

101R- MOB Short Notes

101- MANAGEMENT ORGANIZATIONAL BEHAVIOUR

Unit-1

1. What is Meant by Management? Explain the Functions of Management?

Management is the act of getting people together to accomplish desired goals and objectives using available resources efficiently and effectively. Since organizations can be viewed as systems, management can also be defined as human action, including design, to facilitate the production of useful outcomes from a system. This view opens the opportunity to manage oneself, a pre-requisite to attempting to manage others. Management functions include: Planning, organizing, staffing, leading or directing, and controlling an organization (a group of one or more people or entities) or effort for the purpose of accomplishing a goal.

There are several different resource types within management. Resourcing encompasses the deployment and manipulation of:

- Human resources
 - Financial resources
 - Technological resources
 - Natural resources
- Definition:**

According to F.W. Taylor, ‘Management is an art of knowing what to do when to do and see that it is done in the best and cheapest way ‘.

According to Harold Koontz, ‘Management is an art of getting things done through and with the people in formally organized groups. It is an art of creating an environment in which people can perform and individuals and can co-operate towards attainment of group goals.’

Functions of Management:



1. **Planning:** When you think of planning in a management role, think about it as the process of choosing appropriate goals and actions to pursue and then determining what strategies to use, what actions to take, and deciding what resources are needed to achieve the goals.
2. **Organizing:** This process of establishing worker relationships allows workers to work together to achieve their organizational goals.
3. **Directing:** This function involves articulating a vision, energizing employees, inspiring and motivating people using vision, influence, persuasion, and effective communication skills.
4. **Staffing:** Recruiting and selecting employees for positions within the company (within teams and departments).
5. **Controlling:** Evaluate how well you are achieving your goals, improving performance, taking actions. Put processes in place to help you establish standards, so you can measure, compare, and make decisions.

2. What is Meant By Decision Making ? Explain the Decision Making Process?

A decision-making process is a series of steps taken by an individual to determine the best option or course of action to meet their needs. In a business context, it is a set of steps taken by managers in an enterprise to determine the planned path for business initiatives and to set specific actions in motion. Ideally, business decisions

101- MANAGEMENT ORGANIZATIONAL BEHAVIOUR

are based on an analysis of objective facts, aided by the use of business intelligence and analytics tools.

In any business situation there are multiple directions in which to take a strategy or an initiative. The variety of alternatives to weigh – and the volume of decisions that must be made on an ongoing basis, especially in large organizations – makes the implementation of an effective decision-making process a crucial element of managing successful business operations.

There are many different decision-making methodologies, but most share at least Seven steps in common.

Step 1: Identify the decision

You realize that you need to make a decision. Try to clearly define the nature of the decision you must make. This first step is very important.

Step 2: Gather relevant information

Collect some pertinent information before you make your decision: what information is needed, the best sources of information, and how to get it. This step involves both internal and external “work.” Some information is internal: you’ll seek it through a process of self-assessment. Other information is external: you’ll find it online, in books, from other people, and from other sources. **Step 3: Identify the alternatives**

As you collect information, you will probably identify several possible paths of action, or alternatives. You can also use your imagination and additional information to construct new alternatives. In this step, you will list all possible and desirable alternatives.

Step 4: Weigh the evidence

Draw on your information and emotions to imagine what it would be like if you carried out each of the alternatives to the end. Evaluate whether the need identified in Step 1 would be met or resolved through the use of each alternative. As you go through this difficult internal process, you’ll begin to favor certain alternatives: those that seem to have a higher potential for reaching your

goal. Finally, place the alternatives in a priority order, based upon your own value system.

Step 5: Choose among alternatives

Once you have weighed all the evidence, you are ready to select the alternative that seems to be best one for you. You may even choose a combination of alternatives. Your choice in Step 5 may very likely be the same or similar to the alternative you placed at the top of your list at the end of Step 4. **Step 6: Take action**

Step 6: Take action

You’re now ready to take some positive action by beginning to implement the alternative you chose in Step 5.

Step 7: Review your decision & its consequences In this final step, consider the results of your decision and evaluate whether or not it has resolved the need you identified in Step 1. If the decision has **not** met the identified need, you may want to repeat certain steps of the process to make a new decision. For example, you might want to gather more detailed or somewhat different information or explore additional alternatives.

Unit-2

1. What is meant by Organizational Behavior?

Explain the Determinants and scope of OB?

Organizational Behavior (OB) can be defined as the understanding, prediction and management of human behavior both individually or in a group that occur within an organization.

Internal and external perspectives are the two theories of how organizational behavior can be viewed from an organization’s point of view. In this tutorial, we will be learning in detail about both the theories.

Importance of OB

While working in an organization, it is very important to understand others behavior as well as make others understand ours. In order to maintain a healthy working environment, we need to adapt to the environment and understand the goals we need to achieve. This can be done easily if we understand the importance of OB. Following points bring out the importance of OB –

- It helps in explaining the interpersonal relationships employees share with each other as well as with their higher and lower subordinates.

101- MANAGEMENT ORGANIZATIONAL BEHAVIOUR

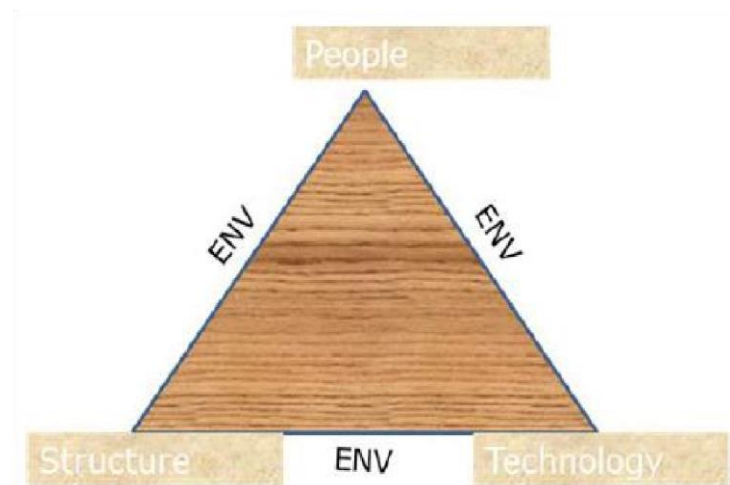
- The prediction of individual behavior can be explained.
- It balances the cordial relationship in an enterprise by maintaining effective communication.
- It assists in marketing.
- It helps managers to encourage their subordinates.
- Any change within the organization can be made easier.
- It helps in predicting human behavior & their application to achieve organizational goals.
- It helps in making the organization more effective.

Thus studying organizational behavior helps in recognizing the patterns of human behavior and in turn throw light on how these patterns profoundly influence the performance of an organization.

Determinants of Organizational Behavior:

There are three major factors that affect OB. The working environment being the base for all three factors, they are also known as the determinants of OB. The three determinants are – • People

- Structure
- Technology



healthy environment, all the employees should be treated equally and be judged according to their work and other aspects that affects the firm. **Example** – A company

offers campus placement to trainees from different states like Orissa, Haryana, Arunachal Pradesh and many more. However, during and after training, all trainees are examined only on the basis of their performance in the tasks assigned.

Organizational Structure

Structure is the layout design of an organization. It is the construction and arrangement of relationships, strategies according to the organizational goal.

Example – Organizational structure defines the relation of a manager with employees and co-workers.

Technology

Technology can be defined as the implementation of scientific knowledge for practical usage. It also provides the resources required by the people that affect their work and task performance in the right direction.

Example – Introduction of SAP, big data and other software in the market determines individual and organizational performance.

101- MANAGEMENT ORGANIZATIONAL BEHAVIOUR

Environment

All companies function within a given internal and external environment. Internal environment can be

effectiveness of organization. The group efforts made towards the achievement of organization's goal is group behavior. In short, it is the way how a group behaves.

an enterprise that influences the activities, choices made by the firm, and especially the behavior of the employees. While external environment can be defined as outside factors that affect the company's ability to operate. Some of them can be manipulated by the company's marketing, while others require the company to make adjustments.

Some **examples of internal environment** include employee morale, culture changes, financial changes or issues, and some **examples of external environment** include political factors, changes to the economy and the company itself.

People

An organization consists of people with different traits, personality, skills, qualities, interests, background, values and intelligence. In order to maintain a which it can govern or influence the operations of an organization. The scope of OB integrates 3 concepts respectively –

Individual Behavior

It is the study of individual's personality, learning, attitudes, motivation, and job satisfaction. In this study, we interact with others in order to study about them and make our perception about them.

Example – The personal interview round is conducted to interact with candidates to check their skills, apart from those mentioned in the resume.

Inter-individual Behavior

It is the study conducted through communication between the employees among themselves as well as their subordinates, understanding people's leadership qualities, group dynamics, group conflicts, power and politics.

Example – A meeting to decide list of new board members. **Group Behavior**

Group behavior studies the formation of organization, structure of organization and

Scope of Organizational Behavior:

In a very broad sense, the **scope of OB** is the extent to beliefs, defined as the conditions, factors, and elements within organization. The scope of OB integrates 3 concepts respectively –

Example – Strike, rally etc.

2. What is Meant by Learning and Explain the Learning Theories?

Learning can be defined as the permanent change in behavior due to direct and indirect experience. It means change in behavior, attitude due to education and training, practice and experience. It is completed by acquisition of knowledge and skills, which are relatively permanent.

Nature of Learning

Nature of learning means the characteristic features of learning. Learning involves change; it may or may not guarantee improvement. It should be permanent in nature, that is learning is for lifelong.

The change in behavior is the result of experience, practice and training. Learning is reflected through behavior.

Learning Theories:

Learning can be understood clearly with the help of some theories that will explain our behavior. Some of the remarkable theories are –

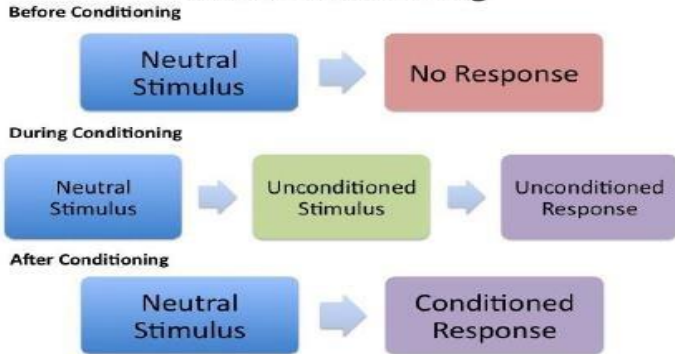
101- MANAGEMENT ORGANIZATIONAL BEHAVIOUR

- Classical Conditioning Theory
- Operant Conditioning Theory
- Social Learning Theory
- Cognitive Learning Theory

Classical Conditioning Theory

Operant Conditioning Theory

Classical Conditioning



Operant Conditioning

	Reinforcement Increase Behavior	Punishment Decrease Behavior
Positive Stimulus (something added)	Positive Reinforcement Add something to increase behavior	Positive Punishment Add something to decrease behavior
Negative Stimulus (something removed)	Negative Reinforcement Remove something to increase behavior	Negative Punishment Remove something to decrease behavior

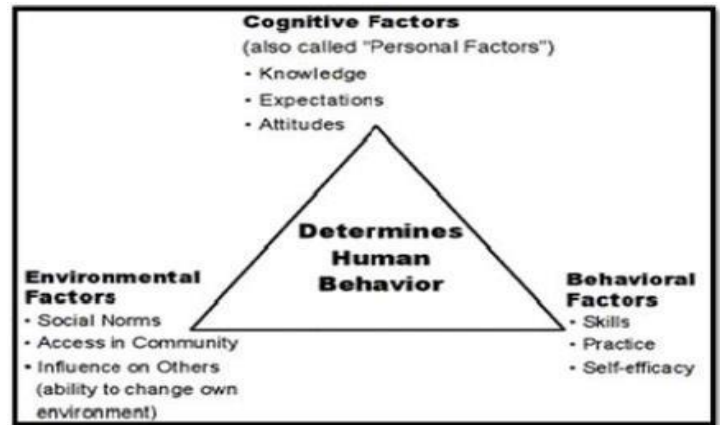
Social Learning Theory

The key assumptions of social learning theory are as follows –

- Learning is not exactly behavioral, instead it is a cognitive process that takes place in a social context.
- Learning can occur by observing a behavior and by observing the outcomes of the behavior (known as vicarious reinforcement).
- Learning includes observation, extraction of information from those observations, and making decisions regarding the performance of the behavior (known as observational learning or

modeling). Thus, learning can occur beyond an observable change in behavior.

Cognitive Learning Theory



UNIT-3 Explain

Motivational Theories?

Motivation theories can help management teams determine the best way to achieve a business goal or work toward an outcome. Successfully applying motivation theories can also help managers support their employees more efficiently. This can help businesses enhance their productivity, which can increase their overall profits. In this article, we explore five motivational theories for management teams and provide three tips for using them effectively.

