are divided into two
classifications for:

A. On-the-job Training Methods:
   a. Coaching
   b. Mentoring
   c. Job Rotation
   d. Job Instruction Technology
   e. Apprenticeship
   f. Understudy

B. Off-the-Job Training Methods:
   a. Lectures and Conferences
   b. Vestibule Training
   c. Simulation Exercises
   d. Sensitivity Training

A. On-the-job Training Methods:

Under these methods new or inexperienced employees learn through observing peers or managers performing the job and trying to imitate their behaviour. These methods do not cost much and are less disruptive as employees are always on the job, training is given on the same machines and experience would be on already approved standards, and above all the trainee is learning while earning. Some of the commonly used methods are:

1) Coaching: Coaching is a one-to-one training. It helps in quickly identifying the weak areas and tries to focus on them. It also offers the benefit of transferring theory learning to practice. The biggest problem is that it perpetrates the existing practices and styles. In India most of the scooter mechanics are trained only through this method.

2) Mentoring: The focus in this training is on the development of attitude. It is used for managerial employees. Mentoring is always done by a senior inside person. It is also one-to-one interaction, like coaching
   a) Job Rotation: It is the process of training employees by rotating them through a series of related jobs. Rotation not only makes a person well acquainted with different jobs, but it also alleviates boredom and allows to develop rapport with a number of people. Rotation must be logical.
   b) Job Instructional Technique (JIT): It is a Step by step (structured) on the job training method in which a suitable trainer (a) prepares a trainee with an overview of the job, its purpose, and the results desired, (b) demonstrates

3. Explain the Performance Appraisal

Performance Appraisal is the systematic evaluation of the performance of employees and to understand the abilities of a person for further growth and development. Performance appraisal
is generally done in systematic ways which are as follows:

- The supervisors measure the pay of employees and compare it with targets and plans.
- The supervisor analyses the factors behind work performances of employees.
- The employers are in position to guide the employees for a better performance.

Performance Appraisal Methods

Ranking Method

The ranking system requires the rater to rank his subordinates on overall performance. This consists in simply putting a man in a rank order. Under this method, the ranking of an employee in a work group is done against that of another employee. The relative position of each employee is tested in terms of his numerical rank. It may also be done by ranking a person on his job performance against another member of the competitive group.

Advantages of Ranking Method

- Employees are ranked according to their performance levels.
- It is easier to rank the best and the worst employee.

Forced Distribution method This is a ranking technique where raters are required to allocate a certain percentage of rates to certain categories (eg: superior, above average, average) or percentiles (eg: top 10 percent, bottom 20 percent etc). Both the number of categories and percentage of employees to be allotted to each category are a function of performance appraisal design and format. The workers of outstanding merit may be placed at top 10 percent of the scale, the rest may be placed as 20% good, 40% outstanding, 20% fair and 10% fair.

Advantages of Forced Distribution

This method tends to eliminate raters’ bias

By forcing the distribution according to pre-determined percentages, the problem of making use of different raters with different scales is avoided.

Critical Incident techniques Under this method, the manager prepares lists of statements of very effective and ineffective behaviour of an employee. These critical incidents or events represent the outstanding or poor behaviour of employees or the job. The manager maintains logs of each employee, whereby he periodically records critical incidents of the workers’ behaviour. At the end of the rating period, these recorded critical incidents are used in the evaluation of the worker’s performance. Example of a good critical incident of a Customer Relations Officer is March 12 - The Officer patiently attended to a customer’s complaint. He was very polite and prompt in attending the customer’s problem.

- Most frequently used method in evaluation of the employee’s performance.

Limitations of Checklists and Weighted Checklists

- This method is very expensive and time consuming
○ Rater may be biased in distinguishing the positive and negative questions.

○ It becomes difficult for the manager to assemble, analyze and weigh a number of statements about the employee’s characteristics, contributions and behaviours.

be taken to prevent repetition of the grievance.

4. **Employee Grievance Handling Procedure:**

Grievance may be any genuine or imaginary feeling of dissatisfaction or injustice which an employee experiences about his job and its nature, about the management policies and procedures. It must be expressed by the employee and brought to the notice of the management and the organization. Grievances take the form of collective disputes when they are not resolved. Also they will then lower the morale and efficiency of the employees. Unattended grievances result in frustration, dissatisfaction, low productivity, lack of interest in work, absenteeism, etc. In short, grievance arises when employees’ expectations are not fulfilled from the organization as a result of which a feeling of discontentment and dissatisfaction arises. This dissatisfaction must crop up from employment issues and not from personal issues.

**Grievance may result from the following factors:**

Improper working conditions such as strict production standards, unsafe workplace, bad relation with managers, etc. Irrational management policies such as overtime, transfers, demotions, inappropriate salary structure, etc.,

Violation of organizational rules and practice

The manager should immediately identify all grievances and must take appropriate steps to eliminate the causes of such grievances so that the employees remain loyal and committed to their work. Effective grievance management is an essential part of personnel management. The managers should adopt the following approach to manage grievance effectively-

**Quick action**- As soon as the grievance arises, it should be identified and resolved. Training must be given to the managers to effectively and timely manage a grievance. This will lower the detrimental effects of grievance on the employees and their performance.

**Acknowledging grievance**- The manager must acknowledge the grievance put forward by the employee as manifestation of true and real feelings of the employees. Acknowledgement by the manager implies that the manager is eager to look into the complaint impartially and without any bias. This will create a conducive work environment with instances of grievance reduced.

**Gathering facts**- The managers should gather appropriate and sufficient facts explaining the grievance’s nature. A record of such facts must be maintained so that these can be used in later stage of grievance redressal.

**Examining the causes of grievance**- The actual cause of grievance should be identified. Accordingly remedial actions should be taken to prevent repetition of the grievance.

**Decision**- After identifying the causes of grievance, alternative course of actions should be thought of to manage the grievance. The effect of each course of action on the existing and future management policies and procedure should be analyzed and accordingly decision should be taken by the manager.
Execution and review - The manager should execute the decision quickly, ignoring the fact, that it may or may not hurt the employees concerned.

5. Explain Personal management versus Human resource management:

Personnel management function is often viewed as a function of the specialized staff.

Human resource management function is the responsibility of all the line managers in the organization.

1. Personnel management goal is employee orientation.
2. Human resource management goal is organization orientation
3. Personnel management managerial function Human resource management operative function
4. Personnel management cooperative level manager concern Human resource management top level manager concern

6. Explain the Selection: and its process

The process of identifying the most suitable persons for the organization is called selection. Selection is also called a negative function because at a stage the applications are screened and short-listed based on the selection criteria. The main purpose of selection is to choose the right person for the right job. The job analysis, job description, and job specifications are carried out before the position is advertised. These provide adequate insight about nature of the job, its description, and its specifications, and further focus on what type of person is to be selected for a given position. These simplify the process of selection.

Selection process involves the following stages:

a) Initial screening/Short listing
b) Comprehensive application/bio data screening
c) Aptitude or written rests
d) Group discussion
e) Personal interviews
f) Group discussion
g) Personal interviews
h) Medical examination
i) Employment offer letter

7. Explain the Job Evaluation:
An attempt to determine and compare the demands which the normal performance of particular job makes on normal workers without taking account of the individual abilities or performance of workers concerned. It rates the job not the rank.

Objectives:

1. To establish correct wage differentials for all jobs with in the factory
2. To bring new jobs into their proper relatively with jobs previously established
3. To help clarify lines of authority, responsibility and promotion
4. To accomplish the foregoing by means of the facts and principles, which can be readily explained to and accepted by all concerned
5. To establish a general wage level for a given factory which will have parity with those of neighboring factories

Advantages:

1. It is simple, inexpensive and expeditions
2. It is easily understood and easily administered
3. It helps setting better rates than the arbitrary rates based purely on judgment and experience
4. Same unions prefer it, because it leases more room for bargaining.

Disadvantages:

1. Job may be ranked on the basis of incomplete inform action and without the benefits of well defined standards
2. The rank position of different jobs is likely to be influenced by the prevailing wage ranks
3. No one committee number is likely to be familiar with all the jobs.

8. Explain the importance of Manpower Planning:

It is the scientific process of evolving the right quantity of right men to be required in future at right time on the right job.

Definition:

Manpower planning may be defined as a rational method of assessing the requirements of human resources at different levels in the organization. It ends with proposals for recruitment, retention, or even dismissal, where necessary.

Objectives of Manpower Planning:

a. Making correct estimate of manpower requirement
b. Managing the manpower according to the need of enterprises

c. Helps in recruitment and selection

d. Maintaining production level

e. Making employees development programme effecting

f. Establishing industrial peace

g. Reduction in labour costs

h. Minimization of labour costs

9. Explain Merit Rating in detail:

Merit rating is the process of evaluating the relative merit of the person on a given job. It is an essential task of the personnel manager to distinguish the meritorious employees from the other. The data collected from this task is used for strategic decisions such as releasing an increment in pay, promotion, transfer, and transfer on promotion to a critical assignment or even discharge.

**Ranking method:** In this method, all the staff of a particular cadre or a department are arranged either in the ascending or the descending order in order of merit or value to the firm. Though this is a simple method, it cannot be followed where the employees in the department are many in number.

**Paired comparison method:** Here, every employee is compared with all others in a particular cadre in the department. By comparing each pair of employees, the rater can decide which of the employees is more valuable to the organization.

**Rating scale:** Here, the factors dealing with the quantity and quality of work are listed and rated. A numeric value may be assigned to each factor and the factors could be weighed in the order of their relative importance. All the variables are measured against a three or five point scale.

**Forced distribution method:** Here, employees are given a set of alternatives and they have to choose one, which reflects their understanding of the true nature of the job. Their thinking is conditioned by the given set of answers.

**Narrative or essay method:** Here, the candidate is required to narrate in an essay format his/her strengths, weaknesses, and potential to perform. Here, the candidate is not restricted by any given set of alternatives. The candidate is free to decide what to furnish or what not to furnish.

**Management by objectives (MBO):** The short-term objectives mutually agreed upon by the management and the employees are used as performance standards. This method considers the actual performance as the basis for evaluation. It is a systematic method of goal setting. In
addition, it provides for reviewing performance based on results rather than personality traits or characteristics. However, this is not practical at all levels and for all kinds of work in the organizations.

10. **Explain the Method of Job Evaluation:**

It is broadly be classified as

1) Qualitative Method
2) Quantitative Method

**Qualitative Method:** It can broadly be classified as ranking or classifying the job from lowest to highest.

a) **Ranking technique:** In this method, the jobs in the organization are arranged in either in the ascending or descending order and numbered serially. The basis of such arrangement could be the job description in terms of duties, responsibilities, qualifications needed, relative difficulty involved in don the job, or value to the company.

**Points considered:**

- Amount of work involved
- Supervision needed
- Extent of responsibility required
- Difficulties involved in the work
- Work conditions required

b) **Classification Method:** This is also called job- grading method. Here, the number of grades and the salary particulars for each grade are worked out first.

**Quantitative Method:**

Where point values are assigned to the various demands of a job and relative value is obtained by summing all such point values.

a) **Factor comparison method:** Every job requires certain capabilities on the part of the person who does the job. These capabilities are considered as critical factors, which can be grouped as follows:

- Meaneffort
- Skill
Physical Responsibility Workingconditions

b) **Point-rating method**: There are four widely accepted factors used in the point-rating method, skill, effort, responsibility and job conditions each of these factors is divided into sub-factors.

Skills-
- Education and training
- Experience
- Judgment and initiative

Efforts
- Physical
- Mental Responsibility towards
  - Materials or product
  - Equipment or process
  - Safety of others
  - Work of others

**SHORT QUESTIONS**

1. **Define Recruitment?**
   Applications are invited at this stage for further scrutiny and short listing. Before advertising for the position, it common to check up of the position could be filled in internally.

2. **What is Placement?**
   After training, the employee is placed in his/her position under the charge of a manager. The new recruit is allowed to exercise full authority and is held responsible for the results.

3. **What is Transfer?**
   It is a lateral shift that moves an individual employee from one position to another. It may be in the same department, or to a different department or location. This does not involve any changes in the duties, responsibilities, or skills needed. The salary benefits also may remain the same.
4. **What is Separation?**

Separation refers to termination of employment. In other words, the employee is separated from his job. In case of misconduct or misbehavior, where the employee is not in a position to improve his performance despite notice, his/her employment is terminated. This is also called dismissal.

5. **Define HRM**

Human resource management is the process of managing the human resources of an organization in tune with the vision of the top management.

6. **Define Personnel Management:**

It is a planning, organizing, and controlling of the procurement, development, compensation, integration and maintenance of people for the purpose of contributing to the organizational goals.

7. **What is Job Analysis?**

Job analysis can be defined as the process of identifying the tasks comprising a particular job to assess whether they could be organized in a productive manner.

8. **What do you mean by Development?**

Development is an activity aimed at career growth rather than immediate performance. Employee development is the process, which helps him or her to understand and interpret knowledge rather than teaching a specific set of functional skills. Development, therefore, focuses more on employee’s personal growth in the near future.

9. **Define Human Resource Development (HRD).**

It is the framework for helping employees develops their personal and organizational skills, knowledge, and abilities.

10. **What is Separation?**
Separation refers to termination of employment. In other words, the employee is separated from his job. In case of misconduct or misbehavior, where the employee is not in a position to improve his performance despite notice, his/her employment is terminated. This is also called dismissal.

**FILL IN THE BLANKS**

1. The guide to management action in HRM
   Ans: Business needs

2. ------------------ constitutes prized management skills in HRM
   Ans: Facilitation

3. Manpower planning ends with ------------------------
   Ans: Feedback control

4. Redundancy means ------------------
   Ans: Separation

5. The Type of person required to be selected for a given job is outlined by -------------------------
   Ans: Job specification

6. The process of evaluating the relative merit of the person on a given job is called------------------
   Ans: Merit rating

7. The technique of assessing systematically the relative worth of each job -------------------------
   Ans: Job Evaluation

8. Personal manager is a line manager in the issues related to -------------------------
   Ans: Staff selection
9. The top management relies on personal management for developing ----------------------- for the organization
Ans: Vision and culture

10. The keys relations of labor management in personnel, according to Storey, shift their focused to -------- ---------------- in HRM
Ans: customer

MULTIPLE CHOICE QUESTIONS

1. The following is (are) the key components of a business process Re-engineering program? [D]
   A. Product development  B. service delivery  C. customer satisfaction  D. All of the above

2. The actual achievements compared with the objectives of the job is [A]
   A. Job performance  B. Job evaluation  C. Job description  D. None of the above

3. The following is (are) concerned with developing a pool of candidates in line with the human resources plan [C]
   A. Development  B. Training  C. Recruitment  D. All of the above

4. Majority of the disputes in industries is (are) related to the problem of
   A. Wages  B. Salaries  C. Benefits  D. All of the above

5. In an organization initiating career planning, the career path model would essentially form the basis for
   A. Placement  B. Transfer  C. Rotation  D. All of the above

6. Section _______ of the Industrial Disputes Act 1947, states that an employer should only retrench employees who have been most recently hired
   A. 24-F  B. 24-G  C. 25-F  D. 25-G

7. Performance development plan is set for the employee by his immediate boss.
8. The following type of recruitment process is said to be a costly affair. [B]
   A. Internal recruitment  B. External recruitment  C. Cost Remains Same  D. None of the above

9. The following is (are) the objective(s) of inspection. [A]
   A. Quality product  B. Defect free product  C. Customer satisfaction  D. All of the above

10. Large recruitment problematic and vice-versa [A]
    A. Less  B. More  C. Any of the above
UNIT-IV

UNIT - 4

1. Explain PERT AND CPM:

PERT: Program me evaluation and review technique (PERT) is a tool to evaluate a given program me and review the progress made in it from time to time. A program me is also called a project. A project is defined as a set of activities with a specific goal occupying a specific period. It may be a small or big project, such as construction of a college building, roads, marriage, picnic etc. It is concerned with estimating the time for different stages in such a program me or a project and find out what the critical path is, which consumes a maximum resources.

CPM: Critical path method assumes that the time required to complete an activity can be predicted fairly accurately, and thus, the costs involved can be quantified once the critical path has been identified. Since time is an important factor, CPM involves a trade-off between costs and time. It involves determining an optimum duration for the project, that is, a minimum duration that involves the lowest overall costs.

2. Explain CPM and the Basic terminology:

Ans: Critical Path: Critical path is that path which consumes the maximum amount of time or resources. It is that path which has zero slack value. Slack means the time taken to delay a particular event without affecting the project completion time. If a path has zero slack that means it is the critical path.

Slack = LFT – EFTEarliest Start Time (EST): It is the earliest possible time at which an activity can start, and is calculated by moving from first to last event in the network diagram. Earliest Finish Time (EFT): It is the earliest possible time at which an activity can finish
EFT = EST + Duration of activity

Latest Start Time (LST): It is the latest possible time by which an activity can start without delaying the date of completion of the project.

LST = LFT – Duration of the activity

Latest Finish Time (LFT): It is the latest time by which the activity must be completed. So that the scheduled date for the completion of the project may not be delayed. It is calculated by moving backwards.

Float: Floats in the network analysis represent the difference between the maximum time available to finish the activity and the time required to complete it.

The basic difference between slack and float times is a slack is used with reference to event, float is used with reference to activity.

Floats are three types:

1) Total float
2) Free float
3) Independent float

1) Total float: It is the additional time which a non-critical activity can consume without increasing the project duration. However, total float may affect the floats in previous and subsequent activities.

Total float = LST–EST or LFT – EFT

2) Free float: Free float refers to the time by which an activity can expand without affecting succeeding activities.

Free float = EST of Head Event – EST of Trail Event – Activity duration

3) Independent float: This the time by which activity may be delayed or extended without affecting the preceding or succeeding activities in any way.

Independent float = EST of Head event – LFT of Trail event – Activity duration

3. A small engineering project consists of six activities. The three time estimates in number days for each activity are given below.

<table>
<thead>
<tr>
<th>Activity</th>
<th>t0</th>
<th>tM</th>
<th>tp</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>2</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>2-3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3-5</td>
<td>0</td>
<td>6</td>
<td>18</td>
</tr>
<tr>
<td>5-6</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>1-4</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4-5</td>
<td>2</td>
<td>8</td>
<td>14</td>
</tr>
</tbody>
</table>

Find out:

MD ASIF (Asst.Professor)
1. Calculate the values of expected time (te), variance (vi) of each activity
2. Draw the network diagram and mark time on each activity
3. Calculate EST and LFT and mark them on the network diagram
4. Calculate total slack for each activity
5. Identify the critical path and mark on the network diagram
6. Probability of completing project in 25 days.

Solution:

<table>
<thead>
<tr>
<th>Activity</th>
<th>to</th>
<th>tm</th>
<th>tp</th>
<th>de</th>
<th>4tm</th>
<th>dp</th>
<th>Variance</th>
<th>S.D</th>
<th>6t</th>
<th>t^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>2</td>
<td>5</td>
<td>8</td>
<td>5</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-5</td>
<td>0</td>
<td>6</td>
<td>18</td>
<td>7</td>
<td>3</td>
<td></td>
<td></td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-6</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>0</td>
<td></td>
<td></td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td></td>
<td></td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-5</td>
<td>2</td>
<td>8</td>
<td>14</td>
<td>8</td>
<td>2</td>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

EST  LFT

MD ASIF (Asst. Professor)
Critical path = 1-2-3-5-6 = 20 days

Probability for completing project in 25 days:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Duration</th>
<th>EST</th>
<th>LST</th>
<th>EFT</th>
<th>LFT</th>
<th>Total float</th>
<th>Free float</th>
<th>Independent float</th>
</tr>
</thead>
<tbody>
<tr>
<td>A B C D</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>E F</td>
<td>6</td>
<td>4</td>
<td>10</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>8</td>
<td>12</td>
<td>11</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>15</td>
<td>18</td>
<td>18</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: LST = LFT − activity duration LFT = EST + activity duration
Total float = LST−EST or LFT −EFT
Free float = EST of Head Event – EST of Trail Event – Activity duration Independent float = EST of Head event – LFT of Trail event – Activity duration

4. Explain the Project crashing and project cost

Direct and indirect costs, the relationship between project time and project cost, the concept of cost slope and how the optimum cost and optimum duration are ensured for a given project while crashing.

Project costs: Costs associated with any project can be classified into two categories a) Direct cost  b) Indirect cost

MD ASIF (Asst. Professor)
Direct cost: These costs are those, which are directly proportional to the number of activities involved in the project. Ex: Raw material cost

Direct cost

Crash time   Normal time

Indirect cost: In direct cost are those costs that are determined per day.

5. Explain Normal cost (Nc): Normal Time, Crash cost and Crash Time

Ans: It is the lowest cost of completing an activity in the minimum time, employing normal means i.e. not using overtime or other special resource.

**Normal time (NT):** It is the minimum time required to achieve the normal cost.

**Crash cost (CC):** It is the least cost of completing an activity by employing all possible means like overtime, additional machinery, proper materials etc.

**Crash time (CT):** It is the absolute minimum time associated with the crash cost.

**Cost Slope:** Cost Slope is the amount that has to be spent over and above the normal direct cost for reducing the duration by one unit of time (day, week etc.).

Cost slope is defined as the additional cost for reducing one unit of time, assuming a given rate of increase in direct cost with a decrease in one unit of time.

\[
\text{Cost slope} = \frac{\text{Crash cost} \cdot \text{Normal cost}}{\text{Normal time} \cdot \text{Crash time}}
\]

\[
S = \frac{CC \cdot NC}{NT \cdot CT}
\]

Crashing of Network: After identifying the critical path, it is necessary to identify the priority to crash the activities by calculating the cost slope.

For reducing the duration extra expenditure to be incurred, but to save resources, organizations keep this extra expenditure at a minimum.

CT = Crash Time  OT = Optimum Time  NT = Normal Time

MD ASIF (Asst. Professor)
6. PERT Basic Terminology:

**Event**: A event is specific instant of time which indicates the beginning or end of the activity. The event is also known as a junction or node. It is represented by a circle and the event number is written within the circle.

![Diagram of Event with Tail and Head event](image)

**Activity**: Every project consists of number of job operations or tasks which are called activity.

**Ex**: Start machine installation - An event
Machine installation - An activity
Completion of machine - An event

**Classification of activities**:

1) Critical activity
2) Non-Critical activity
3) Dummy activity

**Critical activity**: In a network diagram critical activities are those which if consume more than their estimated time, the project will be delayed. It shown with thick arrow.
**Non-critical activity:** Such activities have a provision of float or slack so that, even if they consume a specified time over and above the estimated time.

**Dummy activity:** When two activities start at the same instant of time like A and B the head event are joined by dotted arrows and this is known as dummy activity.

---

7. **What is Network analysis and explain its features?**

**Network Analysis**

It is refers to a number of techniques for the planning and control of complex projects. The basis of network planning is the representation of sequential relationships between activities by means of a network of lines and circles. The idea is to link the various activities in such a way that the overall time spent on the project is kept to a minimum.

**Features of Network Analysis:**

**Logical base of planning:** Network analysis is highly applicable at several stages of project management right from early planning stage of selecting right option from various alternative to scheduling stage and operational stage.

**Simple in nature:** Net work analysis is straightforward in concept and can be easily explained to any laymen. Data calculations are simple and for large projects computers can be used.

**Improves coordination and communication:** The graphs generated out of network analysis display simply and direct way the complex nature of various sub-divisions of project may, quickly perceive from the graph

**Wider application:** The network analysis is applied to many types of projects. Moreover, they may be applied at several levels within a given project from a single department working on a sub-system to multi-plant operations within corporation.

8. **Differences between PERT and CPM**

<table>
<thead>
<tr>
<th>Differences between PERT and CPM</th>
<th>PERT</th>
</tr>
</thead>
</table>

---

MD ASIF (Asst.Professor)
CPM uses activity oriented network. PERT uses event oriented Network.

Durations of activity may be estimated with a fair degree of accuracy. Estimate of time for activities are not so accurate and definite.

It is used extensively in construction projects. It is used mostly in research and development projects, particularly projects of non-repetitive nature.

Deterministic concept is used. Probabilistic model concept is used.

CPM can control both time and cost when planning. PERT is basically a tool for planning.

In CPM, cost optimization is given prime importance. In PERT, it is assumed that cost varies directly with time. Attention is therefore given to minimize the time so that minimum cost results. Thus in PERT, time is the controlling factor.

<table>
<thead>
<tr>
<th>SHORT QUESTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Define Network Analysis</strong></td>
</tr>
<tr>
<td>It is refers to a number of techniques for the planning and control of complex projects.</td>
</tr>
<tr>
<td>The basis of network planning is the representation of sequential relationships between activities by means of a network of lines and circles. The idea is to link the various activities in such a way that the overall time spent on the project is kept to a minimum</td>
</tr>
<tr>
<td>2. <strong>Define Project</strong></td>
</tr>
<tr>
<td>• Project is a temporary endeavour undertaken to create a unique product –</td>
</tr>
<tr>
<td>• Project are unique undertakings</td>
</tr>
<tr>
<td>• Project are composed of interdependent activities</td>
</tr>
<tr>
<td>3. <strong>What is PERT?</strong></td>
</tr>
<tr>
<td>Program me evaluation and review technique (PERT) is a tool to evaluate a given program me and review the progress made in it from time to time. A program me is also called a project. A project is defined as a set of activities with a specific goal occupying a specific period. It may be a small or big project, such as construction of a college building, roads, marriage, picnics etc.</td>
</tr>
<tr>
<td>4. <strong>What is Critical path?</strong></td>
</tr>
<tr>
<td>Critical path is that path which consumes the maximum amount of time or resources. It is that path which has zero slack value.</td>
</tr>
<tr>
<td>5. <strong>What is slack?</strong></td>
</tr>
</tbody>
</table>

MD ASIF (Asst.Professor)
Slack means the time taken to delay a particular event without affecting the project completion time. If a path has zero slack that means it is the critical path.

6. What is Float?

Floats in the network analysis represent the difference between the maximum time available to finish the activity and the time required to complete it.

7. What is Direct cost:?

These costs are those, which are directly proportional to the number of activities involved in the project. Ex: Raw material cost

8. Indirect cost:?

In direct cost are those costs that are determined per day. Some of examples for indirect costs are supervisory personnel salary, supplies, rent, interest and borrowings, ads, depreciation. These costs are directly proportional to the number of days of the duration of the project. If the project duration is reduced the indirect cost also comes down.

9. Define Normal time (NT):

It is the minimum time required to achieve the normal cost

10. Define Crash time (CT):

It is the absolute minimum time associated with the crash cost.

FILL IN THE BANKS

1. A program me is also called a ------------------
   Ans: Project

2. An activity with a specific goal occupying a specific period of time is called ------------------
   Ans: Project

3. ------------------ is an event oriented
   Ans: PERT

4. The event, which is not tied into the network is called ------------------
5. All such events carrying a zero slack or minimum slack fall under ----

Ans: critical path

6. Direct costs are those --------------------------

Ans: Activities

7. Indirect costs are always ------------------------ per given time, in the short run

Ans: Fixed

8. Total cost is aggregate of ------------------ and ------------------

Ans: Direct and Indirect

9. Rent is an example for ------------------------ costs

Ans: Indirect cost

10. The additional cost per additional of time assuming a linear rate of ---------------

SAns: cost slope

1. PERT and CPM  [ D ]
   A. A. are most valuable when a small number of activities must be scheduled
   B. B. have different features and are not applied to the same situation
   C. C. Do not require a chronological relationship among activities
   D. D. have been combined to develop a procedure that uses the best of each.
   E. DFAFDSF
   F. FDF

2. Which is not a significant challenge of project scheduling?[B ]
   A. Deadlines exist
   B. Activities are independent
   C. Many employees could be required.
   D. Delays are costly.

3. Arcs in a project network indicate  [ B ]
A. Completion times
B. Precedence relationships
C. activities
D. the critical path

4. The critical path  [D]
   A. is any path that goes from the starting node to the completion node.
   B. is a combination of all paths.
   C. is the shortest path.
   D. is the longest path.

5. The earliest start time rule [B]
   A compares the starting times of all activities for successors of an activity.
   B. compares the finish times for all immediate predecessors of an activity.
   C. determines when the project can begin.
   D. determines when the project must begin.