5 motivation theories for management teams Here are five motivational theories you can consider for increasing employee satisfaction and productivity:

1. Incentive theory

The incentive motivational theory suggests people feel motivated by reinforcement, recognition, incentives and rewards. The incentive theory also proposes that people may display certain behaviors in order to achieve a specific result, incite a particular action or receive a reward.

2. McClelland's need theory

McClelland's need theory proposes there are three different needs. Each type of need corresponds to a specific type of person who feels motivated to address that need. Understanding McClelland's need theory can help managers identify employee needs, which may give them the ability to place their employees in situations where they can thrive and reach their goals.

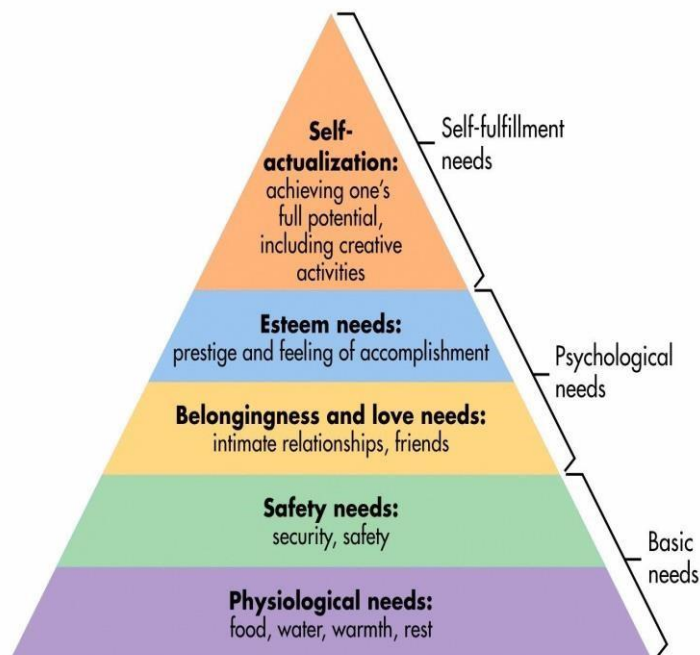
3. Competence theory

Competence theory proposes that people often want to engage in specific activities to display their skills, intelligence and abilities. If an employee successfully demonstrates their intelligence in front of their peers, it can motivate them to feel competent in a particular area. Feeling competent may increase how confidently they perform tasks, which can improve productivity and efficiency.

4. Expectancy theory

The expectancy theory suggests that people may perform certain behaviors if they think those actions may lead to desirable outcomes. You can apply the expectancy theory in the workplace if you're interested in improving your team's productivity, effort or efficiency.

5. Maslow's hierarchy of needs theory Maslow's hierarchy is a psychological theory that outlines the types of needs a person must meet in order to progress to more complex needs. The hierarchy of needs includes five levels, including:



2. What are the styles and theories of Leadership?

Understanding theories and styles of leadership can help you be more effective in your role, particularly if your position requires frequent collaboration with or

management of others. Also, during the job search process, interviewers may assess your leadership potential, so it can be helpful to understand your preferred leadership practice. In this article, we define leadership theory and leadership style, explore the main leadership theories and explain why you should define your leadership approach.

What are leadership theory and leadership style?

Leadership theory studies the qualities of good leaders. Psychologists analyze and develop leadership theory, and researchers try to discover the common qualities or behavioral patterns of excellent leaders. Some of the leadership aspects they consider include:

- Personality traits
 - Actions
 - Environment
 - Situation
 - Decision-making process
 - How input is received
 - How relationships are maintained
- Leadership style is the way a leader approaches managing team members. Leadership styles were formally developed as a result of studies on leadership theory, and each style includes distinct qualities. Common leadership styles include:
- Coach: Recognizes strengths and weaknesses, helps people set goals and provides a lot of feedback.
 - Visionary: Manages through inspiration and confidence.
 - Servant: Focuses on helping team members feel fulfilled.
 - Autocratic or authoritarian: Makes decisions with little or no input from others.
 - Laissez-faire or hands-off: Delegates tasks and provides little supervision.
 - Democratic: Considers the opinions of others before making a decision.
 - Pacesetter: Sets high standards and focuses on performance.
 - Bureaucratic: Follows a strict hierarchy and expects team members to follow procedure. Six

101- MANAGEMENT ORGANIZATIONAL BEHAVIOUR

main leadership theories The primary leadership theories are:

The great man theory

The great man theory of leadership states that excellent leaders are born, not developed. A popular concept in the 19th century, this theory states that leadership is an inherent quality. This type of leader often possesses the natural attributes of intelligence, courage, confidence, intuition and charm, among others.

The trait theory

The trait theory of leadership states that certain natural qualities tend to create good leaders. Having certain qualities does not necessarily mean someone has strong leadership skills, however. Some leaders may be excellent listeners or communicators, but not every listener or communicator makes an excellent leader.

The behavioral theory

The behavioral theory of leadership focuses on how a person's environment, not natural abilities, forms him or her into a leader. One of the key concepts of behavioral theory is conditioning. Conditioning states that a person will be more likely to act or lead in a certain style as a result of environmental responses to behavior.

The transactional theory or management theory

The transactional theory of leadership, also called "the management theory," studies leadership as a system of rewards and penalties. It views effective leadership as results-focused and hierarchical. Transactional leaders prioritize order and structure over creativity.

The transformational theory or relationship theory

The transformational theory of leadership, also called "the relationship theory," studies effective leadership as the result of a positive relationship between leaders and team members. Transformational leaders motivate and inspire through their enthusiasm and passion. They are a model for their teams, and they hold themselves to the same standard they expect of others.

The situational theory

The situational theory of leadership does not relate to a certain type of leader or claim that any one style is best. Instead, situational theory argues that the best kind of leader is one who is able to adapt her style based on the

situation. They may respond to a situation by commanding, coaching, persuading, participating, delegating or however they think is necessary.

Situational leaders are defined by their flexibility.

UNIT-4

1. Explain Organizational Culture and Climate?

Difference between organizational culture and organizational climate is that the culture is about the norms, values and behavior adopted by the employees within the organization while the climate is about the atmosphere of the organization that is created based on the culture. Organizational culture and climate differ from one organization to another. This article presents you with a brief description of the two concepts and an analysis of the difference between organizational culture and climate.

What is Organizational Culture?

Organizational culture is a set of values, beliefs, behaviors, customs and attitudes that govern how people behave within organizations. The culture of an organization provides boundaries and guidelines that help the employees of the organization to know the correct way of performing their jobs.

The culture of an organization is ingrained in the behavior of the employees within an organization and in a way it shows the 'personality' of the organization. The unique culture of an organization creates a distinct atmosphere that is felt by the people who are a part of the group, and this atmosphere is known as the climate of an organization.

Types of Organizational Culture

There are four types of cultures that can be identified in organizations as follows:

- **Clan culture** – It is where employees are behaving as an extended family, mentoring, nurturing and participation can be seen.
- **Adhocracy culture** – It is where employees of the organization are dynamic, risk-taking and innovative.
- **Market Oriented culture** – It is where employees are result oriented and focus on the job, competition and achievements.

101- MANAGEMENT ORGANIZATIONAL BEHAVIOUR

- Hierarchically oriented culture – It is where the employees undergo a rigid structure, controls, former rules and policies. They expect to maintain stability, consistency and uniformity in their processes.

For example, an educational institute has a hierarchically oriented culture. It is the way all the activities function and also people perceive, think, and feel about things at the institute.

What is Organizational Climate?

Organizational climate is about the the perception and feeling of each regarding the culture of a particular organization. The climate of an organization is subject to change frequently with the direct influence of top management within the organization. Organizational climate is much easier to experience and measure than organizational culture. **Types of Organizational Climate**

There are different types of climates that have been created by the culture of an organization that can be categorized as follows:

- People-oriented climate – It is a climate that focuses on perceptions of individuals who are working in the organization.
- Rule-oriented climate – It is a climate based on established rules, policies and procedures in an organization.
- Innovation-oriented climate – It is a climate that encourages creative or new ways of doing tasks.
- Goal-oriented climate – It is a climate that focuses on achieving organizational goals.

What is the difference between Organizational Culture and Climate?

According to Rosario Longo in 2012, the relationship between the organizational culture and climate can be indicated as follows:

- Organizational climate can be clearly identified with the perceptions of individuals regarding the quality and characteristics of the organizational culture.
- Culture represents the true image of the organization, whereas climate represents individuals' perceptions, although there might be differences between each of their ideas.

- Organizational culture is concerned with the macro vision of an organization, whereas organizational climate is very much concerned with the micro image of the organization.

2. Explain the Process and Implementation of Change Management?

Your organization is constantly experiencing change. Whether caused by new technology implementations, process updates, compliance initiatives, reorganization, or customer service improvements, change is constant and necessary for growth and profitability. A consistent change management process will aid in minimizing the impact it has on your organization and staff. Below you will find 8 essential steps to ensure your change initiative is successful.

1. Identify What Will Be Improved Since most change occurs to improve a process, a product, or an outcome, it is critical to identify the focus and to clarify goals. This also involves identifying the resources and individuals that will facilitate the process and lead the endeavor. Most change systems acknowledge that knowing what to improve creates a solid foundation for clarity, ease, and successful implementation.

2. Present a Solid Business Case to Stakeholders

There are several layers of stakeholders that include upper management who both direct and finance the endeavor, champions of the process, and those who are directly charged with instituting the new normal. All have different expectations and experiences and there must be a high level of "buy-in" from across the spectrum. The process of onboarding the different constituents varies with each change framework, but all provide plans that call for the time, patience, and communication.

3. Plan for the Change

This is the "roadmap" that identifies the beginning, the route to be taken, and the destination. You will also integrate resources to be leveraged, the scope or objective, and costs into the plan. A critical element of

101- MANAGEMENT ORGANIZATIONAL BEHAVIOUR

planning is providing a multi-step process rather than sudden, unplanned "sweeping" changes. This involves outlining the project with clear steps with measurable targets, incentives, measurements, and analysis. For example, a well-planned and controlled change management process for IT services will dramatically reduce the impact of IT infrastructure changes on the business. There is also a universal caution to practice patience throughout this process and avoid shortcuts.

4. Provide Resources and Use Data for Evaluation

As part of the planning process, resource identification and funding are crucial elements. These can include infrastructure, equipment, and software systems. Also consider the tools needed for re-education, retraining, and rethinking priorities and practices. Many models identify data gathering and analysis as an underutilized element. The clarity of clear reporting on progress allows for better communication, proper and timely distribution of incentives, and measuring successes and milestones.

5. Communication

This is the "golden thread" that runs through the entire practice of change management. Identifying, planning, onboarding, and executing a good change management plan is dependent on good communication. There are psychological and sociological realities inherent in group cultures. Those already involved have established skill sets, knowledge, and experiences. But they also have pecking orders, territory, and corporate customs that need to be addressed. Providing clear and open lines of communication throughout the process is a critical element in all change modalities. The methods advocate transparency and two-way communication structures that provide avenues to vent frustrations, applaud what is working, and seamlessly change what doesn't work.

6. Monitor and Manage Resistance, Dependencies, and Budgeting Risks

Resistance is a very normal part of change management, but it can threaten the success of a project. Most resistance occurs due to a fear of the unknown. It also

occurs because there is a fair amount of risk associated with change – the risk of impacting dependencies, return on investment risks, and risks associated with allocating budget to something new. Anticipating and preparing for resistance by arming leadership with tools to manage it will aid in a smooth change lifecycle.

7. Celebrate Success

Recognizing milestone achievements is an essential part of any project. When managing a change through its lifecycle, it's important to recognize the success of teams and individuals involved. This will help in the adoption of both your change management process as well as adoption of the change itself.

8. Review, Revise and Continuously Improve

As much as change is difficult and even painful, it is also an ongoing process. Even change management strategies are commonly adjusted throughout a project. Like communication, this should be woven through all steps to identify and remove roadblocks. And, like the need for resources and data, this process is only as good as the commitment to measurement and analysis. **Unit-5**

1. What is meant by organizational Development and explain the process of it?

Organizational development is a planned, systematic change in the values or operations of employees to create overall growth in a company or organization. It differs from everyday operations and workflow improvements in that it follows a specific protocol that management communicates clearly to all employees. Organizational change and development can be a long, sometimes overwhelming process, but companies usually begin with several goals in mind:

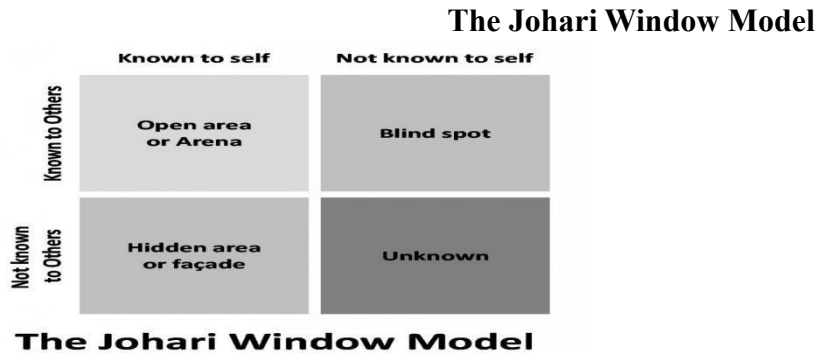
- **Ongoing improvement.** Changing company culture to view new strategies as a positive growth opportunity allows for ongoing improvement and encourages employees to become more open to change and new ideas. New strategies are introduced systematically through planning, implementation, evaluation, improvement, and monitoring.