6. Activities following a node [B]
   A. can begin as soon as any activity preceding the node has been completed.
   B. have an earliest start time equal to the largest of the earliest finish times for all activities
      entering the node.
   C. have a latest start time equal to the largest of the earliest finish times for all activities
      entering the node.
   D. None of the alternatives is correct.

7. Activities G, P, and R are the immediate predecessors for activity W. If the earliest
   finish times for the three are 12, 15, and 10, then the earliest start time for W [   ]

   A 10
   B 12.
   C 15
   D. cannot be determined.

8. Activities K, M and S immediately follow activity H, and their latest start times are 14,
   18, and 11. The latest finish time for activity H   [ A   ]
   A. 11.
   B. 14.
   C. 18.
   D. cannot be determined.

9. When activity times are uncertain   [ B]
A. assume they are normally distributed.
B. Calculate the expected time, using \((a + 4m + b)/6\).
C. use the most likely time.
D. calculate the expected time, using \((a + m + b)/3\).

10. To determine how to crash activity time [B]
A. Normal activity costs and costs under maximum crashing must be known
B. Shortest times with crashing must be known.
C. Realize that new paths may become critical
D. All of the alternatives
UNIT-5

1. Explain the Environmental Scanning in detail

Organizational environment consists of both external and internal factors. Environment must be scanned so as to determine development and forecasts of factors that will influence organizational success.

Environmental scanning refers to possession and utilization of information about occasions, patterns, trends, and relationships within an organization’s internal and external environment. It helps the managers to decide the future path of the organization. Scanning must identify the threats and opportunities existing in the environment. While strategy formulation, an organization must take advantage of the opportunities and minimize the threats. A threat for one organization may be an opportunity for another.

Internal analysis of the environment is the first step of environment scanning. Organizations should observe the internal organizational environment. This includes employee interaction with other employees, employee interaction with management, manager interaction with other managers, and management interaction with shareholders, access to natural resources, brand awareness, organizational structure, main staff, operational potential, etc. Also, discussions, interviews, and surveys can be used to assess the internal environment. Analysis of internal environment helps in identifying strengths and weaknesses of an organization.

As business becomes more competitive, and there are rapid changes in the external environment, information from external environment adds crucial elements to the effectiveness of long-term plans. As environment is dynamic, it becomes essential to identify competitors’ moves and actions. Organizations have also to update the core competencies and internal environment as per external environment. Environmental factors are infinite, hence, organization should be agile and vigile to accept and adjust to the environmental changes. For instance - Monitoring might indicate that an original forecast of the prices of the raw materials that are involved in the product are no more credible, which could imply the requirement for more focused scanning, forecasting and analysis to create a more trustworthy prediction about the input costs. In a similar manner, there can be changes in factors such as competitor’s activities, technology, market tastes and preferences.

While in external analysis, three correlated environment should be studied and analyzed —

- immediate / industry environment
- national environment
- broader socio-economic environment /macro-environment

Examining the industry environment needs an appraisal of the competitive structure of the organization’s industry, including the competitive position of a particular organization and its main rivals. Also, an assessment of the nature, stage, dynamics and history of the industry is essential. It also implies evaluating the effect of globalization on competition within the industry. Analyzing the national environment needs an appraisal of whether the national framework helps in achieving competitive advantage in the globalized environment. Analysis of macro-environment includes exploring macro-economic, social, government,
legal, technological and international factors that may influence the environment. The analysis of organization’s external environment reveals opportunities and threats for an organization.

Strategic managers must not only recognize the present state of the environment and their industry but also be able to predict its future positions.

SWOT is an acronym for Strengths, Weaknesses, Opportunities and Threats. By definition, Strengths (S) and Weaknesses (W) are considered to be internal factors over which you have some measure of control. Also, by definition, Opportunities (O) and Threats (T) are considered to be external factors over which you have essentially no control.

2. Explain about Strategy in detail.

It refers to the process of choosing the most appropriate course of action for the realization of organizational goals and objectives and thereby achieving the organizational vision. The process of strategy formulation basically involves six main steps. Though these steps do not follow a rigid chronological order, however they are very rational and can be easily followed in this order.

Setting Organizations’ objectives - The key component of any strategy statement is to set the long-term objectives of the organization. It is known that strategy is generally a medium for realization of organizational objectives. Objectives stress the state of being there whereas Strategy stresses upon the process of reaching there. Strategy includes both the fixation of objectives as well the medium to be used to realize those objectives. Thus, strategy is a wider term which believes in the manner of deployment of resources so as to achieve the objectives.

While fixing the organizational objectives, it is essential that the factors which influence the selection of objectives must be analyzed before the selection of objectives. Once the objectives and the factors influencing strategic decisions have been determined, it is easy to take strategic decisions.

Evaluating the Organizational Environment - The next step is to evaluate the general economic and industrial environment in which the organization operates. This includes a review of the organizations competitive position. It is essential to conduct a qualitative and quantitative review of an organizations existing product line. The purpose of such a review is to make sure that the factors important for competitive success in the market can be discovered so that the management can identify their own strengths and weaknesses as well as their competitors’ strengths and weaknesses.

After identifying its strengths and weaknesses, an organization must keep a track of competitors’ moves and actions so as to discover probable opportunities of threats to its market or supply sources.

Setting Quantitative Targets - In this step, an organization must practically fix the quantitative target values for some of the organizational objectives. The idea behind this is to compare with long term customers, so as to evaluate the contribution that might be made by various product zones or operating departments.

Aiming in context with the divisional plans - In this step, the contributions made by each
department or division or product category within the organization is identified and accordingly strategic planning is done for each sub-unit. This requires a careful analysis of macroeconomic trends.

Performance Analysis - Performance analysis includes discovering and analyzing the gap between the planned or desired performance. A critical evaluation of the organizations past performance, present condition and the desired future conditions must be done by the organization. This critical evaluation identifies the degree of gap that persists between the actual reality and the long-term aspirations of the organization. An attempt is made by the organization to estimate its probable future condition if the current trends persist.

Choice of Strategy - This is the ultimate step in Strategy Formulation. The best course of action is actually chosen after considering organizational goals, organizational strengths, potential and limitations as well as the external opportunities.

3. Explain Mission Statement

Mission statement is the statement of the role by which an organization intends to serve its stakeholders. It describes why an organization is operating and thus provides a framework within which strategies are formulated. It describes what the organization does (i.e., present capabilities), who all it serves (i.e., stakeholders) and what makes an organization unique (i.e., reason for existence).

A mission statement differentiates an organization from others by explaining its broad scope of activities, its products, and technologies it uses to achieve its goals and objectives. It talks about an organization’s present (i.e., about where we are). For instance, Microsoft’s mission is to help people and businesses throughout the world to realize their full potential. Wal-Mart’s mission is - To give ordinary folk the chance to buy the same thing as rich people. Mission statements always exist at top level of an organization, but may also be made for various organizational levels. Chief executive plays a significant role in formulation of mission statement. Once the mission statement is formulated, it serves the organization in long run, but it may become ambiguous with organizational growth and innovations.

In today’s dynamic and competitive environment, mission may need to be redefined. However, care must be taken that the redefined mission statement should have original fundamentals/components. Mission statement has three main components - a statement of mission or vision of the company, a statement of the core values that shape the acts and behavior of the employees, and a statement of the goals and objectives.

4. Explain SWOT Analysis in Detail

SWOT analysis is defined as the rational and overall evaluation of a company’s strength, weakness, opportunities, and threats which are likely to affect the strategic choice significantly. External environment analysis (Opportunities and Threats):

The external environment has a profound impact on the business operations irrespective of the nature and size of the business. The business has to monitor its key macro- environment forces and micro economic parties.
Opportunities: It necessary should identify what opportunities are available to it to focus upon. The latest technology, deregulated or free markets, liberalized rules and regulations and other may make a lot of difference for a business organization provided it can envision how to avail these visionary identify opportunities from treats.

Threats: Some development in the external environment represents threats. A threat is a challenge posed by an unfavorable trend or a development that results in the loss of sales or profit till a defensive marketing action is initiated. A few example of threat could be outlined as change in government policy such as liberalization privatization and globalization, changing technology changing value systems environmental constraints law and order.

Internal environment analysis (Strength and Weakness): It is necessary to analyze one’s own strength and weakness periodically to sustain the degree of its competitive strength. Generally top management or an outside consultant reviews competencies pertaining to marketing, financial, manufacturing and organizational system and rates each factor as a major strength, minor strength, mental, factor, minor weakness, or major weakness.

Strength: It is not necessary that a business organization has to correct all its weakness nor that its propagate its strength. The big question is whether the business should limit itself to those opportunities, where its possesses the required strength or should it consider better opportunities where it might have to develop certain strength.

Weakness: Sometimes the company may not do well not because its departments lack the required motivation but because they do not work together as a team for example consider the case of an electronics company which employs engineers, sales and service staff for its operations. It is not adequate if they keep on doing their work. The organization becomes more effective only when they work as a team. It is therefore, critically important to build effective teams and assess the effectiveness of these teams. This is a part of the internal environmental audit. Progressive companies adopt this strategy.

Strength:

1. Value for money programme
2. Pool of trained faculty
3. Wide choice of offering
4. National network of well equipped training centre

Weakness:

5. Not aggressive in selling
6. Course differentials not sharp
7. Counselor enthusiasm in adequate
8. Customers service not focused enough

Opportunities:

1. Growing demand for computer education
2. Computer library becoming a necessity
3. Growth of rich training needs
4. Need for customized training modules

Threats:

1. Rise in number of competitions
2. High rate of technological obsolescence
3. Commoditization of training under cutting of fees

5. Explain the Strategy Formulation and implementation in detail

This is often referred as strategic planning or long-range planning. This process is primarily analytical, not action-oriented. The strategy formulation process is concerned with developing a corporate mission, objectives, strategy and policy.

This process involves scanning external and internal environmental factors, analysis of the strategic factors and generation, evaluation, selection of the best alternative strategy appropriate to the analysis.

Henry Mint berg has pointed out that corporations objectives and strategies are strongly affected by top management’s view of the world. This view determines the mode to be used in strategy formulation. These modes includes

Entrepreneurial mode: one powerful individual formulates Strategy.

- The focus is on opportunities rather than on problems.
- Strategy is guided by the founder’s own vision of direction.

Adaptive Mode: This strategy formulation mode is characterized by reactive solutions to existing problems rather than a proactive search for new opportunities.

Planning Mode: Analysts assume main responsibility for strategy formulation

Strategic planning includes both the practice search for new opportunities and the reactive solution of existing problems.

Thus, strategy formulation process involves environmental analysis organizational analysis, development of strategic alternatives and analysis and selecting the most appropriate strategy from the alternatives developed.

The corporate level strategies include:
• Stability strategies
• Growth strategies
• Retrenchment strategies
• Combination strategy or port-folio restructuring

Implementation of strategies:

• Institutionalization of strategy
• Setting proper organizational climate
• Developing appropriate operating plans
• Developing appropriate organizational structures
• Periodic review of strategy

6. Explain policy, programs and purpose

Policy:
Policy a broad guideline set by the top management for the purpose of making decisions at different levels in the organization, once the corporate objectives are established policies can be formulated organization policy reflects the owner’s attitude to different segments such as creditors, the employees, customers and society at large.

Programs:
Programs refer to the logical sequence of operations to be performed in a given project based on a set of goals, policies, procedures, rules and task assignments. They are used to carry out a given course of action.

Purpose:
A strategy is an operational tool to achieve the goals, and thus, the corporate mission. Strategies do not attempt to outline exactly how the enterprise is to accomplish its objective. A company may view downsizing in a competitive market to render cost effective services. Thus, strategy provides a framework to guide thinking and action.

7. Explain the Corporate planning process:

It is a process or series of steps. The basic steps are:

Identifying Corporate Mission: Identify what the organization wants to achieve to start with for the purpose of it is necessary that all concerned parties understand the overall
Formulate strategic objectives: By preparing statements of mission, policy, strategy, and goals, the top management established the framework within which its divisions or departments prepare their plans.

Appraise internal and external environment: To evolve alternative strategies to achieve these objectives, a detailed appraisal of both the internal and external environment is carried out. The appraisal of the internal environment reveals the strengths and weaknesses of the firm. The appraisal of the external environment reveals the opportunities and threats for the firm. It is popularly called as SWOT analysis. Capitalizes on internal strengths, makes use of best opportunities and beware of the threats in the external environment.

Develop and evaluate alternative strategies: There could be some alternative strategies to pursue a given goal.

Select the best strategy: For the firm to be more successful, it is necessary to focus its strategies around its strengths and opportunities.

Establish strategic business units (SBUs): It is more strategic to define a business unit in terms of customer groups, needs and/or technology and set up the business unit accordingly.

Fix target, allot resources to each SBU: The development of SBUs based on appropriate finding the top level management knows that its portfolio has certain old, established relatively new, and brand new products.

Developing operating plans: The operating plan explain how the long-term goals of the organization can be met, the corporate plans reveal how much the projected sales and revenue are, where the top management finds a significance gap between the targeted sales and actual sales, it can either develop the existing business or acquire a new one to fill the gap.

Monitor performance: The results of the operating plans should be well monitored from time to time. In the case of poor performance, check up with the members of the team to find out their practical problems and sort these out. Also, it is essential to verify whether there are any gaps in formulating the operating/tactical plans.

Revise the operating plans, where necessary: It is necessary to revise the operational plans particularly when the firm does not perform as well as expected. The planes can be revised in terms of focus, resource or time frame.
8. Explain the generic alternative Strategies

The best generic alternative strategies

1. Cost Leadership

The cost-leadership strategy is a good option for companies that are able to consistently reduce the costs of doing business.

2. Differentiation

A differentiation strategy is a better alternative for a company that doesn't have strong cost advantages or prefers to emphasize strengths in production or resale. The key to this approach is to research customer needs, design and develop quality products or service proceeds to match and effectively market and sell solutions by stressing the differences from competing brands.

3. Cost Focus

In general, the focus strategy is distinct because it is used when you serve a niche target market. The cost-focus approach means you use the principles of a low-cost operation to market affordability to a niche market.

4. Differentiation Focus

A differentiated-focus approach means you market a bigger or better solution to a smaller market segment. Local businesses commonly rely on this strategy when competing against larger box retailers.

9. Explain Benchmarking and Balance scorecard

A process of searching for, identifying, and using ideas, techniques and improvement of other companies/situations in its own activities.
Definition:

A systematic and ongoing process of improving performance by measuring a product, service or process against a partner that has mastered it.