101- MANAGEMENT ORGANIZATIONAL BEHAVIOUR

- **Better or increased communication.** The Process of Organizational Development The Organizational development that leads to increased feedback and interaction in the organization aligns employees with the company's vision. Employees feel that they have more ownership in the company's mission and may be more motivated as a result.
 - **Employee development.** In today's business world, employees must constantly adapt to changing products, platforms, and environments. Employee development comprises training and work process improvements that help everyone keep up with shifting demands.
 - **Product and service improvement.** Organizational development leads to innovation, which can help improve products and services. This innovation often comes as the result of intensive market research and analysis.
 - **Increased profit.** Organizational development helps increase profits by optimizing communication, employee processes, and products or services. Each serves to increase a company's bottom line.
 - **Creating an action plan.** The company then creates a plan with allocated resources and clearly defined employee roles. This plan will include specific support for individuals involved and identify a measurable goal. During this step, companies should think about how they'll communicate changes to staff and manage feedback.
 - **Creating motivation and a vision.** Once the company has clearly defined and communicated a plan, its leaders must motivate their employees to share in a vision. This step involves leaders acting as enthusiastic role models while helping employees understand the plan's big-picture goals and desired impact.
 - **Implementing.** While stability is necessary during implementation, supporting employees during the transition with mentoring, training, and coaching is equally important. When thinking about such support, management should consider what new skills employees will need and what delivery methods will be most effective. Ongoing feedback and communication can help make the change process easier.
 - **Evaluating initial results.** Once the company has implemented a plan, its leaders may create space for shared reflection, asking themselves and their employees if the change effectively met the business goals. They'll also evaluate the change management process and consider what could be done differently. This step can't be overlooked; if the company doesn't evaluate the changes, it won't know whether interventions have been effective.
 - **Adapting or continuing.** Depending on the evaluation of the initial results, the company may choose to adapt its plan. If the results show success, it may continue with the current plan to keep improving.
- **Identifying an area of improvement.** Organizational change begins with identifying a need that aligns with business goals. Companies often know that need right away, but they may consider a data-driven approach to identify problems through formal surveys and feedback. This approach allows for a more thorough understanding of the area for improvement. Companies should ask themselves what they want to change, and why that change is necessary.
 - **Investigating the problem.** Once the area for improvement is identified, companies conduct an investigation to learn why the problem exists, what the barriers to improvement are, and what solutions have previously been attempted. This step can also include surveys or focus groups and individual consultations.

2. Explain Johari Window?

The Johari window model is used to enhance the individual's perception on others. This model is based on two ideas- trust can be acquired by revealing information about you to others and learning yourselves from their feedbacks. Each person is represented by the Johari model through four quadrants or window pane. Each four window panes signifies personal information, feelings, motivation and whether that information is known or unknown to oneself or others in four viewpoints.



The method of conveying and accepting feedback is interpreted in this model. A Johari is represented as a common window with four panes. Two of these panes represent self and the other two represent the part unknown to self but to others. The information transfers from one pane to the other as the result of mutual trust which can be achieved through socializing and the feedback got from other members of the group.

1. **Open/self-area or arena** – Here the information about the person his attitudes, behaviour, emotions, feelings, skills and views will be known by the person as well as by others. This is mainly the area where all the communications occur and the larger the arena becomes the more effectual and dynamic the relationship will be. 'Feedback solicitation' is a process which occurs by understanding and listening to the feedback from another person. Through this way the open area can be increased horizontally decreasing the blind spot. The size of the arena can also be increased downwards and thus by reducing the hidden and unknown areas through revealing one's feelings to other person.
2. **Blind self or blind spot** – Information about yourselves that others know in a group but you will be unaware of it. Others may interpret yourselves differently than you expect. The blind spot is reduced for an efficient communication through seeking feedback from others.
3. **Hidden area or façade** – Information that is known to you but will be kept unknown from others. This can be any personal information which you feel reluctant

102R- MC Short Notes

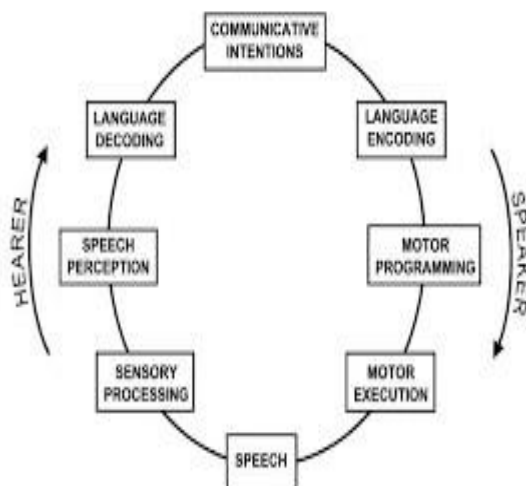
102 – MANAGEMENT COMMUNICATION

Unit-1:

1. What is Communication? Explain Communication cycle ?

Communication is one of the most vital elements of society. People need people, and to interact, it's essential they be able to convey messages and understand each other. The **communication cycle** expresses how the system of conveying and understanding messages operates.

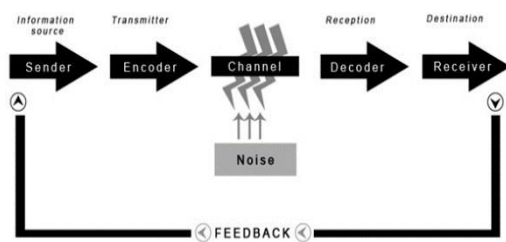
- **Sender:** the person or entity originating the communication
- **Message:** the information that the sender wishes to convey
- **Encoding:** how the sender chooses to bring the message into a form appropriate for sending
- **Channel:** the means by which the message is sent
- **Receiver:** the person or entity to whom the message is sent
- **Decoding:** how the receiver interprets and understands the message
- **Feedback:** the receiver's response to the message



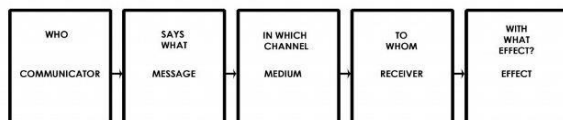
2. Explain Theories and Models of communication?

Communication theory studies the scientific process of sending and receiving information. There are many principles, methods, and components that can affect a message, and communication theory explains it all.

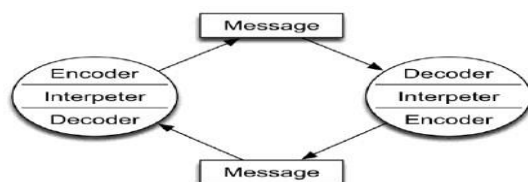
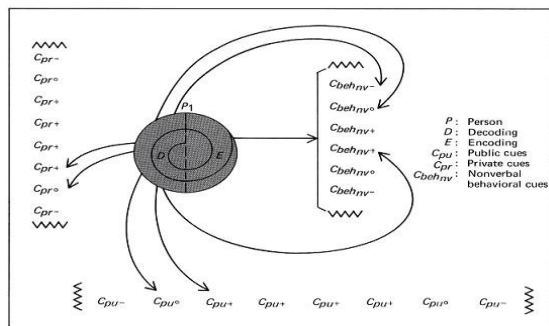
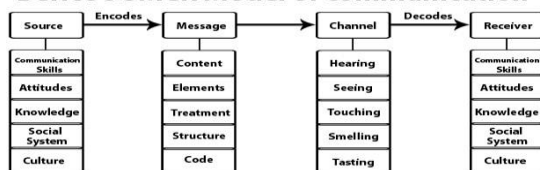
- Shannon Weaver communication model
- Lasswell communication model
- Berlo communication model
- Barnlund communication model
- Schramm communication model



SHANNON-WEAVER'S MODEL OF COMMUNICATION



Berlos's SMCR Model of communication



Unit-2

3. What is Oral Communication? Explain advantages & disadvantages of Oral communication?

Ans: Oral communication is the process of expressing information or ideas by word of mouth. Learn more about the types and benefits of oral communication, and find out how you can improve your own oral communication abilities.

- Face-to-face conversations
- Telephone conversations
- Discussions that take place at business meetings
- Presentations at business meetings
- Classroom lectures
- Commencement speech given at a graduation ceremony

Advantages of Oral Communication

- Less expensive
- Saves time
- Immediate feedback
- Personal contact
- Useful in difficult situations
- Co-operative spirit
- Useful in secret matters
- Persuasive
- Useful for all kinds of audiences

articles-junction.blogspot.com

Disadvantages of Oral Communication

- No legality
- Lack of accountability
- Low reference value
- Greater scope for errors
- Easily forgotten
- Not useful for long distance

articles-junction.blogspot.com

4. Explain about conducting meetings?

What is a meeting?

A gathering of **two or more people** who interact **face to face, verbally and nonverbally**, to achieve an **expected outcome**, and are **interdependent** on each other.



Business Communication: Meeting/Group Discussion Skills

How to Conduct Effective Meetings

1. Ensure outcomes are defined prior to the meeting

- ✓ Never go to a meeting where the desired outcomes are not clearly understood by all involved.
- ✓ This includes the meetings you call and the ones you are required to attend.
- ✓ Send an outline of the purpose of the meeting and the required outcomes

2. Plan the meeting in advance

- ✓ Think about what you want to say, what information you require or what you need to learn from the meeting.
- ✓ Anticipate and prepare for questions and objections, raise them yourself if they are important.
- ✓ Prepare agendas for formal meetings and distribute in advance



BSBPMG507A Manage Project Communications

© 2008 TAFE NSW - Northern Sydney Institute

Unit-3

5. What is written communication? Explain the advantages and disadvantages of written communication?

Ans: written communication is the most common form of business communication.

It is essential for small business owners and managers to develop effective written communication skills and to encourage the same in all employees.

Effective Meetings Follow A Three Step Process



© Quality Assurance Solutions / Operational Excellence Consulting - All rights reserved.

7

Business Communication Articles

Wide Access

Filing

Unit -4

7. What is Non-Verbal Communication?

Explain types of Non-Verbal Communication?

Ans: Nonverbal communication is the process of communication through sending and receiving wordless (mostly visual) cues between people.

- * • **Types of Nonverbal Communication**
- 1 • Communication by Body Language
- 2 • Communication by Gestures
- 3 • Communication by Posture
- 4 • Communication by Facial Expressions
- 5 • Communication by Human Behavior
- 6 • Communication by Touch
- 7 • Communication by Dress and Grooming
- 8 • Communication by Proxemics
- 9 • Communication Through Signs and Symbols
- 10 • Communication by Charts, Maps and Graphs
- 11 • Communication by Posters
- 12 • Communication by Colors
- 13 • Communication by Silence

articles-junction.blogspot.com

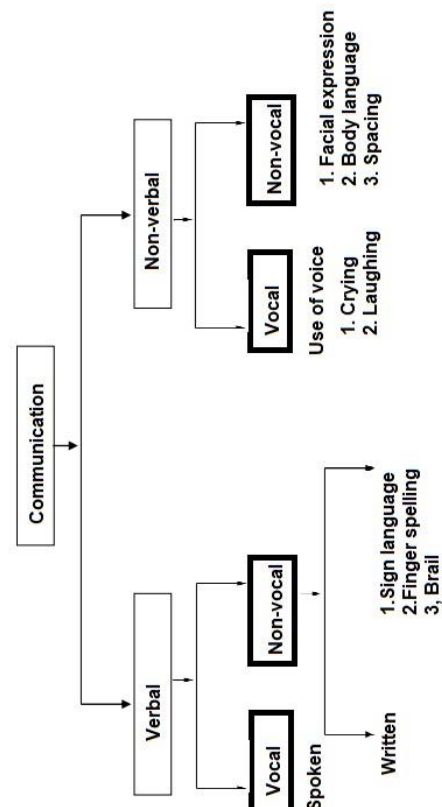


Fig- Types of Communication

8. Explain about time management?

Time management is the process of planning and controlling how much time to spend on specific activities.

Good time management enables an individual to complete more in a shorter

*

period of time, lowers stress, and leads to [career success](#).

It involves the balancing of various demands upon a person relating to [work](#), [social life](#), [family](#), [hobbies](#), personal interests, and commitments with the finite nature of time.

Why is it important

- Time management is directly relevant to Project Management
- If we cannot manage our own time effectively, how can we expect those working for us to manage theirs?
- Good time management requires
 - Planning – goal settings and time allocation
 - Estimation – setting time allocations based upon experience and knowledge
 - Monitoring – collecting data to determine if things are progressing as they should be
 - Responding – changing priorities and resource allocations if required
- Planning and Monitoring your own time will help to develop your Project Management Skills



Unit -5

9. Explain about intercultural communication and group communication? Intercultural communication essentially means communication across different cultural boundaries. When two or more people with different cultural backgrounds interact and communicate with each other or one another, we can say that intercultural communication is taking place. So intercultural communication can be defined as the sharing of information on different levels of awareness between people with different cultural backgrounds, or put simply: individuals influenced by different cultural groups negotiate shared meaning in interactions.



Group communication is the act of sending and receiving messages to multiple members of a group. In a business environment, groups often use this type of communication to exchange ideas, determine goals and motivate other members. The size of groups can vary, but they typically comprise at least three members and up to 20 members. Group communication can be beneficial for groups of all sizes, from smaller focus groups to entire departments. When groups communicate effectively, they can share necessary information as they work to accomplish mutual goals.



*

Propositions about Group Communication	
Advantages	Disadvantages
• Access to more resources • Better retention of concepts • Diversity • Creativity	• Scheduling • Social loafing • Conflict • Coping with misbehavior • Blame for error is shared

10. Explain about communication styles ?

Effective communication in the workplace is essential — not only does it play a role in achieving your daily goals but it has a significant impact on your career. You and your colleague's business communication styles play an important part in successful collaboration.

Understanding how you communicate and the communication styles of those around you is a game-changer. Communication is so much more than the words we speak. It includes our body language, non-verbal cues and the behavior that follows our words.



Importance of Recognizing Communication Styles:

"By being aware of your communication preference, you will have a better understanding of how others perceive you. The ability to recognize and adapt to your listeners' communication styles will make them feel that you have taken the time to listen and focus on their needs. This results in a positive experience and strengthens the relationship."

Hanke, Stacey. "Communication Styles: What Is Your Impact on Others?." Professional Safety 54.5 (2009): 22-25. Academic Search Elite. EBSCO. Web. 6 Oct. 2010.

103R- ME Short Notes

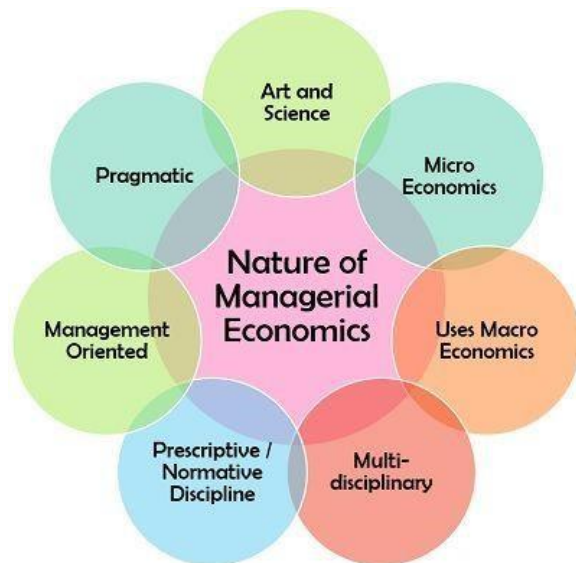
103- Managerial Economics

Unit- 1:

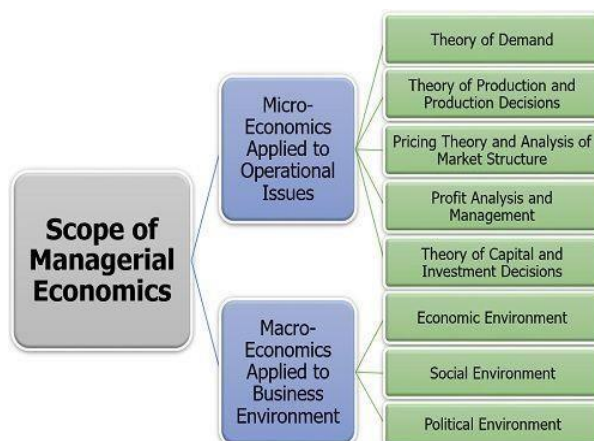
1. What is Economics? Explain Nature and Scope of Managerial Economics?

Ans: “*Managerial economics...is the integration of economics theory with business practice for the purpose of facilitating decisionmaking and forward planning by management.*” **Spencer and Siegelman**

Nature of Managerial Economics:



Scope of Managerial Economics:

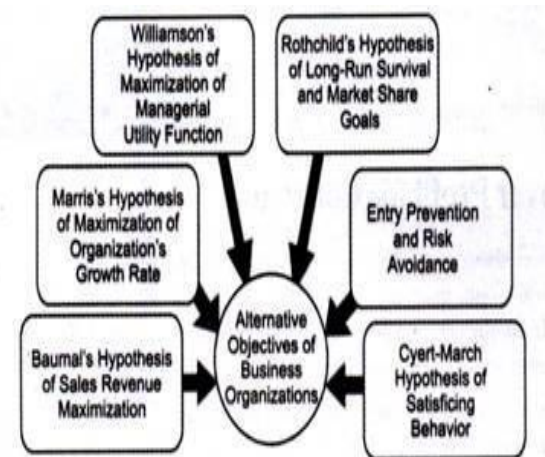


2. What is Firm? Explain the objectives of the Firm?

Ans: Firm is an unit where inputs will be converted to outputs.

Objectives:

- Profit Maximization
- Maintaining Consumer Goodwill
- Reducing risk
- Avoiding losses
- Maintaining Government Intervention
- a. Innovation Theory
- b. Risk- Bearing Theory
- c. Monopoly Theory
- d. Managerial Efficiency Theory
- e. Fiction Theory
- Firm value maximization
- Sales maximization
- Growth maximization
- Long- Run Survival
- Managerial Utility maximization
- Satisfying
- Non- Profit objectives



Unit- 2

3. What is Elasticity? Explain Types of Elasticity?

Ans: In economics, *the term elasticity means a proportionate (percentage) change in one variable relative to a proportionate (percentage) change in another variable.*

Types:

- ✓ Price Elasticity of Demand
- ✓ Income Elasticity of Demand
- ✓ Cross Elasticity of Demand
- ✓ Advertising Elasticity of Demand

Income Elasticity = Proportionate change in the Quantity Demanded / Proportionate change in Income

$$= \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in income}}$$

$$= \frac{\Delta Q / Q}{\Delta I / I}$$

Where, ΔQ = Change in quantity demanded
 ΔI = Change in Income
 I = Income
 Q = Quantity demanded

Price Elasticity = Proportionate change in the Quantity Demanded / Proportionate change in price

$$= \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}$$

$$= \frac{\Delta Q / Q}{\Delta P / P}$$

Where, ΔQ = Change in quantity demanded
 ΔP = Change in price
 P = Price
 Q = Quantity demanded

Cross Elasticity = Proportionate change in the Quantity Demanded / Proportionate change in price of substitute and complement goods

$$= \frac{\text{Percentage change in quantity demanded}}{\text{Proportionate change in price of substitute and complement goods}}$$

$$= \frac{\Delta Q / Q}{\Delta S / S}$$

Where, ΔQ = Change in quantity demanded
 ΔS = Change in price of substitute and complement goods
 S = Price of substitute and complement goods
 Q = Quantity demanded

Promotion Elasticity = Proportionate change in the Quantity Demanded / Proportionate change in Promotion Expenditure

$$= \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in Promotion Expenditure}}$$

$$= \frac{\Delta Q / Q}{\Delta E / E}$$

Where, ΔQ = Change in quantity demanded
 ΔE = Change in Promotion Expenditure
 P = Price
 Q = Promotion Expenditure

4. What is demand Forecasting?

Explain Demand forecasting methods?

Ans: Demand forecasting is the activity of estimating the quantity of a product or service that consumers will purchase.

FACTORS INVOLVED IN DEMAND FORECASTING: 🚦

Period of Forecasting

🚦 Levels of Demand

forecasting ○

Macro level ○

Industry level ○

Firm level

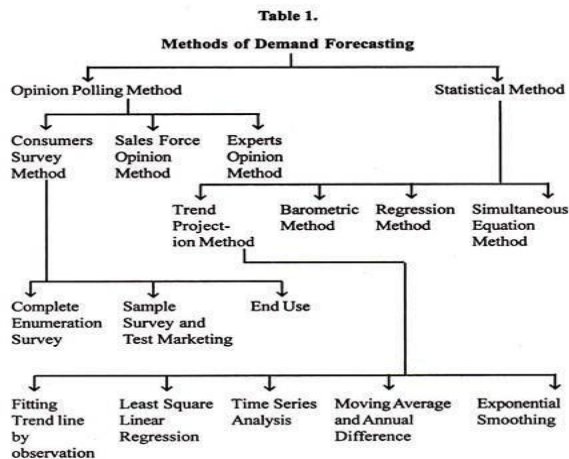
🚦 The forecast may be general or specific

🚦 As far as the new products are concerned

CRITERIA OF A GOOD FORECASTING METHOD:

- Simplicity and Ease of Comprehension
- Economy
- Availability
- Durability
- Accuracy

Techniques of Demand Forecasting:



Unit: 3

5. What is cost? Explain Cost Concepts & Classifications?

Ans: According to **Marshall**, the real cost of production includes the —real cost of efforts of various Qualities and —real cost of waiting.

Cost Determinants:

- ✚ Level of output
- ✚ Price of input factors
- ✚ Productivities of factors of production
- ✚ Size of plant
- ✚ Output stability ✚ Lot size
- ✚ Laws of returns
- ✚ Levels of capacity utilization
- ✚ Time period
- ✚ Technology
- ✚ Experience
- ✚ Process of range of products
- ✚ Supply chain and logistics ✚ Government incentives

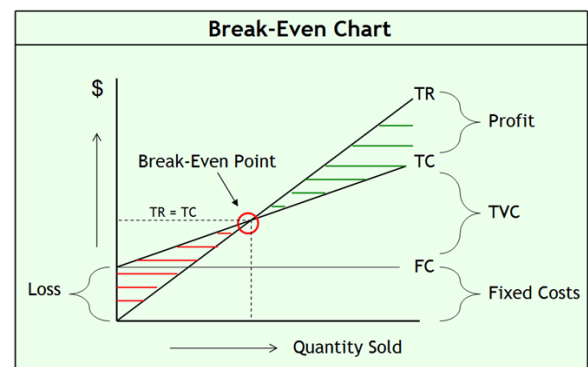
Cost Concepts & Classifications:

- Opportunity Costs and Outlay Cost
- Explicit and Implicit/ Imputed Cost
- Historical Cost and Replacement Cost
- Short Run and Long run Costs ➤ Out of Pocket and Book Costs

- Fixed Cost and Variable Costs
- Past and Future Costs
- Traceable Cost and Common Costs
- Avoidable Costs and Unavoidable Costs
- Controllable Cost and Uncontrollable Cost
- Incremental Cost and Sunk Costs
- Total, Average and Marginal Costs
- Accounting and Economic Costs

6. Explain Break Even Analysis?

Ans: The break-even level or break-even point (BEP) represents the sales amount—in either unit or revenue terms—that is required to cover total costs (both fixed and variable). Total profit at the break-even point is zero.



Advantages of a break even analysis

Break even analysis enables a business organization to:

1. Measure profit and loss at different levels of production and sales.
2. To predict the effect of changes in price of sales.
3. To analysis the relationship between fixed cost and variable cost.
4. To predict the effect on profitability if changes in cost and efficiency.

Disadvantages of break-even analysis

1. Assumes that sales prices are constant at all levels of output.
2. Assumes production and sales are the same.
3. Break even charts may be time consuming to prepare.
4. It can only apply to a single product or single mix of products.