In short – comparing methods against the best to identify changes. A quality management tool that includes a set of practices aimed at improving product and service quality.

Bench marking involves measuring the performance of the organization, team or individuals against the best practice for the industry, function or particular activity.

Balance scorecard:

It is a management system that enables organizations to clarify their vision and strategy and translate them into action. It provides feedback around both the internal business processes and external outcomes in order to continuously improve strategic performance and result. When full deployed, the balance scorecard transforms strategic planning from an academic exercise into the nerve center of an enterprise.

1. What is Strategy?

“Plan of Action”

1. General programs of action and development of resources to attain comprehensive objectives

2. The program of objectives of an organization and their changes, resources used to attain these objectives.

2. Define Mission?

The mission or purpose identifies the basic function or task of an enterprises or agency or of any part of its. Every kind of organized operation has, or at least should have if it is to be meaningful,
3. Define policy?

Policy is a broad guideline set by the top management for the purpose of making decisions at different levels in the organization. Once the corporate objectives are established, policies can be formulated. Organization policy reflects the owner’s attitude towards different segments such as creditors, the employees, customers, and society at large.

4. Define SWOT Analysis

SWOT analysis is defined as the rational and overall evaluation of a company’s strength, weakness, opportunities, and threat which are likely to affect the strategic choice significantly.

5. What is Environmental scanning?

Environmental scanning is a vital part of the corporate planning process. Effective planners try to anticipate what is likely to happen or attempt to influence the environment in favorable directions. This requires long-term strategic vision and commitments to corporate planning.

6. Define Goal

It is goals naturally contribute to the attainment of enterprise objectives but the two sets of goals may entirely differ.

7. Define Objective

Objectives are the ends towards which activities are aimed—they are results to be achieved. They represent not only the end point of planning but the end toward which point of planning but the end toward which organizing, staffing, leading, and controlling are aimed. While enterprises' objectives are the basic plan of firm a department may also have its own objectives.

8. Define Program

Programs refer to the logical sequence of operations to be performed in a given project based on a set of goals, policies, procedures, rules, and task assignments.

MD ASIF (Asst. Professor)
They are used carry out a given course of action.

**9. What is Balance score card**

A process of searching for, identifying, and using ides, techniques and improvement of other companies/situations in its own activities.

**10 What is benchmarking**

It is a management system that enables organizations to clarify their vision and strategy and translate them into action. It provides feedback around both the internal business processes and external outcomes in order to continuously improve strategic performance and result. When full deployed, the balance scorecard transforms strategic planning from an academic exercise into the nerve center of an enterprise.

**FILL IN THE BLANKS**

1. Strategy is an -------------- tool to achieve the goals set through mission
   Ans: **Operational**

2. Goal is broken down into -------------- for each department or level in organization
   Ans: **objectives**

3. To emerge stronger, today's corporate strategies include --------------
   Ans: **Mergers**

4. The basic reason for the existence of an organization --------------
   Ans: **Mission**

5. External environment analysis is also called ----------------
   Ans: **opportunities and Threats**

6. A Good Strategy with ---------------- implementation has a higher probability of success
Ans: Effective

7. An acid test for an alliance is greater sales at ---------- cost

Ans: Less

8. Strategy management process starts with ----------

Ans: Mission and Goals

9. Subcontracting is an example for ---------- strategy

Ans: Combination

10. JIT IS originated in ----------

Ans: Japan

MULTIPLE CHOICE QUESTIONS

1. Strategic management is[ A ]

   a. a set of managerial decisions and actions
   b. oriented to short-run performance of an organization
   c. a process that is done best if it is done quickly
   d. all of the above

2. Strategic management uses the management function [ D ]

   a. planning and leading
   b. organizing
   c. controlling
   d. all of the above

MD ASIF (Asst.Professor)
3. According to your textbook, studies of the factors that contribute to organizational performance have shown a relationship between strategic planning and performance. [D]

a. no
b. a mixed
c. a negative
d. a positive

4. An example of a core competence of a firm is [D]

a. an ability to serve the needs of a particular target market on a large scale
b. communicating with customers in their own languages worldwide
c. developing least-squared exemptions within its accounting system
d. only a and b are true

5. It is the collection of managerial decisions and actions that determine the long-run performance of an organization. [B]

a. Planning
b. Goal-oriented management
c. Strategic management
d. Leadership

6. In the first step of strategic management, the mission of the firm, [B]

a. What business should we be in?

b. What is our reason for being in business?
c. Who are our customers?
d. Who are our creditors?
7. In the first step of strategic management, identifying the current strategies and goals provide [A]

a. foundation for planning
b. measurable performance targets for employees
c. a basis to determine if the goals need to be changed
d. all of the above

8. Currently strategic practices are not viable for [D]

a. hospitals
b. government agencies
c. nonprofit organizations
d. none of the above

9. It is the collection of managerial decisions and actions that determine the long-run performance of an organization. [A]

a. Planning
b. Goal-oriented management
c. Strategic management
d. Leadership

10. Strategic analysis involves [D]

a. selecting strategies that minimize or correct organizational weaknesses
b. developing and evaluating strategic alternatives
c. selecting strategies that exploit organizational strengths
d. all the above
UNIT-I

Two marks questions with answers

1) What is management?

It uses various scientific research-based principles, strategies, and analytical methods including mathematical modeling, statistics and numerical algorithms to improve an organization's ability to enact rational and accurate management decisions by arriving at optimal or near optimal solutions to complex decision problems.

2) What is administration?

Management science is concerned with a number of different areas of study: One is developing and applying models and concepts that may prove useful in helping to illuminate management issues and solve managerial problems

3) What is a decision making?

The management scientist's mandate is to use rational, systematic, science-based techniques to inform and improve decisions of all kinds. The techniques of management science are not restricted to business applications but may be applied to military, medical, public administration, charitable groups, political groups or community groups.

4) What is organization?

The field was initially an outgrowth of applied mathematics, where early challenges were problems relating to the optimization of systems which could be modeled linearly, i.e., determining the optima (maximum value of profit, assembly line performance, crop yield, bandwidth, etc. or minimum of loss, risk, costs, etc.) of some objective function.

5) Explain Nature of Management?

The study and application of management techniques in managing the affairs of the organization have changed its nature over a period of time

Three marks questions with answers

1. What is the importance of Management?

Management has been important to the daily lives of people and to the organizations. The importance of management may be traces with the following.

1) **Effective utilization of Resources**: Management tries to make effective utilization of various resources. The resources are scarce in nature and to meet the demand of the society, their contribution should be more for the general interests of the society. Management not only decides in which particular alternative a particular resource should be used, but also takes actions to utilize it in that particular alternative in the best way.

2) Development of Resources: Management develops various resources. This is true with human as well as non-human factors. Most of the researchers for resource development are carried on in an organized way and management is involved in these organized activities.
2. Different functions of management

It ensures continuity in the organization: Continuity is very important in the organizations. Where there are no proper guidelines for decision making continuity cannot be guaranteed. It is quite natural that new people join while some others retire or leave the organization. It is only management that keeps the organization continuing.

Integrating various interest groups: In the organized efforts, there are various interest groups and they put pressure over other groups for maximum share in the combined output. For example, in case of a business organization, there are various pressure groups such as shareholders, employee

3. Explain the approach management

In the 1960, an approach to management appeared which try to unify the prior schools of thought. This approach is commonly known as ‘Systems Approach’. Its early contributors include Ludwing Von Bertalanfty, Lawrence J. Henderson, W.G. Scott, Deniel Katz, Robert L. Kahn, W. Buckley and J.D. Thompson.

They viewed organisation as an organic and open system, which is composed of interacting and interdependent parts, called subsystems. The system approach is top took upon management as a system or as “an organised whole” made up of sub-systems integrated into a unity or orderly totality.

4. what are Managerial Qualities and Training

According to Fayol the following are the list of qualities required in a manager.

- Physical (Health, Vigor and Health)
- Mental (Ability to understand and learn, judgment, mental vigor and capability)
- Moral (energy, firmness, initiative, loyalty, tact etc.)
- Educational
- Technical (peculiar to the function being performed)
- Experience
5. What are the 3 different types of leadership styles

**Autocratic Leadership:** It is also known as authoritarian, directive or monothetic style. In autocratic leadership style, a manager centralizes decision-making power in him. He structures the complete situation for his employees and they do what they are told. Here the leadership may be negative because followers are uninformed, insecure, and afraid if the leader’s authority.

**Participative Leadership Style:** It is also called as democratic, consultative or idiographic leadership style. In this style the manager decentralizes his decision-making process. Instead of taking unilateral decision he emphasizes consultation and participation of his subordinates. He can win the cooperation of his group and can motivate them effectively and positively.

**Free Rein Leadership:** Free Rein or laissez – faire technique means giving complete freedom to subordinates. In this style, manager once determines policies, programmes and limitations for action and the entire process is left to subordinates. Group member’s person everything and the manager usually maintains contacts with outside persons to bring the information and materials which the group needs.

---

**Five marks questions with answers**

1. Explain FAYOL'S PRINCIPLES OF MANAGEMENT.
   Fayol has given 14 principles of management. He has made distinction between management principles and management elements. While management principles is a fundamental truth and establishes cause effect relationship, elements of management denotes the function performed by a manager.

   1. Division of work: It is helpful to take the advantage of specialization. Here, the work is divided among the members of the group based on the employees skills and talents. It can be applied at all levels of the organization.
   2. Authority and Responsibility: Fayol finds authority as a continuation of official and personal factors. Official authority is derived from the manager’s position and personal authority is derived from personal qualities such as intelligence, experience, moral worth, past services, etc., Responsibility arises out of assignment of activity. In order to discharge the responsibility properly, there should be parity between authority and responsibility.
   3. Discipline: All the personal serving in an organization should be disciplined. Discipline is obedience, application, behavior and outward mark of respect shown by employees.
   4. Unity of Command: Unity of command means that a person should get orders from only one superior. Fayol has considered unity of command as an important aspect in managing an organization. He says that —should it be violated, authority is undermined, discipline is in jeopardy, order disturbed, and stability threatened.
   5. Unity of Direction: According to this principle, each group of activities with the same objective must have one head and one plan. It is concerned with functioning of the organization I respect of grouping of activities or planning. Unity of direction provides better coordination among various activities to be undertaken by an organization.
   6. Subordination of individual interest to general interest: Individual interest must be subordinate to general interest when there is conflict between the two. However factors like
ambition, laziness, weakness, etc., tend to reduce the importance of general interest. Therefore, superiors should set an example in fairness and goodness.

7. Remuneration to Personnel: Remuneration to employees should be fair and provide maximum possible satisfaction to employees and employers. Fayol did not favor profit sharing plan for workers but advocated it for managers. He was also in favor of non-financial benefits.

8. Centralization: Everything which goes to increase the importance of subordinate’s role is decentralization; everything which goes to reduce it is centralization. The degree of centralization or decentralization is determined by the needs of the company.

9. Scalar Chain: There should be a scalar chain of authority and of communication ranging from the highest to the lowest.

1. Order: This is a principle relating to the arrangement of things and people. In material order, there should be a place for everything and everything should be in its place. Similarly, in social order, there should be the right man in the right place.

2. Equity: Equity is the combination of justice and kindness. Equity in treatment and behavior is liked by everyone and it brings loyalty in the organization. The application of equity requires good sense, experience and good nature.

3. Stability of tenure: No employee should be removed within short time. There should be reasonable security of jobs. Stability of tenure is essential to get an employee accustomed to new work and succeeding in doing it well.

4. Initiative: Within the limits of authority and discipline, managers should encourage their employees for taking initiative. Initiative is concerned with thinking out and execution of a plan. Initiative increases zeal and energy on the part of human beings.

5. Esprit de corps: It is the principle of union is strength and extension of unity of command for establishing team work. The manager should encourage esprit de corps among his employees.

2. Explain HERZBERG’S MOTIVATION – HYGIENE THEORY.
Frederick Hertzberg conducted a structured interview programme to analyse the experience and feelings of 200 engineers and accountants in nine different companies in Pittsburg area, U.S.A during the structured interview, they were asked to describe a few previous job experiences in which they felt ‘exceptionally good’ or exceptionally bad about jobs.

In his analysis, he found that there are some job conditions which operate primarily to dissatisfy employees when the conditions are absent, however their presence does not motivate them in a strong way.

Hygiene factors
These are company policy and administration, technical supervision, salary, job security, personal life, status, working conditions, interpersonal relationship with superiors, interpersonal relationship with peers and interpersonal relationship with subordinates.

These maintenance factors are necessary to maintain at a reasonable level of satisfaction in employees. Any increase beyond this level will not produce any satisfaction to the employees: however, any cut below this level will dissatisfy them.
Motivational Factors:
These factors are capable of having a positive effect on job satisfaction often resulting in an increase in one's total output. Hertzberg includes six factors that motivate employees. These are achievement, recognition, advancement; work itself, possibility of growth and responsibility.

3. Discuss the meaning, nature and objectives of organization

Management is a process involving planning, organizing, directing and controlling human efforts to state of objectives in an organization.

The second phase of management process is organizing, which basically involves analysis of activities to be performed for achieving organizational objectives, grouping these activities into various division, departments and sections so that these can be assigned to various individuals and delegating them appropriate authority so that they are able to carry on their work effectively.

CONCEPT OF ORGANISATION AND ORGANISING:

In management literature, sometimes the term organisation and organizing are used interchangeably because the term organisation is used in many ways. But it is not correct organisation is different from organising. Organising is one of the functions of management whereas organisation refers to the institution where in the functions of management is performed.

Organising is a process of –

□ Determining, grouping and structuring the activities.

□ Creating rules for effective performance at work.

□ Allocation necessary authority and responsibility.

□ Determining detailed procedures and systems for different problems areas such as coordination, communication motivation etc.

The ultimate result of organising is organisation. In other words, organising function ends with creating a structure of relationships

4. Explain the Subject layout in 5 units

LINE ORGANISATION STRUCTURE

It is also known as scalar, military, or vertical organisation and perhaps is the oldest form. In this form of organisation managers have direct responsibility for the results; line organisation can be designed in two ways

1. PURE LINE ORGANISATION:
Under this form, similar activities are performed at a particular level. Each group of activities is self-contained unit and is able to perform the assigned activities without the assistance of other managers.