Unit: 4

7. What is market Structure? Explain Pricing policies under different markets?

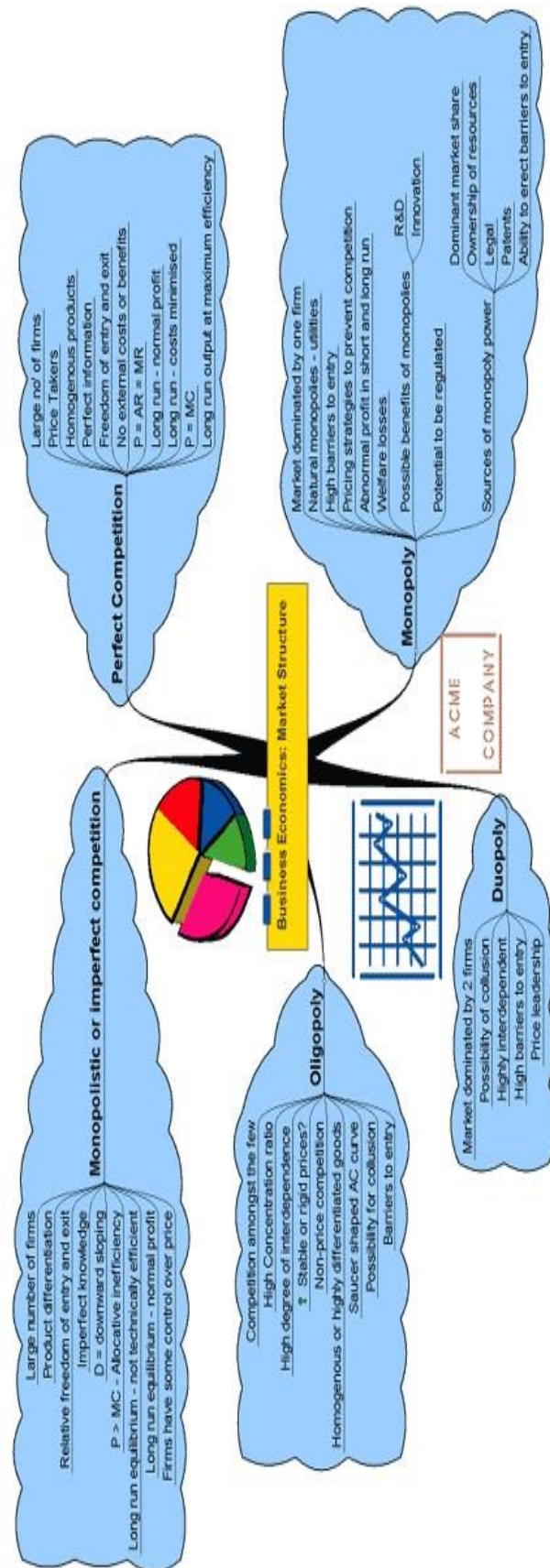
Ans: Market structure is the number of firms producing identical products which are homogeneous.

- **Perfect Competition**
 - Large number of firms
 - Price takers
 - Homogenous products
 - Perfect information
 - Freedom of entry and exit
 - No external costs or benefits
 - Perfect
 - Freedom of entry and exit
 - No
 - external costs or benefits
- **Monopoly**
 - Market dominated by one firm
 - Natural monopolies - utilities
 - High barriers to entry
 - Pricing strategies to prevent competition
 - Abnormal profit in short and long run
 - Welfare losses
 - Possible benefits of monopolies
 - Potential to be regulated
 - Sources of monopoly power
- **Oligopoly**
 - Competition amongst the few
 - High Concentration ratio
 - High degree of interdependence
 - Stable or rigid prices?
 - Non-price competition
 - Homogenous or highly differentiated goods
 - Saucer shaped AC curve
 - Possibility for collusion
 - Barriers to entry
- **Monopolistic or imperfect competition**
 - Large number of firms
 - Product differentiation
 - Relative freedom of entry and exit
 - Imperfect knowledge
 - D = downward sloping
 - $P > MC$ - Allocative inefficiency
 - Long run equilibrium - not technically efficient
 - Long run equilibrium - normal profit
 - Firms have some control over price

Unit- 5:

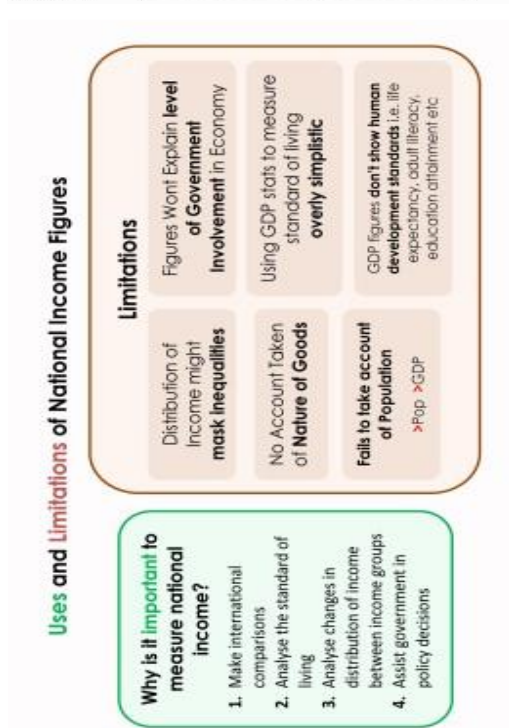
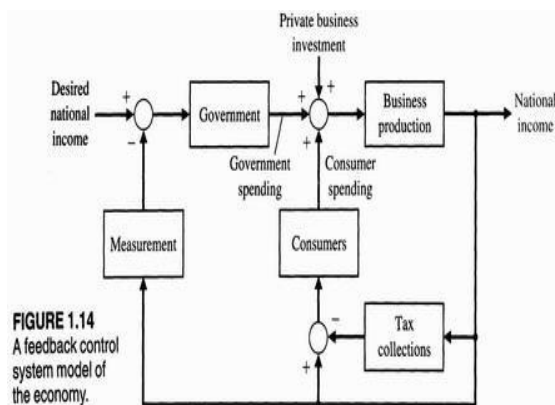
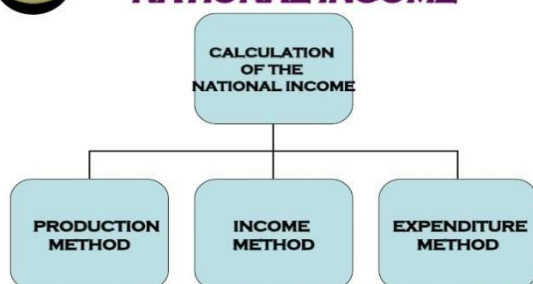
8. What is National Income? Explain.

Ans: National income is the total value a country's final output of all new goods and services produced in one year.





MEASURING NATIONAL INCOME



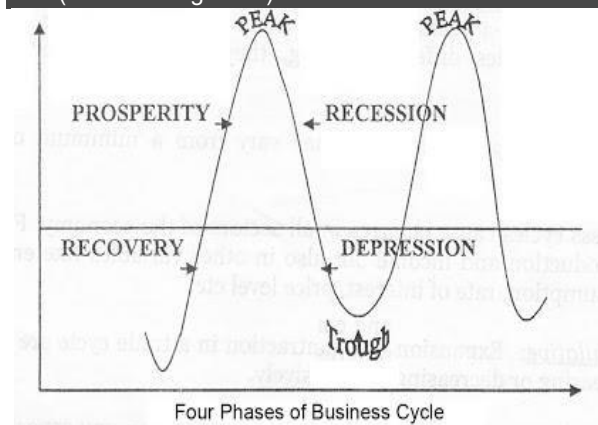
9. What is Business Cycle? Explain.

Ans: The term **business cycle** (or **economic cycle** or **boom–bust cycle**) refers to fluctuations in

aggregate production, trade and activity over several months or years in a market economy.

Business Cycle (or Trade Cycle) is divided into the following four phases :-

1. **Prosperity Phase** : Expansion or Boom or Upswing of economy.
2. **Recession Phase** : from prosperity to recession (upper turning point).
3. **Depression Phase** : Contraction or Downswing of economy.
4. **Recovery Phase** : from depression to prosperity (lower turning Point).



1. Prosperity Phase

The **features of prosperity** are :-

1. High level of output and trade.
2. High level of effective demand.
3. High level of income and employment.
4. Rising interest rates.
5. Inflation.
6. Large expansion of bank credit.
7. Overall business optimism.

Depression Phase

features of depression are :-

1. Fall in volume of output and trade.
2. Fall in income and rise in unemployment.
3. Decline in consumption and demand.
4. Fall in interest rate.
5. Deflation.
6. Contraction of bank credit.

104R- AFM Short Notes

104- Accounting for Managers

Unit: 1

1. What is accounting? Explain Accounting concepts & conventions?

Ans: According to AICPA “Accounting is the art of recording, classifying and summarizing in a significant manner and in terms of money, transactions and events which are, in part at least, of a financial character and interpreting the results thereof”.

Functions of Accounting

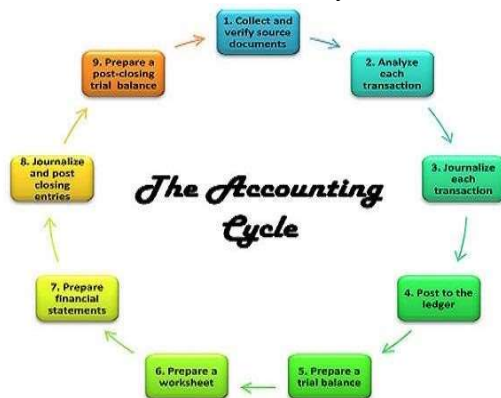
- Maintaining systematic records,
- Communicating the financial results,
- Meeting legal needs,
- Protecting business assets,
- Fixing responsibility,

Accounting Concepts

- a. Separate Entity Concept
- b. Going Concern Concept
- c. Money Measurement Concept
- d. Cost Concept
- e. Dual Aspect Concept
- f. Periodic Matching of Cost and Revenue Concept
- g. Realization Concept

Accounting Conventions

- a. Convention of Conservatism
- b. Convention of Full Disclosure
- c. Convention of Consistency
- d. Convention of Materiality.



Unit- 2:

2. Explain Depreciation Accounting?

Ans: Depreciation means diminution in the value of an asset, specially fixed asset, due to wear and tear, obsolescing, etc.

Factors that cause depreciation are as

- under:** ➤ Wear and tear due to actual use.
- Efflux of time
 - Obsolescence ➤ Accident
 - Fall in market value.

Method of Depreciation:

- ✓ Straight Line Method or the Fixed Instalment Method).
- ✓ Fixed percentage on the diminishing balance (also known as the Reducing Instalment method).
- ✓ Annuity Method.
- ✓ Depreciation Fund Method.
- ✓ Insurance Policy Method.
- ✓ Machine Hour Rate Method.
- ✓ Depletion Method.
- ✓ Revaluation Method.

Advantages & Disadvantages of Straight line method

❖ Advantages:

- Simple, easy to understand and to apply
- It provides uniform charge every year
- It's calculated on original cost over the life time

❖ Disadvantages:

- Depreciation is not related to the usage factor. It ignores the fact that in the later years of the life of the asset, efficiency of the asset declines.
- Loss of interest on investment in the asset is not accounted for...

REDUCING BALANCE METHOD

• Advantage

- Overall expenses (including repairs and maintenance) charged for the use of a fixed asset would be fairly constant.

• Disadvantages

- Difficult to calculate.
- Assets are always left with a small value at the end of useful life.

Unit- 3

3. What is Budget? Explain. Ans: A *budget* is a set of interlinked plans that quantitatively describe an entity's projected future operations. A budget is used as a yardstick against which to measure actual operating results, for the allocation of funding, and as a plan for future operations.

Objectives:

- ✓ Monitoring the income and expenditures over the course of a year (or a specific project time frame).
- ✓ Helping to determine if adjustments need to be made in programs and goals
- ✓ Forecasting income and expenses for projects,
- ✓ Including the timing and the availability of income.
- ✓ Providing a basis for accountability and transparency.

BUDGET COMPONENTS

- ✓ Income
- ✓ Expenses
- ✓ Budget Headings
- ✓ Currency
- ✓ Notes
- ✓ Contingency funds
- ✓ In-kind (non-monetary) contribution

STEP-BY-STEP: Creating a Budget

- ✓ Identify and plan your activities.
- ✓ Determine what each of your expenses. ✓ Estimate what your sources of income.
- ✓ Analyze the difference between your income and expenses.
- ✓ Develop a plan for the unexpected.
- ✓ Present your draft budget and cash flow statement.
- ✓ Make any changes and finalize your income and expenses budgets.
- ✓ Monitor the budget.

Essentials of budgetary control:

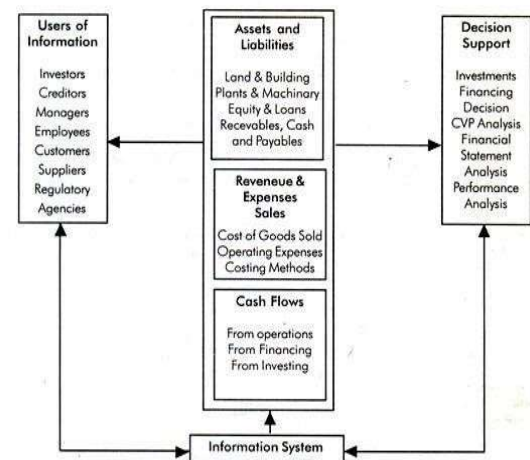
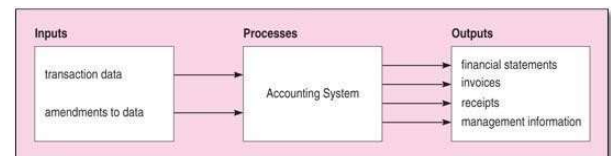
- ✓ Establishment of objectives for each function and section of the organization.
- ✓ Comparison of actual performance with budget.
- ✓ Ascertainment of the causes for such deviations of actual from the budgeted performance.
- ✓ Taking suitable corrective action from different available alternatives to achieve the desired objectives.

Unit- 4

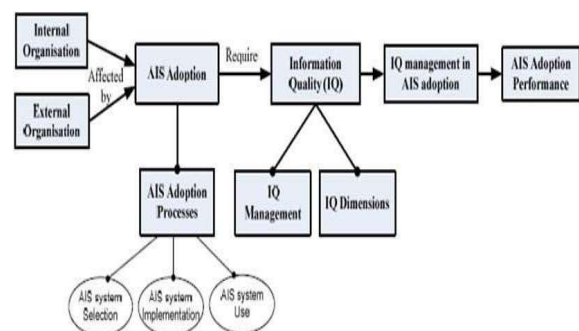
4. Define accounting information systems?

Ans: Accounting information systems (AISs) is, in large part, the study of the application of information technology (IT) to accounting systems.

An accounting information system is a collection of data and processing procedures that creates needed information for its users.



Accounting as an Information System

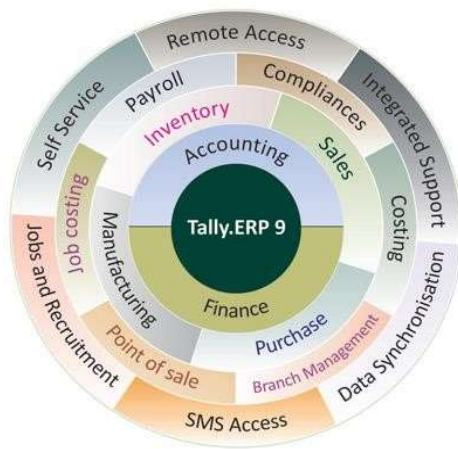


5. What is Tally? Explain.

Ans: Tally's software is mainly used for vouchers, financial statements, and taxation in many industries, and has specialised packages for retail businesses. More advanced capabilities are found in its [enterprise resource planning](#) package.

Tally Solutions offers four products:

- Tally.ERP 9
- Tally.Developer 9 ➤ Shoper 9
- Tally.Server 9999



Advantages:

- **Enables effortless data Movements**
- **Less expenses on data collection and data transfer of files**
- **Fast data files transaction**
- **Human errors is eliminated on the data**
- **To get easy and fast documents accesses**
- **Promotes business development activities**
- **For better sales promotion's**
- **Industry specific software sides**
- **Web enabled services**
- **Easy to use and handle**

Unit- 5:

6. What is Human Resource Accounting?

Explain.

Ans: **Human resource accounting** is the process of identifying and reporting [investments](#) made in the [human resources](#) of an organisation that are presently unaccounted for in the conventional [accounting](#) practices. It is an extension of standard accounting principles. Measuring the value of human resources can assist organizations in accurately documenting their assets.

Objectives

1. Providing cost value information about acquiring, developing, allocating and maintaining human resources.
2. Enabling management to monitor the use of human resources.
3. Finding depreciation or appreciation among human resources.
4. Assisting in developing effective management practices.
5. Increasing managerial awareness of the value of human resources.
6. For better human resource planning.
7. For better decisions about people, based on improved information system.
8. Assisting in effective utilization of manpower.

Advantages of HR Accounting

- Human Resource Planning anticipates not only the required kind and number of employees but also determines the action plan. The major benefits of HR accounting are:
- It checks the corporate plan of the organisation. The corporate plan aiming for expansion, diversification, changes in technological growth etc. has to be worked out with the availability of human resources for such placements or key positions. If such manpower is not likely to be available, HR accounting suggests modification of the entire corporate plan.
- It offsets uncertainty and change, as it enables the organisation to have the right person for the right job at the right time and place.

3. This system has not been given preference by tax authorities.

** All The Best* Accounting*

7. Explain Inflation Accounting?

Ans:

Inflation: Definitions

- ▶ Decrease in purchasing power of money due to an increase in the general price level
- ▶ "A process of steadily rising prices resulting in diminishing purchasing power of a given nominal sum of money"

The Penguin Dictionary of Economics

- ▶ "Rise in prices brought about by the expansion of the supply of bank money, credit, etc."

Oxford Advanced Learner's Dictionary of Current English



Inflation accounting is a term describing a range of accounting systems designed to correct problems arising from historical cost accounting in the presence of inflation.

Methods

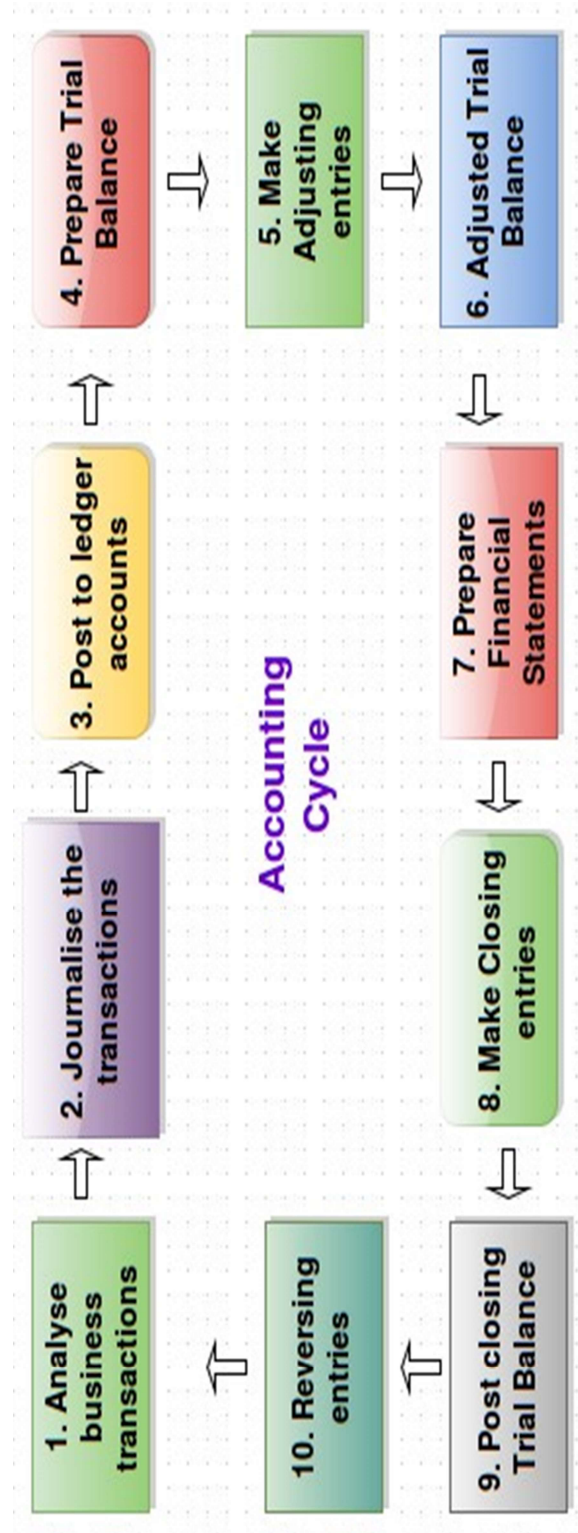
- Though an effective and acceptable method of inflation accounting is still not developed but there are techniques with the help of which enterprises are restating their financial statements. The commonly accepted methods of accounting for price level changes are:

1. Current Purchasing Power (CPP) Method
2. Current cost accounting method (CCA) Method
3. Hybrid method

Limitations of Inflation Accounting

1. Change in the price level is a continuous process.
2. This system makes the calculations a tedious task because of too many conversions and calculations.

Pictures:



105R- QAMD Short Notes

$$\lim_{x \rightarrow -4} \frac{x^2 - x - 20}{x + 4}$$

Sol. Given data

$$\lim_{x \rightarrow -4} \frac{x^2 - x - 20}{x + 4}$$

$$= \lim_{x \rightarrow -4} \frac{-4^2 + 4 - 20}{-4 + 4} = \frac{16 + 4 - 20}{0} = \frac{0}{0} \text{ undefined value.}$$

$$= \lim_{x \rightarrow -4} \frac{x^2 - x - 20}{x + 4}$$

$$= \lim_{x \rightarrow -4} \frac{x^2 - 5x + 4x - 20}{x + 4}$$

$$= \lim_{x \rightarrow -4} \frac{x(x-5) + 4(x+5)}{x+4}$$

$$= \lim_{x \rightarrow -4} \frac{(x-5)(\cancel{x+4})}{\cancel{x+4}}$$

$$= \lim_{x \rightarrow -4} (x-5)$$

$$= -4 - 5$$

$$= -9.$$

check the continuous of the function and given below at $x=1$ and $x=2$

$$f(x) = \begin{cases} x+1 & \text{if } x \leq 1 \\ 2x & \text{if } 1 < x \leq 2 \\ 1+x^2 & \text{if } x \geq 2 \end{cases}$$

Sol Given data

$$f(x) = \begin{cases} x+1 & \text{if } x \leq 1 \\ 2x & \text{if } 1 < x \leq 2 \\ 1+x^2 & \text{if } x \geq 2 \end{cases}$$

at $x=1$

$$\begin{aligned} \text{L.H.S } \lim_{x \rightarrow 1^-} (x+1) \\ = 1+1 = 2 \end{aligned}$$

$$\begin{aligned} \text{R.H.S } \lim_{x \rightarrow 1^+} 2x \\ = 2(1) \\ = 2 \end{aligned}$$

$$\text{L.H.S} = \text{R.H.S}$$

at $x=2$

$$\begin{aligned} \text{L.H.S } \lim_{x \rightarrow 2^-} 2x \\ = 2(2) = 4 \end{aligned}$$

$$\begin{aligned} \text{R.H.S } \lim_{x \rightarrow 2^+} (1+x^2) \\ = 1+2^2 = 1+4 \\ = 5 \end{aligned}$$

$$\text{L.H.S} \neq \text{R.H.S}$$

Ex: The total cost of $f(x)$ purchasing x units of items with in each intervals is as follows. find the points of discontinuities.

$$f(x) = \begin{cases} 15x & \text{if } 0 < x \leq 200 \\ 13x & \text{if } 200 < x \leq 400 \\ 10x & \text{if } x \geq 400 \end{cases}$$

Sol Given data

$$\begin{aligned} \text{L.H.S } \lim_{x \rightarrow 200^-} 15x \\ = 15(200) \\ = 3000 \end{aligned}$$

$$\begin{aligned} \text{L.H.S } \lim_{x \rightarrow 400^-} 13(x) &= 13(400) \\ &= 5200 \end{aligned}$$

$$\begin{aligned} \text{R.H.S } \lim_{x \rightarrow 200^+} 13x &= 13(200) \\ &= 2600 \end{aligned}$$

$$\begin{aligned} \text{R.H.S } \lim_{x \rightarrow 400^+} 10(x) &= 10(400) \\ &= 4000 \end{aligned}$$

$$\text{L.H.S} \neq \text{R.H.S}$$

$$\text{L.H.S} \neq \text{R.H.S}$$

find the maxima and minimum value of $f(x) = x^3 - 18x^2 + 96x$.

Soln Given data

UNIT-2

$$\text{let } f(x) = x^3 - 18x^2 + 96x$$

$$y = x^3 - 18x^2 + 96x \rightarrow \textcircled{1}$$

Now taking D.W.T to equation $\textcircled{1}$

$$f'(x) = \frac{dy}{dx} = \frac{d}{dx} (x^3 - 18x^2 + 96x)$$

$$= \frac{d}{dx} x^3 - 18 \frac{d}{dx} x^2 + 96 \frac{d}{dx} (x)$$

$$= 3x^2 - 18(2)x + 96(1)$$

$$= 3x^2 - 36x + 96 \rightarrow \textcircled{2}$$

$$\Rightarrow f'(x) = 0$$

$$3x^2 - 36x + 96 = 0$$

divided by '3'

$$x^2 - 12x + 32 = 0 \Rightarrow$$

$$x^2 - 8x - 4x + 32 = 0$$

$$x(x-8) - 4(x-8) = 0$$

$$(x-4)(x-8) = 0$$

$$\boxed{x=4} \quad \boxed{x=8}$$

another method

$$a=1, b=12, c=32$$

$$y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$y = \frac{12 \pm \sqrt{(-12)^2 - 4(1)(32)}}{2(1)}$$

$$= \frac{12 \pm \sqrt{144 - 128}}{2}$$

$$= \frac{12 \pm \sqrt{16}}{2}$$

$$= \frac{12 \pm 4}{2}$$

$$\Rightarrow \frac{12+4}{2}, \Rightarrow \frac{12-4}{2} = \frac{8}{2} =$$

$$\Rightarrow \frac{16}{2} = 8 \quad x=4, x=8$$

Again differentiate w.r.t respect to "x" of equation (2)

$$f''(x) = \frac{d^2y}{dx^2} = \frac{d}{dx} (3x^2 - 36x + 96)$$

$$= 6x - 36$$

$$\Rightarrow 6x - 36 < 0$$

$$\text{put } x=4$$

$$6(4) - 36 < 0$$

$$24 - 36 < 0$$

$$-12 < 0$$

The point value is maximum,

$$\Rightarrow f(x) \text{ } y = x^3 - 18x^2 + 96x$$

$$\text{put } x=4$$

$$= 4^3 - 18(4)^2 + 96(4)$$

$$= 64 - 288 + 384$$

$$= 160$$

$\therefore$ The maximum point is 160.