Production Manager

Foreman-A  Foreman-B  Foreman-c

2. DEPARTMENTAL LINE ORGANISATION:

Under this form, entire activities are divided into different departments on the basis of similarity of activities. The basic objective of this form is to have uniform control, authority and responsibility.

Merits  Demerits

1) It is simple to understand
2) Easy supervision & control
3) Quick decisions
4) It sets clearly the direct lines of authority and responsibility of a line manager

5. **Explain Cellular Organisation**

   Organisation structured around the units/cells that complete the entire assembly processes are called cellular organisations. In the modern organisations, cellular Organisations have been replacing the continuous line or linear production process systems. In cellular organisations, workers manufacture total product or subassemblies in teams (cells).

   Every team (cell) of workers has the responsibility to improve or maintain the quality and quantity of its products. Each team is free to reorganise itself to improve performance and product quality. These cells comprise self-managed teams. They monitor themselves and also correct where necessary on their own. Cellular Organisations are characterised by much smaller staff all over the Organisation with middle management positions reduced and lean management members at the top. It is both a lean and flat structure.
Objective question with answers

11. Henri fayol laid down [C]
   a. 10 principles b. 12 principles c. 14 principles d. None

2. Esprit corps means [D]
   a. Union is strength b. service is our motto c. buyer seller d. none of the above

3. Which of the following is a major function of management? [D]
   a. Planning b. organizing c. controlling d. all of the above.

4. Which of the following contributed by F.W.Taylor? [B]
   a. Principles of management b. scientific management c. theory of motivation d. 14 principles

5. Management is [C]
   a. An art b. science c. both d. None

6. Need based theory of motivation invented by [A]
   a. MC Gregor b. Peter drucker c. Elton Mayo d. Maslow

7. The first men who advocated the view that the management should can be target [B]

8. Which of the following roles does not constitute management roles as proposed by Henry Mintzberg? [B]
   a. Interpersonal role b. informational role c. decision role d. training role

9. Which one of the following approach has emerged from the findings of Hawthorne experiments? [D]
   a. Human behavior approach b. system approach c. human relations approach d. decision theory approach

10. Write one of the following is not associated with social responsibility? [D]
    a. social commitment b. social concern c. social programme d. social structure
FILL IN THE BLANKS

1. The father of scientific Management is---------
   Ans: F.W Taylor

2. Unity of command means ------------------------
   Ans: one employee one boss

3. ESpirit De corps means-----------------------
   Ans: Teamwork

4. Theory X & y was contributed by-----------------
   Ans: McGregor

5. A flat organization is always associated with -------------
   Ans: Wider span

6. The lines of authority are identified in-------------
   Ans: organization structure

7. The project organization is also called-------------
   Ans: Matrix organization

8. The framework of an establishment is called ----------
   Ans: organization

9. Management is necessary to ensure-----------------
   Ans: continuity in organization

10. Planning ends with -----------------------
    Ans: decision making
UNIT-II

Two marks questions with answers

1. What do you mean by layout?
   Product or Line Layout: If all the processing equipment and machines are arranged according to the sequence of operations of the product, the layout is called product type of layout. In this type of layout, only one product of one type of products is produced in an operating area.

2. Name the 3 layouts?
   Types of plant Layout
   1. Product or Line Layout
   2. Process or Functional Layout.

3. Define the production?
   Job production where items are made individually and each item is finished before the next one is started. Designer dresses are made using the job production method.
   Batch production where groups of items are made together. Each batch is finished before starting the next block of goods. For example, a baker first produces a batch of 50 white loaves. Only after they are completed will he or she start baking 50 loaves of brown bread.

4. Explain the different methods of production
   Flow production where identical, standardised items are produced on an assembly line. Most cars are mass-produced in large factories using conveyor belts and expensive machinery such as robot arms. Workers have specialised jobs, for instance, fitting wheels.

5. What is work study
   Work study is a term used to embrace the techniques of method study and work measurement which are employed to ensure the best possible use of human and material resources in carrying out a specified activity.” In other words, “work study is a tool or technique of management involving the analytical study of a job or operation.” Work study helps to increase productivity.

MD ASIF (Asst.Professor)
**Three marks questions with answers**

1. **What is Method study?**

**Method Study**

Method study aims to achieve the better method of doing work, and for this reason method study is sometimes called Work Method Design.

**Definition:** Method study can be defined as the procedure for systematic recording, analysis and critical examination of existing or proposed method of doing work for the purpose of development and application of easier and more effective method.

**Method Study Procedure**

The following general steps describe the procedure for making a method study.

1. Select the job – on which method study is to be applied.
2. Obtain information and record.
3. Examine the information critically.
4. Develop the most practical, economical and effective method by considering real limitations of the situation.
5. Install the new method as standard practice.
6. Maintain the standard practice by regular follow up.

2. **What is the procedure?**

The basic procedure of work study is as follows:

- Select the job or process to be suited.
- Record from direct observation everything that happens in order to obtain data for analysis.
- Examine the recorded facts critically and challenge everything that is done, considering in turn: the purpose of activity, the place where it is performed, the sequence in which the elements are performed, the person who is doing it, the means by which it is done.
- Develop the most economic methods, taking into account all the circumstances.
- Measure the amount of work involved in the method used and calculate a “standard time” for doing it.
- Define the new method and the related time.
- Install the new method and time as agreed standard practices.
- Maintain the new standard practice by proper control procedure.
3. **what is Business process Reengineering**

Business Process Reengineering involves the radical redesign of core business processes to achieve dramatic improvements in productivity, cycle times and quality. In Business Process Reengineering, companies start with a blank sheet of paper and rethink existing processes to deliver more value to the customer.

Business Process Reengineering involves the radical redesign of core business processes to achieve dramatic improvements in productivity, cycle times and quality. In Business Process Reengineering, companies start with a blank sheet of paper and rethink existing processes to deliver more value to the customer. They typically adopt a new value system that places increased emphasis on customer needs. Companies reduce organizational layers and eliminate unproductive activities in two key areas. First, they redesign functional organizations into cross-functional teams. Second, they use technology to improve data dissemination and decision making.

4. **Discuss about what do you mean by statistical quality control ?**

Statistical quality control refers to the use of statistical methods in the monitoring and maintaining of the quality of products and services. One method, referred to as acceptance sampling, can be used when a decision must be made to accept or reject a group of parts or items based on the quality found in a sample.

In manufacturing, a measure of excellence or a state of being free from defects, deficiencies and significant variations. It is brought about by strict and consistent commitment to certain standards that achieve uniformity of a product in order to satisfy specific customer or user requirements. ISO 8402-1986 standard defines quality as "the totality of features and characteristics of a product or service that bears its ability to satisfy stated or implied needs." If an automobile company finds a defect in one of their cars and makes a product recall, customer reliability and therefore production will decrease because trust.

5. **Explain Types of Process Data & Control Charts**

Two types of process data:

1. Variable: continuous data. Things we can measure. Example includes length, weight, time, temperature, diameter, etc.
2. Attribute: discrete data. Things we count. Examples include number or percent defective items in a lot, number of defects per item etc.

Types of Control Charts: the classification of control charts depend upon the type of data.

1. Variable charts: are meant for variable type of data. X bar and R Chart, X bar and sigma chart, chart for the individual units
2. Attribute charts: are meant for attribute type of data. p chart, np chart, c chart, u chart, U chart
Five marks questions with answers

1. Write short note on:
   i. DSP
   ii. PLD
   iii. ASIC
   iv. COTS

(i) Digital Signal Processors:

- DSP are powerful special purpose 8/16/32 bit microprocessor designed to meet the computational demands and power constraints of today’s embedded audio, video and communication applications.
- DSP are 2 to 3 times faster than general purpose microprocessors in signal processing applications. This is because of the architectural difference between DSP and general purpose microprocessors.
-DSPs implement algorithms in hardware which speeds up the execution whereas general purpose processor implement the algorithm in software and the speed of execution depends primarily on the clock for the processors.

DSP includes following key units:

  **Program memory:** It is a memory for storing the program required by DSP to process the data.
  **Data memory:** It is a working memory for storing temporary variables and data/signal to be processed.
  **Computational engine:** It performs the signal processing in accordance with the stored program memory computational engine incorporated many specialized arithmetic units and each of them operates simultaneously to increase the execution speed. It also includes multiple hardware shifters for shifting operands and saves execution time.
  **I/O unit:** It acts as an interface between the outside world and DSP. It is responsible for capturing signals to be processed and delivering the processed signals.

Examples:
1. Audio video signal processing, telecommunication and multimedia applications.
2. SOP(Sum of Products) calculation, convolution, FFT(Fast Fourier Transform), DFT (Discrete Fourier Transform), etc are some of the operation performed by DSP.

(ii) Application Specific Integrated Circuits(ASIC)

- ASICs is a microchip design to perform a specific and unique applications.
- Because of using single chip for integrates several functions there by reduces the system development cost.
Most of the ASICs are proprietary (which having some trade name) products, it is referred as Application Specific Standard Products (ASSP).

As a single chip ASIC consumes a very small area in the total system. Thereby helps in the design of smaller system with high capabilities or functionalities.

The developers of such chips may not be interested in revealing the internal detail of it.

(iii) Programmable logic devices (PLD’s)

- A PLD is an electronic component. It used to build digital circuits which are reconfigurable. A logic gate has a fixed function but a PLD does not have a defined function at the time of manufacture.
- PLDs offer customers a wide range of logic capacity, features, speed, voltage characteristics.
- PLDs can be reconfigured to perform any number of functions at anytime.
- A variety of tools are available for the designers of PLDs which are inexpensive and help to develop, simulate and test the designs.

PLDs are following two major types

- **CPLD (Complex Programmable Logic Device):**
  CPLDs offer much smaller amount of logic up to 1000 gates.

- **FPGAs (Field Programmable Gate Arrays):**
  It offers highest amount of performance as well as highest logic density, the most features.

Advantages of PLDs:-
1) PLDs offer customer much more flexibility during the design cycle.
2) PLDs do not require long lead times for prototypes or production parts because PLDs are already on a distributor’s shelf and ready for shipment.
3) PLDs can be reprogrammed even after a piece of equipment is shipped to a customer

(iv) Commercial off-the-shelf components (COTs)

- A Commercial off the Shelf product is one which is used 'as- is'.
- The COTS components itself may be develop around a general purpose or domain specific processor or an ASICs or a PLDs.
- The major advantage of using COTS is that they are readily available in the market, are chip and a developer can cut down his/her development time to a
The major drawback of using COTS components in embedded design is that the manufacturer of the COTS component may withdraw the product or discontinue the production of the COTS at any time if rapid change in technology occurs.

Advantages of COTS:
1) Ready to use
2) Easy to integrate
3) Reduces development time

Disadvantages of COTS:
4) No operational or manufacturing standard (all proprietary)
5) Vendor or manufacturer may discontinue production of a particular COTS product

2. DEFINE SENSOR AND ACTUATOR?

Sensor
- A Sensor is used for taking input.
- It is a transducer that converts energy from one form to another for any measurement or control purpose.
- Ex. A Temperature sensor

Actuator
- Actuator is used for output.
- It is a transducer that may be either mechanical or electrical which converts signals to corresponding physical actions.
- Ex. LED (Light Emitting Diode)
- LED is a p-n junction diode and contains a Cathode and Anode
- For functioning the anode is connected to +ve end of power supply and cathode is connected to –ve end of power supply.
- The maximum current flowing through the LED is limited by connecting a RESISTOR in series between the power supply and LED as shown in the figure below.
There are two ways to interface an LED to a microprocessor/microcontroller:

**The Anode of LED is connected to the port pin and cathode to Ground:**
In this approach the port pin sources the current to the LED when it is at logic high (i.e. 1).

**The Cathode of LED is connected to the port pin and Anode to Vcc:**
In this approach the port pin sources the current to the LED when it is at logic high (i.e. 1). Here the port pin sinks the current and the LED is turned ON when the port pin is at Logic low (i.e. 0).

3. Explain about Onboard communication interface?

Onboard Communication Interfaces
- These are used for internal communication of the embedded system i.e. communication between different components present on the system.
- Common examples of onboard interfaces are:
  - Inter Integrated Circuit (I2C)
  - Serial Peripheral Interface (SPI)
  - Universal Asynchronous Receiver Transmitter (UART)
  - 1-Wire Interface
  - Parallel Interface

**Inter Integrated Circuit (I2C)**
- It is synchronous
- Bi-directional, half duplex, two wire serial interface bus
- Developed by Phillips semiconductors in 1980
- It comprises of two buses:
  1. Serial clock – SCL
  2. Serial Data – SDA
- SCL generates synchronization clock pulses
- I2C is a shared bus system to which many devices can be connected
- Devices connected by I2C can act as either master or slave
- The master device is responsible for controlling communication by initiating/terminating data transfer.
- Devices acting as slave wait for commands from the master and respond to those commands.

I2C Bus Interfacing

4. Discuss about External or Peripheral Communication Interfaces?

These are used for external communication of the embedded system i.e: communication of different components present on the system with external or peripheral components/devices.

Common examples of external interfaces are:
- Universal Serial Bus(USB)
- IEEE 1394(Fire wire)
- Infrared(IrDA)
- Bluetooth
- Wi-Fi
- ZigBee
- General Packet Radio Service(GPRS)
- RS-232 & RS-485

RS-232 & RS-485

- It is wired, asynchronous, serial, full duplex communication
- RS 232 interface was developed by EIA(Electronic Industries Associates) in early 1960s
- RS-232 is the extension to UART for external communications
RS-232 logic levels use:

- +3 to +25 volts to signify a "Space" (Logic 0)
- -3 to -25 volts to signify a "Mark" (logic1).