Ex 17

$$\int_2^3 \left(\sqrt{x} + \frac{1}{\sqrt{x}} \right) dx$$

Sol: Given data

$$\int_2^3 \left(\sqrt{x} + \frac{1}{\sqrt{x}} \right) dx$$

$$= \int_2^3 \left((x)^{1/2} + (x)^{-1/2} \right) dx$$

$$6x - 36 < 0$$

$$\text{put } x=8$$

$$6(8) - 36 < 0$$

$$48 - 36 < 0$$

$$12 > 0$$

The point value is minimum

$$f(x) = y = x^3 - 18x^2 + 96x$$

$$\text{put } x=8$$

$$= (8)^3 - 18(8)^2 + 96(8)$$

$$= 512 - 1152 + 768$$

$$= 128$$

$\therefore$ The minimum point is 128.

$$= \left[\int x^{1/2} dx + \int x^{-1/2} dx \right]_2^3$$

$$= \left[\frac{x^{1/2+1}}{\frac{1}{2}+1} \right] + \left[\frac{x^{-1/2+1}}{-1/2+1} \right]_2^3$$

$$= \left[\frac{x^{3/2}}{3/2} + \frac{x^{1/2}}{1/2} \right]_2^3$$

$$= \left[\frac{2}{3} x^{3/2} + 2x^{1/2} \right]_2^3$$

$$f(b) - f(a)$$

$$= \left[\frac{2}{3} x^{3/2} + 2x^{1/2} \right]_3 - \left[\frac{2}{3} x^{3/2} + 2x^{1/2} \right]_2$$

$$= \left[\frac{2}{3} (3)^{3/2} + 2(3)^{1/2} \right] - \left[\frac{2}{3} (2)^{3/2} + 2(2)^{1/2} \right]$$

$$= \left[\frac{2}{3} (\sqrt{3})^3 + 2(\sqrt{3}) \right] - \left[\frac{2}{3} (\sqrt{2})^3 + 2(\sqrt{2}) \right]$$

$$= \left[\frac{2}{3} (\sqrt{3})^3 + 2\sqrt{3} \right] - \left[\frac{2}{3} (\sqrt{2})^3 + 2\sqrt{2} \right]$$

$$= \left[\frac{2(\sqrt{3})^3}{3} + 2\sqrt{3} \right] - \left[\frac{2(\sqrt{2})^3}{3} + 2\sqrt{2} \right]$$

$$= \left[\frac{2(\sqrt{3})^3}{(\sqrt{3})^2} + 2\sqrt{3} \right] - \left[\frac{2}{3} \cdot (\sqrt{2})^2 \cdot \sqrt{2} + 2\sqrt{2} \right]$$

$$= \left[2 \cdot \sqrt{3} + 2\sqrt{3} \right] - \left[\frac{2}{3} \cdot 2 \cdot \sqrt{2} + 2\sqrt{2} \right]$$

$$= 4\sqrt{3} - \left[\frac{4}{3}\sqrt{2} + 2\sqrt{2} \right] = 4\sqrt{3} - \frac{4\sqrt{2} + 6\sqrt{2}}{3} = 4\sqrt{3} - \frac{10\sqrt{2}}{3}$$

Ex find the 3 numbers whose sum is 14^{th} and their product is 64.

Sol let $\frac{a}{r}, a, ar \dots$

UNIP-3

sum of 3 terms is 14

$$\frac{a}{r} + a + ar = 14 \longrightarrow \textcircled{1}$$

product of 3 terms is 64

$$\frac{a}{r} \cdot a \cdot ar = 64 \longrightarrow \textcircled{2}$$

$$a^3 = 64$$

$$a^3 = 4^3$$

$$\boxed{a = 4}$$

"a" value subs in equation $\textcircled{1}$

$$\frac{4}{r} + 4 + 4r = 14$$

$$\frac{4 + 4r + 4r^2}{r} = 14$$

$$4 + 4r + 4r^2 = 14r$$

$$4r^2 + 4r - 14r + 4 = 0$$

$$4r^2 - 10r + 4 = 0$$

$$4r^2 - 8r - 2r + 4 = 0$$

$$4r(r-2) - 2(r-2) = 0$$

$$(4r-2)(r-2) = 0$$

$$4r-2=0 \quad | \quad r-2=0$$

$$4r=2 \quad | \quad r=2$$

$$r = \frac{2}{4}$$

$$r = \frac{1}{2}$$

$$\frac{a}{r}, a, ar$$

$$r = \frac{1}{2} \Rightarrow \frac{A}{\frac{1}{2}}, A, A(\frac{1}{2}) \dots$$

$$= 8, 4, 2 \dots$$

$$r = 2 \Rightarrow \frac{a}{r}, a, ar \dots$$

$$\frac{A}{2}, A, A(2) \dots$$

$$2, 4, 8 \dots$$

Ex: A person borrows 80000 Rs/- in a bank agreeing to pay loan in 12 months. installment with interest rate is with 11% for a month of the unpaid balance. what should be the monthly the payment that will of 12 months.

Sol Given data

$$P.V.A = 80000$$

$$A = ?$$

$$n = 12$$

$$i = 11\% = 0.11$$

$$P.V.A = \frac{A[(1+i)^n - 1]}{i(1+i)^n}$$

$$80000 = \frac{A[(1+0.11)^{12} - 1]}{0.11(1+0.11)^{12}}$$

$$80000 = \frac{A[(1.11)^{12} - 1]}{0.11(1.11)^{12}}$$

$$80000 = \frac{A(3.4985 - 1)}{0.11(3.4985)}$$

$$80000 = \frac{A(2.4985)}{0.3848}$$

$$80000 \times 0.3848 = A(2.4985)$$

$$30784 = A(2.4985)$$

$$A(2.4985) = 30784$$

$$A = \frac{30784}{2.4985}$$

$$A = \underline{\underline{12320}}$$

Exⁿ calculate the future value of 12 monthly deposits of 1000\$ if each payment is made on the first day of the month. and the interest rate for month is 1.1% also calculate the total interest earned on the deposits if the old amount is with draw on the last day of 12 months.

Sol Given data

$$A = 1000$$

$$i = 1.1\% = \frac{1.1}{100} = 0.011$$

$$n = 12$$

$$F.V.A.D = \frac{A[(1+i)^n - 1]}{i} \cdot (1+i)$$

$$= \frac{1000[(1+0.011)^{12} - 1]}{0.011} \cdot [1.011]$$

$$= \frac{1000[1.1403 - 1]}{0.011} (1.011)$$

$$= \frac{1000[0.1403]}{0.011} (1.011)$$

$$= \frac{140.30}{0.011} (1.011)$$

$$= 12754.54(1.011)$$

$$= 12894.8399$$

=

Ex: To calculate $A^2 + 2b - 5c + 4I = ?$

UNIT - A

$$A = \begin{bmatrix} 3 & 4 & 5 \\ 1 & 2 & 3 \\ 1 & 1 & 2 \end{bmatrix} \quad B = \begin{bmatrix} 3 & 1 & 2 \\ 1 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix} \quad C = \begin{bmatrix} 11 & 2 & 1 \\ 7 & 6 & 2 \\ 1 & 1 & 0 \end{bmatrix}$$

Sol

$$A^2 + 2b - 5c + 4I = ?$$

$$A^2 = A \cdot A$$

$$A^2 = \begin{bmatrix} 3 & 4 & 5 \\ 1 & 2 & 3 \\ 1 & 1 & 2 \end{bmatrix} \begin{bmatrix} 3 & 4 & 5 \\ 1 & 2 & 3 \\ 1 & 1 & 2 \end{bmatrix}$$

$$= \begin{bmatrix} 3 \times 3 + 4 \times 1 + 5 \times 1 & 3 \times 4 + 4 \times 2 + 5 \times 1 & 3 \times 5 + 4 \times 3 + 5 \times 2 \\ 1 \times 3 + 2 \times 1 + 3 \times 1 & 1 \times 4 + 2 \times 2 + 3 \times 1 & 1 \times 5 + 2 \times 3 + 3 \times 2 \\ 1 \times 3 + 1 \times 1 + 2 \times 1 & 1 \times 4 + 1 \times 2 + 2 \times 1 & 1 \times 5 + 1 \times 3 + 2 \times 2 \end{bmatrix}$$

$$= \begin{bmatrix} 9+4+5 & 12+8+5 & 15+12+10 \\ 3+2+3 & 4+4+3 & 5+6+6 \\ 3+1+2 & 4+2+2 & 5+3+4 \end{bmatrix} = \begin{bmatrix} 18 & 25 & 37 \\ 8 & 11 & 17 \\ 6 & 8 & 12 \end{bmatrix}$$

$$A^2 + 2b = 2 \begin{bmatrix} 3 & 1 & 2 \\ 1 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 6 & 2 & 4 \\ 2 & 2 & 2 \\ 2 & 0 & 2 \end{bmatrix}$$

$$5c = 5 \begin{bmatrix} 11 & 2 & 1 \\ 7 & 6 & 2 \\ 1 & 1 & 0 \end{bmatrix} = \begin{bmatrix} 55 & 10 & 5 \\ 35 & 30 & 10 \\ 5 & 5 & 0 \end{bmatrix}$$

$$4I = 4 \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 4 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 4 \end{bmatrix}$$

$$A^2 + 2B = \begin{bmatrix} 18 & 25 & 37 \\ 8 & 11 & 17 \\ 6 & 8 & 12 \end{bmatrix} + \begin{bmatrix} 6 & 2 & 4 \\ 2 & 2 & 2 \\ 2 & 0 & 2 \end{bmatrix}$$

$$= \begin{bmatrix} 18+6 & 25+2 & 37+4 \\ 8+2 & 11+2 & 17+2 \\ 6+2 & 8+0 & 12+2 \end{bmatrix}$$

$$= \begin{bmatrix} 24 & 27 & 41 \\ 10 & 13 & 19 \\ 8 & 8 & 14 \end{bmatrix}$$

$$\begin{aligned} A^2 + 2B - 5C &= \begin{bmatrix} 24 & 27 & 41 \\ 10 & 13 & 19 \\ 8 & 8 & 14 \end{bmatrix} - \begin{bmatrix} 55 & 10 & 5 \\ 35 & 30 & 10 \\ 5 & 5 & 0 \end{bmatrix} \\ &= \begin{bmatrix} 24-55 & 27-10 & 41-5 \\ 10-35 & 13-30 & 19-10 \\ 8-5 & 8-5 & 14-0 \end{bmatrix} = \begin{bmatrix} -31 & 17 & 36 \\ -25 & -17 & 9 \\ 3 & 3 & 14 \end{bmatrix} \end{aligned}$$

$$\begin{aligned} A^2 + 2B - 5C + 4I &= \begin{bmatrix} -31 & 17 & 36 \\ -25 & -17 & 9 \\ 3 & 3 & 14 \end{bmatrix} + \begin{bmatrix} 4 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 4 \end{bmatrix} \\ &= \begin{bmatrix} -31+4 & 17+0 & 36+0 \\ -25+0 & -17+4 & 9+0 \\ 3+0 & 3+0 & 14+4 \end{bmatrix} = \begin{bmatrix} -27 & 17 & 36 \\ -25 & -13 & 9 \\ 3 & 3 & 18 \end{bmatrix} \end{aligned}$$

Inversion method is:

- ① To find out Inversion method from the given equations (or) Solve the following equations by using inversion method.

$$3x + y + 2z = 3$$

$$2x - 3y - z = -3$$

$$x + 2y + z = 4$$

Sol ^{is} Given data.

$$A = \begin{bmatrix} 3 & 1 & 2 \\ 2 & -3 & -1 \\ 1 & 2 & 1 \end{bmatrix} \quad x = \begin{bmatrix} x \\ y \\ z \end{bmatrix} \quad B = \begin{bmatrix} 3 \\ -3 \\ 4 \end{bmatrix}$$