RS 232 supports two different types of connectors:

**DB 9 and DB 25** as shown in figure below

- RS 232 interface is a point to point communication interface and the devices involved are called as Data Terminating Equipment (DTE) And Data Communications Terminating Equipment (DCE)
- Embedded devices contain UART for serial transmission and generate signal levels as per TTL/CMOS logic.
- A level translator IC (like Max 232) is used for converting the signal lines from UART to RS 232 signal lines for communication.
- The vice versa is performed on the receiving side.
- Converter chips contain converters for both transmitters and receivers
- RS 232 is used only for point to point connections
- It is susceptible to noise and hence is limited to short distances only
- RS 422 is another serial interface from EIA.
- It supports multipoint connections with 1 transmitter and 10 receivers.
- It supports data rates up to 100 Kbps and distance up to 400 ft
- RS 485 is enhanced version of RS 422 and supports up to 32 transmitters and 32 receivers

5. **Explain about types of memory**

**Introduction**

Many types of memory devices are available for use in modern computer systems. As an embedded software engineer, you must be aware of the differences between them and understand how to use each type effectively

**Types of RAM**

The RAM family includes two important memory devices:

- Static RAM (SRAM) and
- Dynamic RAM (DRAM).
The primary difference between them is the lifetime of the data they store. SRAM retains its contents as long as electrical power is applied to the chip. If the power is turned off or lost temporarily, its contents will be lost forever. DRAM, on the other hand, has an extremely short data lifetime—typically about four milliseconds. This is true even when power is applied constantly.

In short, SRAM has all the properties of the memory you think of when you hear the word RAM. Compared to that, DRAM seems kind of useless. By itself, it is. However, a simple piece of hardware called a DRAM controller can be used to make DRAM behave more like SRAM. The job of the DRAM controller is to periodically refresh the data stored in the DRAM. By refreshing the data before it expires, the contents of memory can be kept alive for as long as they are needed. So DRAM is as useful as SRAM after all. When deciding which type of RAM to use, a system designer must consider access time and cost. SRAM devices offer extremely fast access times (approximately four times faster than DRAM) but are much more expensive to produce.

Types of ROM

Memories in the ROM family are distinguished by the methods used to write new data to them (usually called programming), and the number of times they can be rewritten.

This classification reflects the evolution of ROM devices from hardwired to programmable to erasable-and-programmable. A common feature of all these devices is their ability to retain data and programs forever, even during a power failure.

The very first ROMs were hardwired devices that contained a preprogrammed set of data or instructions. The contents of the ROM had to be specified before chip production, so the actual data could be used to arrange the transistors inside the chip. Hardwired memories are still used, though they are now called "masked ROMs" to distinguish them from other types of ROM.

The primary advantage of a masked ROM is its low production cost. Unfortunately, the cost is low only when large quantities of the same ROM are required. One step up from the masked ROM is the PROM (programmable ROM), which is purchased in an unprogrammed state. If you were to look at the contents of an unprogrammed PROM, you would see that the data is made up entirely of 1's. The process of writing your data to the PROM involves a special piece of equipment called a device programmer. The device programmer writes data to the device one word at a time by applying an electrical charge to the input pins of the chip. Once a PROM has been programmed in this way, its contents can never be changed. If the code or data stored in the PROM must be changed, the current device must be discarded. As a result, PROMs are also known as one-time programmable (OTP) devices.

An EPROM (erasable-and-programmable ROM) is programmed in exactly the same manner as a PROM. However, EPROMs can be erased and reprogrammed repeatedly. To erase an EPROM, you simply expose the device to a strong source of ultraviolet light. (A window in the top of the device allows the light to reach the silicon.) By doing this, you essentially reset the entire chip to its initial-unprogrammed-state. Though more expensive than PROMs, their ability to be reprogrammed makes EPROMs an essential part of the software development and testing process. As memory technology has matured in recent years, the line between RAM and
ROM has blurred. Now, several types of memory combine features of both. These devices do not belong to either group and can be collectively referred to as hybrid memory devices.

Hybrid memories can be read and written as desired, like RAM, but maintain their contents without electrical power, just like ROM.

Two of the hybrid devices, EEPROM and flash, are descendants of ROM devices. These are typically used to store code. The third hybrid, NVRAM, is a modified version of SRAM. NVRAM usually holds persistent data. EEPROMs are electrically-erasable-and-programmable. Internally, they are similar to EPROMs, but the erase operation is accomplished electrically, rather than by exposure to ultraviolet light. Any byte within an EEPROM may be erased and rewritten. Once written, the new data will remain in the device forever—or at least until it is electrically erased. The primary tradeoff for this improved functionality is higher cost, though write cycles are also significantly longer than writes to a RAM. So you wouldn't want to use an EEPROM for your main system memory.

Flash memory combines the best features of the memory devices described thus far. Flash memory devices are high density, low cost, nonvolatile, fast (to read, but not to write), and electrically reprogrammable. These advantages are overwhelming and, as a direct result, the use of flash memory has increased dramatically in embedded systems. From a software viewpoint, flash and EEPROM technologies are very similar.

The major difference is that flash devices can only be erased one sector at a time, not byte-by-byte. Typical sector sizes are in the range 256 bytes to 16KB. Despite this disadvantage, flash is much more popular than EEPROM and is rapidly displacing many of the ROM devices as well. The third member of the hybrid memory class is NVRAM (non-volatile RAM). Nonvolatility is also a characteristic of the ROM and hybrid memories discussed previously. However, an NVRAM is physically very different from those devices. An NVRAM is usually just an SRAM with a battery backup. When the power is turned on, the NVRAM operates just like any other SRAM. When the power is turned off, the NVRAM draws just enough power from the battery to retain its data.

NVRAM is fairly common in embedded systems. However, it is expensive—even more expensive than SRAM, because of the battery—so its applications are typically limited to the storage of a few hundred bytes of system-critical information that can't be stored in any better way.

**Objective question with answers**

1. Which of the following is not an embedded system 
   A) Smartphone 
   B) Digital Camera 
   C) MP3 Player 
   D) Desktop Computer

2. Embedded systems are 
   A) General purpose 
   B) Special purpose 
   C) Desktop Computer 
   D) None

3. The first recognized embedded system is 
   A) AGC 
   B) Apple computer 
   C) Calculator 
   D) none

MD ASIF (Asst. Professor)
4. Which of the following is an intended purpose of embedded system
   A) Data communication
   B) Data Monitoring
   C) Data collection
   D) All of these

5. Application specific user interface example
   A) Mobile phone
   B) Multimeter
   C) ECG
   D) None

6. Electronic toy is an example of
   A) Small scale embedded system
   B) Medium scale embedded system
   C) Large scale embedded system
   D) None

7. Example of first generation embedded system
   A) Z80 and 8085
   B) 8086
   C) Both
   D) None

8. Example of third generation embedded system
   A) Z80 and 8085
   B) 8086
   C) SCADA
   D) None

9. Real time embedded systems are classified into how many types
   A) 1
   B) 2
   C) 6
   D) None

10. The user interface of UGC is called as
    A) DSKY
    B) Mouse
    C) Both
    D) None

Q.No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10
Key  | D | B | A | D | A | A | A | C | B | A

Fill in the blanks question with answers

1. Embedded systems are __________-
2. The first recognized modern embedded system is __________-
3. A digital multimeter is an example of an embedded system for ___ ________-
4. ASIC stands for __________-
5. Response is a measure of __________-
6. A stepper motor is an ________- device
7. Which was the first mass produced embedded system __________-
8. Second generations embedded system example __________-
9. ECG stands for __________-
10. MTBF stands for __________-

MD ASIF (Asst.Professor)
<table>
<thead>
<tr>
<th>S.No</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Special purpose</td>
</tr>
<tr>
<td>2.</td>
<td>AGC</td>
</tr>
<tr>
<td>3.</td>
<td>monitoring</td>
</tr>
<tr>
<td>4.</td>
<td>application specific integrated circuit</td>
</tr>
<tr>
<td>5.</td>
<td>quickness of system</td>
</tr>
<tr>
<td>6.</td>
<td>electro mechanical</td>
</tr>
<tr>
<td>7.</td>
<td>Minuteman</td>
</tr>
<tr>
<td>8.</td>
<td>Scada</td>
</tr>
<tr>
<td>9.</td>
<td>electrocardiograms</td>
</tr>
<tr>
<td>10.</td>
<td>Mean time between failures</td>
</tr>
</tbody>
</table>

**UNIT-III**

1. **What is cross compiler**

   It converts the application to a target processor specific code which is different from the processor architecture on which the compiler is running.

2. **Define link editor**

   In computing, a linker or link editor is a computer program that takes one or more object files generated by a compiler and combines them into a single executable file, library file, or another object file.

3. **In how many ways mixing of assembly and high level language can be done**

   Three ways
   - Mixing assembly with c
   - Mixing c with assembly
   - Invoking assembly instructions inline from the high level code

4. **Define PCB**

   A printed circuit board (PCB) mechanically supports and electrically connects electronic components using conductive tracks, pads and other features etched from copper sheets laminated onto a non-conductive substrate.
5. **Discuss real time clock**

A real-time clock (RTC) is a computer clock (most often in the form of an integrated circuit) that keeps track of the current time.

**Three marks questions with answers**

6. **Define watch dog timer**

The watchdog timer is a timing device that resets the system after a predefined timeout. This time is usually configured and the watchdog timer is activated within the first few clock cycles after power-up. It has a number of applications. In many embedded systems reset by a watchdog timer is very essential because it helps in rescuing the system if a fault develops and the program gets stuck. On restart, the system can function normally. Most microcontrollers have on-chip watchdog timers.

7. **What is assembly language**

An assembly (or assembler) language, often abbreviated ASM, is a low-level programming language for a computer, or other programmable device, in which there is a very strong (but often not one-to-one) correspondence between the language and the architecture's machine code instructions.

8. **What is the purpose of reset circuit**

It ensures that the device is not operating at a voltage level where the device is not guaranteed to operate during system power on, the reset circuit brings the internal registers of the processor to a known state and starts the firmware execution from the reset vector.

4. **What is the significance of watchdog timer in ES?**

It is a timing device which is set to predefined time interval and some task is to be performed at that time. It is used to reset original state when an inappropriate event take place. It is usually operated by counter device.

5. **Discuss about importance of RTC**

RTCs are essential; if the battery fails, it must be replaced to ensure continued operation. A dead battery can be diagnosed with an error message at startup or if the user finds that the clock or the setup configuration has become corrupted, flaky or odd.

**Benefits of RTCs include:**

MD ASIF (Asst.Professor)
RTC ICs have proved to be more precise than other methods — like programming the timer of the controller. It frees the main system from time-critical tasks. It has low power consumption and improved frequency stability.

**Five marks questions with answers**

1. **Discuss about super loop based approach**

The 'Super Loop' Architecture for Embedded C programming an Embedded C Application, there are set of statements which need to be executed forever. Because there are no operating system to return to or an embedded device is running until the power supply is removed. So, to run set of statements, we need a loop that must not be finished, such kind of loops are known as 'Super Loop' or 'Infinite Loop'.

*There is only one difference between 'Super Loop' and 'Infinite Loop'*: There may only one 'Super Loop' but the 'Infinite Loop' may be infinite (i.e. there is no limit of infinite loops in a program).

**Consider the given example (Syntax)**

```c
int main()
{
    /*PINs configuration, interrupts, timers initialization etc*/
    initialize();

    /*Super/Infinite Loop*/
    while(1)
    {
        /*application's tasks*/
        ...;
        anything();
        ...;
    }

    /*program's execution will never reach here*/
    return 0;
}
```

In this example, we used while (1) as 'Super Loop', here while is a looping statement and 1 is a non zero value that will also true and programming will run forever.

**Note:** Since, program's execution will not reach to end of the program, hence return 0 will never be executed, we can also use void main() instead of int main() and then there is no need to use return 0.

**initialize()**

Here, initialize() is not a standard library function, we just wrote this function as an example. That mean at this section before 'Super Loop' you can place initialization related codes (like initializations of interrupts, times, pins configuration, memory and other attached devices).
anything()
Here, anything() is also not a standard library function, at this section you can actual code that you want to execute again and again to keep running the device.
Benefits of 'Super Loop'
These are some of the benefits of using super loop in an Embedded Application.

- 'Super Loop' runs give statements within the scope forever.
- It is very simple to use, edit, debug and understand.
- Less or no dependencies on the hardware.

2. Explain about embedded based OS approach

Embedded operating systems are usually used for hardware that have very little computing power, little RAM/ROM and a slow CPU, so they tend to be very specific in their applications and scope. They are usually made using assembly language in order to really take advantage of the limited computing resources, since it is the closest to machine language and is able to squeeze every drop of computing power available. This means that the OS is optimized for whatever hardware it was developed for and will not be compatible with other hardware systems with different configurations.
In most embedded OSs, the applications are built in to the OS or part of the OS, so they are loaded immediately when the OS starts. The most common examples of devices with an embedded OS would be cell phones before Android and iOS popularized the mobile operating system, which may still be considered as embedded but are also arguably desktop-like in the way they handle tasks and apps and their access to vast amounts of computing power. Embedded OSs can also be found in cars, large laser printers, some home appliances, and even military systems.

Notable embedded OSs currently in use by consumers include:

- Symbian - Used in cell phones, mainly ones made by Nokia
- Embedded Linux - Of which Android is a subset, used in many other devices like printers
- BlackBerry OS - For BlackBerry phones
- iOS - Subset of Mac OS X, used in Apple’s mobile devices
- Palm OS
- Windows Mobile

3. Discuss about Assembly Language Programming

Assembly codes sensitive to the processor, memory, ports and devices hardware Gives a precise control of the processor internal devices Enables full use of processor specific features in its instruction set and its addressing modes
Machine codes are compact, processor and memory sensitive System needs a smaller memory. Memory needed does not depend on the programmer data type selection and rule declarations Not the compiler specific and library functions specific
Device driver codes may need only a few assembly instructions. Bottom-up-design approach

Assembly languages were developed to provide mnemonics or symbols for the machine level code instructions. Assembly language programs consist of mnemonics, thus they should be translated into machine code. A program that is responsible for this conversion is known as assembler. Assembly language is often termed as a low-level language because it directly works with the internal structure of the CPU. To program in assembly language, a programmer must know all the registers of the CPU.

Different programming languages such as C, C++, Java and various other languages are called high-level languages because they do not deal with the internal details of a CPU. In contrast, an assembler is used to translate an assembly language program into machine code (sometimes also called object code or opcode). Similarly, a compiler translates a high-level language into machine code. For example, to write a program in C language, one must use a C compiler to translate the program into machine language.

4. Analyze about Structure of Assembly Language

An assembly language program is a series of statements, which are either assembly language instructions such as ADD and MOV, or statements called directives. An instruction tells the CPU what to do, while a directive (also called pseudo-instructions) gives instruction to the assembler. For example, ADD and MOV instructions are commands which the CPU runs, while ORG and END are assembler directives. The assembler places the opcode to the memory location 0 when the ORG directive is used, while END indicates to the end of the source code. A program language instruction consists of the following four fields:

[ label: ] mnemonics [ operands ] [:comment ]

A square bracket ( [ ] ) indicates that the field is optional.

- The label field allows the program to refer to a line of code by name. The label fields cannot exceed a certain number of characters.

- The mnemonics and operands fields together perform the real work of the program and accomplish the tasks. Statements like ADD A, C & MOV C, #68 where ADD and MOV are the mnemonics, which produce opcodes; "A, C" and "C, #68" are operands. These two fields could contain directives. Directives do not generate machine code and are used only by the assembler, whereas instructions are translated into machine code for the CPU to execute.

5. Explain about brown out protection circuit

Well almost all microcontrollers have Brownout protection inbuilt in them but when connecting a controller to an industry sensor and controlling devices (which are
 extremely costly) it's better we know what a brownout and how is it detected in a microcontroller cause many devices in low to medium scale industry may not be as immune to brownout as our controller.

So what's a brown out??

Brownout as an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. The reduction lasts for minutes or hours, as opposed to short-term voltage sag or dip. The brown out can cause one of the three things for a dc supply system. These things in turn can damage the connected embedded systems. An unregulated direct current supply will produce a lower output voltage for electronic circuits. The output ripple voltage will decrease in line with the usually reduced load current.

A linear direct current regulated supply will maintain the output voltage unless the brownout is severe and the input voltage drops below the drop out voltage for the regulator, at which point the output voltage will fall and high levels of ripple from the rectifier/reservoir capacitor will appear on the output.

A switched-mode power supply which has a regulated output will be affected. As the input voltage falls, the current draw will increase to maintain the same output voltage and current, until such a point that the power supply malfunctions.

Brownouts can cause unexpected behavior in systems with digital control circuits. Reduced voltages can bring control signals below the threshold at which logic circuits can reliably detect which state is being represented. As the voltage returns to normal levels the logic can latch at an incorrect state; even can't happen states become possible.

The seriousness of this effect and whether steps need to be taken by the designer to prevent it depends on the nature of the equipment being controlled; for instance a brownout may cause a motor to begin running backwards.

6. Analyze the reset circuit

Reset means that the processor starts the processing of instructions from a starting address. That address is one that is set by default in the processor program counter (or instruction pointer and code segment registers in x86 processors) on a power-up. From that address in memory, the fetching of program-instructions starts following the reset of the processor. [In certain processors, for example, 68HC11 and HC12, there are two start-up addresses. One is as per power-up reset vector and other is as per reset vector after the Reset instruction or after a time-out (for example from a watchdog timer)]. The reset circuit activates for a fixed period (a few clock cycles) and then deactivates. The processor circuit keeps the reset pin active and then deactivates to let the program proceed from a default beginning address. The reset pin or the internal reset signal, if connected to the other units (for example, I/O interface or Serial Interface) in the system, is activated again by the processor; it becomes an outgoing pin to enforce reset
state in other sister units of the system. On deactivation of the reset that succeeds the processor activation, a program executes from start-up address. Reset can be activated by one of the following:

- An external reset circuit that activates on the power-up, on switching-on reset of the system or on detection of a low voltage (for example < 4.5V when what is required is 5V on the system supply rails). This circuit output connects to a pin called the reset pin of the processor. This circuit may be a simple RC circuit, an external IC circuit or a custom-built IC. The examples of the ICs are MAX 6314 and Motorola MC 34064.

- By (a) software instruction or (b) time-out by a programmed timer known as watchdog timer (or on an internal signal called COP in 68HC11 and 68HC12 families) or (c) a clock monitor detecting a slowdown below certain threshold frequencies due to a fault.

### Objective question with answers

1. RTC acronym
   - A) real tick time
   - B) real clock time
   - C) both
   - D) none

2. LJMP means
   - A) Less jump
   - B) little jump
   - C) large jump
   - D) none

3. ______ from keil software is an example of library creator
   - A) lib51
   - B) lib71
   - C) a51
   - D) none

4. ______ from keil software is an example of linker creator
   - A) al51
   - B) bl51
   - C) a51
   - D) none

5. ______ from keil software is an example for object to hex file converter
   - A) oh51
   - B) bl51
   - C) a51
   - D) none

6. ______ is simple and straightforward without any os related overhead
   - A) super loop
   - B) embedded os based
   - C) a51
   - D) none

7. ______ are examples of RTOS employed in embedded product development
   - A) linux
   - B) vxworks
   - C) both
   - D) none

MD ASIF (Asst.Professor)
8. The accuracy of crystal oscillator is normally expressed in terms of ____ [ ]
   A) pam  B) ppm  C) ppm  D) none

9. _____ is the place holder for arranging different hardware components required to build
   embedded product [ ]
   A) PCB  B) PAB  C) both  D) none

10. ______ are the manufacturer of RTC chips [ ]
    A) maxim  B) atmel  C) both  D) intel

<table>
<thead>
<tr>
<th>Q.No</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>American standard code for info</td>
</tr>
<tr>
<td>2</td>
<td>Watch dog timer</td>
</tr>
<tr>
<td>3</td>
<td>Real time clock</td>
</tr>
<tr>
<td>4</td>
<td>Mnemonics</td>
</tr>
<tr>
<td>5</td>
<td>Super loop model</td>
</tr>
<tr>
<td>6</td>
<td>C</td>
</tr>
<tr>
<td>7</td>
<td>Compiler</td>
</tr>
<tr>
<td>8</td>
<td>Library</td>
</tr>
<tr>
<td>9</td>
<td>Printed circuit board</td>
</tr>
<tr>
<td>10</td>
<td>Conventional based model</td>
</tr>
</tbody>
</table>
UNIT-IV

Two marks questions with answers

1. **What is process life cycle**

   Process Control Block (PCB, also called Task Controlling Block, \[1\]) Entry of the Process Table, \[2\] Task Struct, or Switchframe) is a data structure in the operating system kernel containing the information needed to manage a particular process. The PCB is "the manifestation of a process in an operating system.”

2. **What is user space and kernel space**

   User space is that set of memory locations in which user processes (i.e., everything other than the kernel) run.
   Kernel space can be accessed by user processes only through the use of system calls.

3. **Define light weight processes**

   A thread is a single sequence stream within a process. Because threads have some of the properties of processes, they are sometimes called lightweight processes. What is virtual memory?

4. **Discuss preemptive scheduling**

   Preemption as used with respect to operating systems means the ability of the operating system to preempt (that is, stop or pause) a currently scheduled task in favour of a higher priority task.

Three marks questions with answers

1. **Define round robin scheduling algorithm**

   Round robin scheduling (RRS) is a job-scheduling algorithm that is considered to be very fair, as it uses time slices that are assigned to each process in the queue or line. Each process is then allowed to use the CPU for a given amount of time, and if it does not finish within the allotted time, it is preempted and then moved at the back of the line so that the next process in line is able to use the CPU for the same amount of time.

2. **Explain context switching**

   A context switch (also sometimes referred to as a process switch or a task switch) is the switching of the CPU (central processing unit) from...
one process or thread to another. Context switches can occur only in kernel mode. Kernel mode is a privileged mode of the CPU in which only the kernel runs and which provides access to all memory locations and all other system resources. Other programs, including applications, initially operate in user mode, but they can run portions of the kernel code via system calls.

3. What is process life cycle

Process Control Block (PCB, also called Task Controlling Block,\textsuperscript{[1]} Entry of the Process Table,\textsuperscript{[2]} Task Struct, or Switch frame) is a data structure in the operating system\textsuperscript{k} containing the information needed to manage a particular process. The PCB is "the manifestation of a process in an operating system.

4. What is virtual memory

Virtual memory is a memory management capability of an OS that uses hardware and software to allow a computer to compensate for physical memory shortages by temporarily transferring data from random access memory (RAM) to disk storage. Virtual address space is increased using active memory in RAM and inactive memory in hard disk drives (HDDs) to form contiguous addresses that hold both the application and its data.

5. What is the difference between mutexes and semaphores?

Semaphores are the synchronization tool to overcome critical section problem. Mutex is also a tool that is used to provide deadlock free mutual exclusion. It protects access to every critical data item, if the data is locked and is in use, it either waits for the thread to finish or awakened to release the lock from its inactive state.

Five marks questions with answers

1. Define Operating System and what are the important functions of OS

An Operating System (OS) is an interface between a computer user and computer hardware.

An operating system is a software which performs all the basic tasks like file management, memory management, process management, handling input and output, and controlling peripheral devices such as disk drives and printers.

Some popular Operating Systems include Linux Operating System, Windows Operating System, VMS, OS/400, AIX, z/OS, etc.
Some important functions of OS are

- MemoryManagement
- ProcessorManagement
- DeviceManagement
- FileManagement
- Security
- Control over system performance
- Job accounting
- Error detecting aids
  - Coordination between other software and users

2. What is kernel and what are the types of kernel

The kernel is a part of a software. It is like a bridge between the shell and hardware. It is responsible for running programs and providing secure access to the machine’s hardware. The kernel is used for scheduling, i.e., it maintains a time table for all processes.

**Types of Kernels**

- Monolithic kernel
- Micro kernel
- Exo kernel
- Hybrid kernel

**Monolithic kernel**

Monolithic kernel is a single large processes running entirely in a single address space. It is a single static binary file.

**Micro kernel**

Micro kernels, the kernel is broken down into separate processes, known as servers. Some of the servers run in kernel space and some run in user-space.

**Exo kernel**

Exo kernel is an operating system developed at the Massachusetts Institute of Technology that seeks to provide application-level management of hardware resources. The exo kernel architecture is designed to separate resource protection from management to facilitate application-specific customization.
Hybrid kernel

A hybrid kernel is an operating system kernel architecture that attempts to combine aspects and benefits of microkernel and monolithic kernel architectures used in computer operating systems.

3. Discuss Real-Time Operating System

A real-time system is defined as a data processing system in which the time interval required to process and respond to inputs is small that it controls the environment. The time taken by the system to respond to an input and display of required updated information is termed as the response time. In this method, the response time is very less as compared to online processing.

Real-time systems are used when there are rigid time requirements on the operation of a processor or the flow of data and real-time systems can be used as a control device in a dedicated application. A real-time operating system must have well-defined, fixed time constraints, otherwise the system will fail. For example, Scientific experiments, medical imaging systems, industrial control systems, weapon systems, robots, air traffic control systems, etc.

There are two types of real-time operating systems.

**Hard real-time systems**

Hard real-time systems guarantee that critical tasks complete on time. In hard real-time systems, secondary storage is limited or missing and the data is stored in ROM. In these systems, virtual memory is almost never found.

**Soft real-time systems**

Soft real-time systems are less restrictive. A critical real-time task gets priority over other tasks and retains the priority until it completes. Soft real-time systems have limited utility than hard real-time systems. For example, multimedia, virtual reality, Advanced Scientific Projects like undersea exploration and planetary rovers, etc.

4. Discuss about memory management and device management

**Memory management**

Memory management refers to management of Primary Memory or Main Memory. Main memory is a large array of words or bytes where each word or byte has its own address.
Main memory provides a fast storage that can be accessed directly by the CPU. For a program to be executed, it must in the main memory. An Operating System does the following activities for memory management:

- In multiprogramming, the OS decides which process will get memory when and how much.
- Allocates the memory when a process requests it to do so.
- De-allocates the memory when a process no longer needs it or has been terminated.

**Device Management**

An Operating System manages device communication via their respective drivers. It does the following activities for device management:
- Keeps track of all devices. The program responsible for this task is known as the I/O controller.
- Decides which process gets the device when and for how much time.
- Allocates the device in the most efficient way

5. **Define process and process state transitions**

Process
A process is basically a program in execution. The execution of a process must progress in a sequential fashion

Process transitions

![Process State Diagram]

**Start**

This is the initial state when a process is first started/created.
Ready

The process is waiting to be assigned to a processor. Ready processes are waiting to have the processor allocated to them by the operating system so that they can run. Process may come into this state after Start state or while running it by but interrupted by the scheduler to assign CPU to some other process.

Running

Once the process has been assigned to a processor by the OS scheduler, the process state is set to running and the processor executes its instructions.

Waiting

Process moves into the waiting state if it needs to wait for a resource, such as waiting for user input, or waiting for a file to become available.

Terminated or Exit

Once the process finishes its execution, or it is terminated by the operating system, it is moved to the terminated state where it waits to be removed from main memory.

6. Define multitasking and what are the types of it

The ability to execute more than one task at the same time, a task being a program. The terms multitasking and multiprocessing are often used interchangeably, although multiprocessing implies that more than one CPU is involved. In multitasking, only one CPU is involved, but it switches from one program to another so quickly that it gives the appearance of executing all of the programs at the same time.

There are two basic types of multitasking:

- preemptive
- cooperative.

In preemptive multitasking, the operating system parcels out CPU time slices to each program. In cooperative multitasking, each program can control the CPU for as long as it needs it. If a program is not using the CPU, however, it can allow another program to use it temporarily.

OS/2, Windows 95, Windows NT, the Amiga operating system and UNIX use preemptive multitasking,

whereas Microsoft Windows 3.x and the MultiFinder (for Macintosh computers) use cooperative multitasking.
Objective question with answers

1. Which of the following is an example hard real time system
   B) Air bag control systems  B) Digital Camera
   C) ATM  D) none

2. A Thread does not have its own _______ memories
   C) Data memory  B) heap memory
   C) both  D) None

3. The example of monolithic kernel is
   A) Linux  B) Apple computer
   C) Unix  D) none

4. A good scheduling algorithm has
   D) High cpu utilization  B) medium cpu utilization
   C) low cpu utilization  D) All of these

5. TCB stands for
   a. Task control block  B) task change block
   C) the control block  D) None

6. A process contains at least ------ thread
   a. 1  B) 2
   C) 3  D) None

7. The core of the operating system is called
   a. Kernel  B) rtos
   C) both  D) None

8. TAT stands for
   a. Turn around time  B) turn round time
   C) through around time  D) None

9. SRT means
   a. Shortest remaining time  B) short run time
   C) Both  D) None

10. posix.4a deals with
    A) Thread extensions  B) process extension
    C) real time extension  D) None

<table>
<thead>
<tr>
<th>Q.No</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key</td>
<td>A</td>
<td>C</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
</tbody>
</table>

Fill in the blanks question with answers

MD ASIF (Asst.Professor)
1. Virtual memory is __________
2. First In First Out is __________scheduling algorithm
3. Example of soft real time system ________
4. A ______is a program or part of it ion execution
5. A ______ is preemptive that can execute code
6. LIFO stands for ________
7. Example for RTOS ________
8. Operating systems with a generalized kernel are known as ________
9. RTOS stands for ________
10. The ability of a system to execute multiple processes simultaneously is known as ________

<table>
<thead>
<tr>
<th>Q.No</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>An extremely large main memory</td>
</tr>
<tr>
<td>2.</td>
<td>Non preemptive</td>
</tr>
<tr>
<td>3.</td>
<td>ATM</td>
</tr>
<tr>
<td>4.</td>
<td>Process</td>
</tr>
<tr>
<td>5.</td>
<td>Thread</td>
</tr>
<tr>
<td>6.</td>
<td>Last in first out</td>
</tr>
<tr>
<td>7.</td>
<td>QNX</td>
</tr>
<tr>
<td>8.</td>
<td>General purpose operating system</td>
</tr>
<tr>
<td>9.</td>
<td>Real time operating system</td>
</tr>
<tr>
<td>10.</td>
<td>Multiprocessing</td>
</tr>
</tbody>
</table>

UNIT-V

Two marks questions with answers

1. What is starvation

Starvation: Starvation is a resource management problem where a process does not get the resources it needs for a long time because the resources are being allocated to other processes

2. What is aging

Aging: Aging is a technique to avoid starvation in a scheduling system. It works by adding an aging factor to the priority of each request. The aging factor must increase the request is priority as time passes and must ensure that a request will eventually be the highest priority request (after it has waited long enough)

3. What are the four conditions for deadlock
   - Mutual exclusion
   - Hold and wait
   - No resource preemption
   - Circular wait
4. Define mutex

In computer programming, a mutex (mutual exclusion object) is a program object that is created so that multiple program threads can take turns sharing the same resource, such as access to a file. Typically, when a program is started, it creates a mutex for a given resource at the beginning by requesting it from the system and the system returns a unique name or ID for it.

**Three marks questions with answers**

1. **What is aging**

   Aging: Aging is a technique to avoid starvation in a scheduling system. It works by adding an aging factor to the priority of each request. The aging factor must increase the request’s priority as time passes and must ensure that a request will eventually be the highest priority request (after it has waited long enough).

2. **What is priority ceiling**

   In real-time computing, the priority ceiling protocol is a synchronization protocol for shared resources to avoid unbounded priority inversion and mutual deadlock due to wrong nesting of critical sections. In this protocol each resource is assigned a priority ceiling, which is a priority equal to the highest priority of any task which may lock the resource. The protocol works by temporarily raising the priorities of tasks in certain situations, thus it requires a scheduler that supports dynamic priority scheduling.

3. **What is live lock**

   A condition that occurs when two or more processes continually change their state in response to changes in the other processes. The result is that none of the processes will complete. An analogy is when two people meet in a hallway and each tries to step around the other but they end up swaying from side to side getting in each other's way as they try to get out of the way.

4. **Discuss critical section**

   Critical section is a piece of code that accesses a shared resource (data structure or device) that must not be concurrently accessed by more than one thread of execution. A critical section will usually terminate in fixed time, and a thread, task or process will have to wait a fixed time to enter it (aka bounded waiting). Some synchronization mechanism is required at the entry and exit of the critical section to ensure exclusive use, for example a semaphore.

5. **Explain concept of pipe**

   A pipe is a technique for passing information from one program process to another. Unlike other forms of inter process communication (IPC), a pipe is one-way communication only.

MD ASIF (Asst.Professor)
Basically, a pipe passes a parameter such as the output of one process to another process which accepts it as input. The system temporarily holds the piped information until it is read by the receiving process.

**Five marks questions with answers**

1. **What is deadlock and explain about Coffman conditions?**

   Deadlock is when two or more tasks never make progress because each is waiting for some resource held by another process.

   Example: too little memory

   Two processes each demand 1.5 Gb of memory on a machine with only 2 Gb (and no virtual memory). The operating system kindly gives each 1 Gb exactly. Neither process can make progress until the other gives up some of its memory.

   **Necessary conditions**

   There are four conditions which must hold for deadlock to occur as classically defined. These are known as *Coffman's conditions* from a 1971 survey paper of which Coffman was the first author in alphabetical order (Coffman, E.G., M.J. Elphick, and A. Shoshani, System Deadlocks, ACM Computing Surveys, 3(2):67–78, 1971; coffman_deadlocks.pdf).

   ✓ **Mutual exclusion.** There must be some resource that can't be shared between processes.

   ✓ **Hold and wait.** Some process must be holding one resource while waiting for another.

   ✓ **No preemption.** Only the process holding a resource can release it.

   ✓ **Circular wait.** There must be some cycle of waiting processes P₁, P₂, ...Pₙ such that each process Pᵢ is waiting for a resource held by the next process in the cycle. (Note that this implies hold-and-wait.)

2. **What is semaphore and explain about its types**

   **Semaphores**

   In 1965, Dijkstra proposed a new and very significant technique for managing concurrent processes by using the value of a simple integer variable to synchronize the progress of interacting processes. This integer variable is called *semaphore*. So it is basically a synchronizing tool and is accessed only through two low standard atomic operations, wait and signal designated by P() and V() respectively.

   The classical definition of wait and signal are:

   - **Wait:** decrement the value of its argument S as soon as it would become non-negative.
   - **Signal:** increment the value of its argument, S as an individual operation.

   **Properties of Semaphores**

   - Simple
   - Works with many processes

MD ASIF (Asst.Professor)
Can have many different critical sections with different semaphores
- Each critical section has unique access semaphores
- Can permit multiple processes into the critical section at once, if desirable

**Types of Semaphores**
Semaphores are mainly of two types:

**Binary Semaphore**
It is a special form of semaphore used for implementing mutual exclusion, hence it is often called *Mutex*. A binary semaphore is initialized to 1 and only takes the value 0 and 1 during execution of a program.

**Counting Semaphores**
These are used to implement bounded concurrency.

**Limitations of Semaphores**
- Priority Inversion is a big limitation of semaphores.
- Their use is not enforced, but is by convention only.
- With improper use, a process may block indefinitely. Such a situation is called Deadlock.

3. **Discuss a) message passing  b) shared memory**

**Message Passing**
Message passing is a form of communication used in interprocess communication. Communication is made by the sending of messages to recipients. Each process should be able to name the other processes. The producer typically uses send() system call to send messages, and the consumer uses receive() system call to receive messages. These system calls can be either synchronous or asynchronous, and could either be between processes running on a single machine, or could be done over the network to coordinate machines in a distributed system.
This allows the producer to transfer data to the consumer as it is created.

**Shared Memory**
Shared Memory is an OS provided abstraction which allows a memory region to be simultaneously accessed by multiple programs with an intent to provide communication among them. One process will create an area in RAM which other processes can access (this is typically done using system calls mmap, shmget etc).

Normally the OS prevents processes from accessing the memory of another process, but the Shared Memory features in the OS can allow data to be shared. Since both processes can access the shared memory area like regular working memory, this is a very fast way of communication (as opposed to other mechanisms of IPC). On the other hand, it is less powerful, as for example the communicating processes must be running on the same machine (whereas other IPC methods can use a computer network), and care must be taken to avoid issues if processes sharing memory are running simultaneously and may try to edit the shared buffer at the same time.
4. Explain about device driver

The goal of designing a device driver is to hide the hardware completely. Attempts to hide the hardware completely are difficult.

For example all Flash memory devices share the concept of sectors. An erase operation can be performed only on an entire sector. Once erased individual bites or words can be rewritten. Device drivers for embedded systems are quite different from the workstation counterparts. In modern computers workstation device drivers are most often concerned with satisfying the requirement of the operating system. There are three benefits of good device driver:

i. Modularization, it makes the structure of the overall software is easier to understand.

ii. There exists only one module that interacts directly with the peripheral’s registers making communication easier.

iii. Software changes that result from hardware changes are localized to the device driver.

Components of a Device Driver A device driver can be implemented (as components) in the following steps:

- A data structure that overlays the memory-mapped control and status registers of the device: This basic step involves creating a C style structure that is actually a map of the registers present in the device. These registers can be found out by referring to the data sheet for the device. A table is created which maps the control register to their relative offsets.

- A set of variables to track the current state of the hardware and device driver: It involves listing out the required variables needed to keep track of the state of the hardware and device driver.

- Initialize the hardware: Once the variables to be used are known the next step in device driver programming is to initialize the hardware. Next functions can be written to control the device.

- A set of routines that provide an API for users of the device driver: This involves writing different functions that will implement the various tasks listed to be performed by the device.

- Interrupt service routines Once the required functions and routines are coded the thing remaining to be done is to identify and write routines for servicing the interrupts.

5. What is the meaning of the term busy waiting? Explain why spinlocks are not appropriate for single-processor systems yet are often used in multiprocessor systems

Busy waiting means that a process is waiting for a condition to be satisfied in a tight loop without relinquishing the processor. Alternatively, a process could wait by relinquishing the processor, and block on a condition and wait to be awakened at some appropriate time in the future. Busy waiting can be avoided but incurs the overhead associated with putting a process to sleep and having to wake it up when the appropriate program state is reached.

Spinlocks are not appropriate for single-processor systems because the condition that would break a process out of the spinlock can be obtained only by executing a different process. If the process is not relinquishing the processor, other processes do not get the opportunity to set the program condition required for the first process to make progress. In a multiprocessor system,
other processes execute on other processors and thereby modify the program state in order to release the first process from the spinlock

6. Discuss about dining Philosophers Problem

Dining Philosophers Problem The Dining Philosophers Problem is an illustrative example of a common computing problem in concurrency. The dining philosophers problem describes a group of philosophers sitting at a table doing one of two things - eating or thinking. While eating, they are not thinking, and while thinking, they are not eating. The philosophers sit at a circular table each with a bowl of spaghetti. A chopstick is placed in between each philosopher, thus each philosopher has one chopstick to his or her left and one chopstick to his or her right. As spaghetti is difficult to serve and eat with a single chopstick, it is assumed that a philosopher must eat with two chopsticks. The philosopher can only use the chopstick on his or her immediate left or right. The philosophers never speak to each other, which creates a dangerous possibility of deadlock. Deadlock could occur if every philosopher holds a left chopstick and waits perpetually for a right chopstick (or vice versa). Originally used as a means of illustrating the problem of deadlock, this system reaches deadlock when there is a 'cycle of unwarranted requests'. In this case philosopher P1 waits for the chopstick grabbed by philosopher P2 who is waiting for the chopstick of philosopher P3 and so forth, making a circular chain. The lack of available chopsticks is an analogy to the locking of shared resources in real computer programming. Locking a resource is a common technique to ensure the resource is accessed by only one program or chunk of code at a time. The challenge occurs when there are multiple resources which must be acquired individually. When several programs are involved in locking multiple resources, deadlock can occur. For example, one program needs two files to process. When two such programs lock one file each, both programs wait for the other one to unlock the other file, which will never happen
### Objective question with answers

1. IPC stands for [ ]
   - A) inter process communication
   - B) intra process control
   - C) inter process control
   - D) none

2. The implementation pipe is _____ dependent [ ]
   - A) OS
   - B) IPC
   - C) both
   - D) none

3. _____ specifies the structure of pipes [ ]
   - A) dwflags
   - B) dwsize
   - C) dwword
   - D) none

4. Pipe follow _____ architecture [ ]
   - A) master slave
   - B) client client
   - C) client server
   - D) none

5. RMI acronym [ ]
   - A) remote method invocation
   - B) remote invocation
   - C) both
   - D) none

6. _____ is a piece of software that acts as a bridge between the operating system and the hardware [ ]
   - A) device driver
   - B) racing
   - C) FIFO
   - D) LIFO

7. A common data sharing problem where two processes concurrently access a shared buffer with fixed size is [ ]
   - A) LIFO
   - B) readers writer’s problem
   - C) dining philosopher’s problem
   - D) producer-consumer problem

8. IPC mechanism is _____ dependent [ ]
   - A) user space
   - B) OS kernel
   - C) monolithic kernel
   - D) none

9. Examples of sleep and wake up based mutual exclusion [ ]
   - A) semaphores
   - B) mutex
   - C) events
   - D) all of these

10. Examples of busy waiting based mutual exclusion [ ]
    - A) test and set
    - B) flags
    - C) both
    - D) all of these

<table>
<thead>
<tr>
<th>Q.No</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>C</td>
<td>C</td>
<td>A</td>
<td>D</td>
<td>B</td>
<td>D</td>
<td>C</td>
</tr>
</tbody>
</table>

MD ASIF (Asst.Professor)
**Fill in the blanks question with answers**

1. Multiple processes compete each other to access and manipulate shared data concurrently is _____________
2. A process does not get the CPU or system resources required to continue its execution for a long time is called_____________
3. A system resource for implementing mutual exclusion in shared resources access or for restricting the access to the shared resource is___________
4. The binary semaphore implementation for exclusive resources access under certain OS kernel is called___________
5. A queue for holding messages for exchanging between processes of a multitasking system is called___________
6. Various___________ requirements need to be evaluated before the selection of an RTOS for an embedded design
7. The ability of a system to execute multiple processes simultaneously is known as_______________
8. In priority ceiling a priority is associated with ______shared resource
9. The consumer tries to read data from an empty buffer is called as _______
10. The producer tries to put data to a full buffer is called as __________

<table>
<thead>
<tr>
<th>Q.No</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Racing</td>
</tr>
<tr>
<td>2</td>
<td>Starvation</td>
</tr>
<tr>
<td>3</td>
<td>Semaphore</td>
</tr>
<tr>
<td>4</td>
<td>Mutex</td>
</tr>
<tr>
<td>5</td>
<td>Message queue</td>
</tr>
<tr>
<td>6</td>
<td>Functional and non functional requirements</td>
</tr>
<tr>
<td>7</td>
<td>Multiprocessing</td>
</tr>
<tr>
<td>8</td>
<td>each</td>
</tr>
<tr>
<td>9</td>
<td>Buffer under run</td>
</tr>
<tr>
<td>10</td>
<td>Buffer over run</td>
</tr>
</tbody>
</table>