The given equations are convert into the matrix notation. $\boxed{Ax = B}$

To calculate Inversion method $X = A^{-1} \cdot B$ (or) $X = B \cdot A^{-1}$

Inverse of matrices

$$A = \begin{bmatrix} 3 & 1 & 2 \\ 2 & -3 & -1 \\ 1 & 2 & 1 \end{bmatrix}$$

$$|A| = [a_1(b_2c_3 - b_3c_2) - a_2(b_1c_3 - b_3c_1) + a_3(b_1c_2 - b_2c_1)]$$

$$= [3(-3 \cdot 1 - 2(-1)) - 1(2 \cdot 1 - 1(-1)) + 2(2 \cdot 2 - (-3 \cdot 1))]$$

$$= [3(-3+2) - 1(2+1) + 2(4+3)]$$

$$= 3(-1) - 1(3) + 2(7)$$

$$= -3 - 3 + 14$$

$$= -6 + 14$$

$$|A| = 8$$

Minor of Matrices $A = \begin{bmatrix} 3 & 1 & 2 \\ 2 & -3 & -1 \\ 1 & 2 & 1 \end{bmatrix}$

$$3 = \begin{vmatrix} -3 & -1 \\ 2 & 1 \end{vmatrix} = -3 \times 1 - (-1) \times 2 = -3 + 2 = -1$$

$$1 = \begin{vmatrix} 2 & -1 \\ 1 & 1 \end{vmatrix} = 2 \times 1 - (-1) \times 1 = 2 + 1 = 3$$

$$2 = \begin{vmatrix} 2 & -3 \\ 1 & 2 \end{vmatrix} = 2 \times 2 - (-3) \times 1 = 4 + 3 = 7$$

$$2 = \begin{vmatrix} 1 & 2 \\ 2 & 1 \end{vmatrix} = 1 \times 1 - 2 \times 2 = 1 - 4 = -3$$

$$-3 = \begin{vmatrix} 3 & 2 \\ 1 & 1 \end{vmatrix} = 3 \times 1 - 2 \times 1 = 3 - 2 = 1$$

$$-1 = \begin{vmatrix} 3 & 1 \\ 1 & 2 \end{vmatrix} = 3 \times 2 - 1 \times 1 = 6 - 1 = 5$$

$$1 = \begin{vmatrix} 1 & 2 \\ -3 & -1 \end{vmatrix} = 1 \times (-1) - 2(-3) = -1 + 6 = 5$$

$$2 = \begin{vmatrix} 3 & 2 \\ 2 & -1 \end{vmatrix} = 3(-1) - 2 \times 2 = -3 - 4 = -7$$

$$1 = \begin{vmatrix} 3 & 1 \\ 2 & -3 \end{vmatrix} = 3(-3) - 1 \times 2 = -9 - 2 = -11$$

$$A = \begin{bmatrix} -1 & 3 & 7 \\ -3 & 1 & 5 \\ 5 & -7 & -11 \end{bmatrix}$$

co-factor of A

$$= \begin{bmatrix} -1 & 3 & 7 \\ -3 & 1 & 5 \\ 5 & -7 & -11 \end{bmatrix} \begin{bmatrix} + & - & + \\ - & + & - \\ + & - & + \end{bmatrix}$$

$$= \begin{bmatrix} -1 & -3 & 7 \\ 3 & 1 & -5 \\ 5 & 7 & -11 \end{bmatrix}$$

Adjoint of A = [co-factor of A]^T

$$= \begin{bmatrix} -1 & 3 & 5 \\ -3 & 1 & 7 \\ 7 & -5 & -11 \end{bmatrix}$$

Inverse of matrices

$$A^{-1} = \frac{1}{|A|} \cdot \text{Adj}(A)$$

$$= \frac{1}{8} \begin{bmatrix} -1 & 3 & 5 \\ -3 & 1 & 7 \\ 7 & -5 & -11 \end{bmatrix} = \frac{\begin{bmatrix} -1 & 3 & 5 \\ -3 & 1 & 7 \\ 7 & -5 & -11 \end{bmatrix}}{8}$$

$$A^{-1} = \begin{bmatrix} -\frac{1}{8} & \frac{3}{8} & \frac{5}{8} \\ -\frac{3}{8} & \frac{1}{8} & \frac{7}{8} \\ \frac{7}{8} & -\frac{5}{8} & -\frac{11}{8} \end{bmatrix}$$

$$X = A^{-1} \cdot B$$

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -1/8 & 3/8 & 5/8 \\ -3/8 & 1/8 & 1/8 \\ 1/8 & -5/8 & -11/8 \end{bmatrix} \cdot \begin{bmatrix} 3 \\ -3 \\ 4 \end{bmatrix}$$

$$= \begin{bmatrix} -1/8 \times 3 + 3/8 \times -3 + 5/8 \times 4 \\ -3/8 \times 3 + 1/8 \times -3 + 1/8 \times 4 \\ 1/8 \times 3 + -5/8 \times -3 + -11/8 \times 4 \end{bmatrix}$$

$$= \begin{bmatrix} -3/8 + 9/8 + \frac{20}{8} \\ -9/8 - 3/8 + \frac{28}{8} \\ \frac{21}{8} + \frac{15}{8} - \frac{44}{8} \end{bmatrix}$$

$$= \begin{bmatrix} \frac{-3 - 9 + 20}{8} \\ \frac{-9 - 3 + 28}{8} \\ \frac{21 + 15 - 44}{8} \end{bmatrix}$$

$$= \begin{bmatrix} 8/8 \\ 16/8 \\ -8/8 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}$$

$$x = 1$$

$$y = 2$$

$$z = -1 //$$

Consider the pay off matrix of player A. To solve it optimally using graphical method.

UNIT-5

		player B			
		B ₁	B ₂	B ₃	B ₄
player A	A ₁	2	2	3	-1
	A ₂	4	3	2	6

sol Given data

		player B				
		B ₁	B ₂	B ₃	B ₄	min
player A	A ₁	2	2	3	-1	-1
	A ₂	4	3	2	6	2
max		4	3	3	6	

$$\min \max = [-1, 2] = 2$$

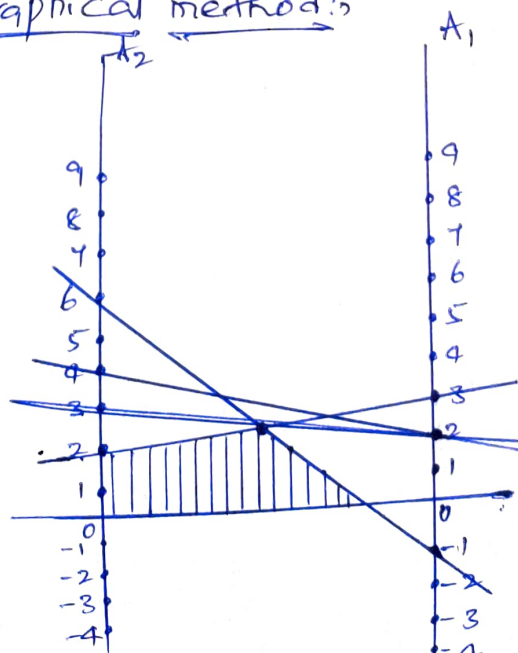
$$\max \min = [4, 3, 3, 6] = 3$$

$$\min \max = \max \min$$

$$2 \neq 3$$

$\therefore$ The saddle point is does not existed.

By using Graphical method:



player B

		B ₁	B ₂
player A	A ₁	3	-1
	A ₂	2	6

$$P_1 = \frac{a_{22} - a_{12}}{(a_{11} + a_{22}) - (a_{12} + a_{21})}$$

$$= \frac{6 - (-1)}{(3+6) - (-1+2)}$$

$$= \frac{7}{9 - (-1)}$$

$$P_1 = \frac{7}{8} //$$

$$P_2 = 1 - P_1 = 1 - \frac{7}{8} = \frac{8-7}{8} = \frac{1}{8} //$$

$$q_1 = \frac{a_{22} - a_{21}}{(a_{11} + a_{22}) - (a_{12} + a_{21})}$$

$$= \frac{6 - 2}{(3+6) - (-1+2)}$$

$$= \frac{4}{9-1} = \frac{4}{8} = \frac{7}{8} = \frac{1}{2}$$

$$q_1 = \frac{1}{2}$$

$$q_2 = 1 - q_1 = 1 - \frac{1}{2} = \frac{2-1}{2} = \frac{1}{2} //$$

$$V = \frac{(a_{11} \cdot a_{22}) - (a_{12} \cdot a_{21})}{(a_{11} + a_{22}) - (a_{12} + a_{21})}$$

$$= \frac{(3 \cdot 6) - (-1 \cdot 2)}{(3+6) - (-1+2)}$$

$$= \frac{18 - (-2)}{9-1}$$

$$= \frac{20}{8} = \frac{5}{2}$$

$$\boxed{V = \frac{5}{2}}$$

Mixed strategies:-

$$\text{player A} = \begin{bmatrix} A_1 & A_2 \\ P_1 & P_2 \end{bmatrix} = \begin{bmatrix} A_1 & A_2 \\ \frac{1}{8} & \frac{1}{8} \end{bmatrix}$$

$$\text{player B} = \begin{bmatrix} B_3 & B_4 \\ Q_1 & Q_2 \end{bmatrix} = \begin{bmatrix} B_3 & B_4 \\ \frac{1}{2} & \frac{1}{2} \end{bmatrix}$$

$\therefore$ The value of the game is $\boxed{V = \frac{5}{2}}$

Consider the pay off matrix of player A. To solve it optimally using graphical method.

		player B	
		B ₁	B ₂
player A	A ₁	1	3
	A ₂	3	5
	A ₃	-1	6
	A ₄	4	1
	A ₅	2	2
	A ₆	-5	0

Sol. Given data

		player B		
		B ₁	B ₂	
player A	A ₁	1	3	min
	A ₂	3	5	3
	A ₃	-1	6	-1
	A ₄	4	1	1
	A ₅	2	2	2
	A ₆	-5	0	-5
max		4	6	

$$\min \max = [1, 3, -1, 1, 2, -5] = 3$$

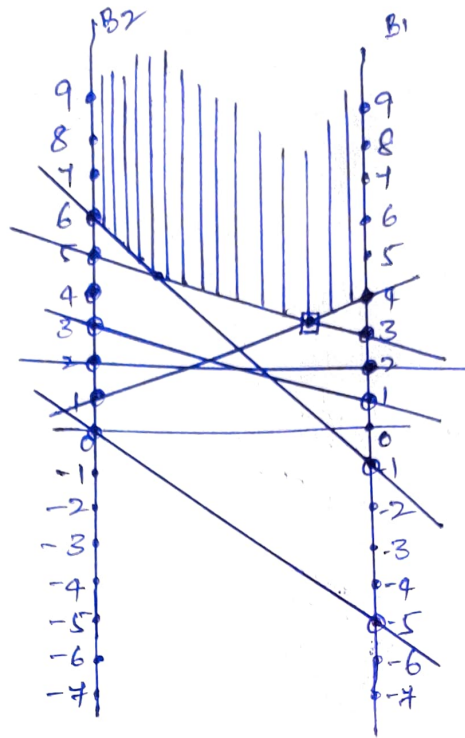
$$\max \min = [4, 6] = 4$$

$$\min \max \neq \max \min$$

$$3 \neq 4$$

$\therefore$ The saddle point does not exist.

By using Graphical method:-



player B

B_1 B_2

player A

A_2	3	5
A_1	4	1

$$P_1 = \frac{a_{22} - a_{12}}{(a_{11} + a_{22}) - (a_{12} + a_{21})} = \frac{1 - 5}{(3 + 1) - (5 + 4)} = \frac{-4}{4 - 9} = \frac{-4}{-5} = \frac{4}{5}$$

$$P_2 = 1 - P_1 = 1 - \frac{4}{5} = \frac{5 - 4}{5} = \frac{1}{5}$$

$$q_1 = \frac{a_{22} - a_{21}}{(a_{11} + a_{22}) - (a_{12} + a_{21})} = \frac{1 - 4}{(3 + 1) - (5 + 4)} = \frac{-3}{4 - 9} = \frac{-3}{-5} = \frac{3}{5}$$

$$q_2 = 1 - q_1 = 1 - \frac{3}{5} = \frac{5 - 3}{5} = \frac{2}{5}$$

$$V = \frac{(a_{11} \cdot a_{22}) - (a_{12} \cdot a_{21})}{(a_{11} + a_{22}) - (a_{12} + a_{21})} = \frac{(3 \cdot 1) - (5 \cdot 4)}{(3 + 1) - (5 + 4)} = \frac{3 - 20}{4 - 9} = \frac{-17}{-5} = \frac{17}{5}$$

$$V = \frac{17}{5}$$

mixed strategies in

$$\text{player A} = \begin{bmatrix} A_1 & A_2 \\ p_1 & p_2 \end{bmatrix} = \begin{bmatrix} A_1 & A_2 \\ \frac{4}{5} & \frac{1}{5} \end{bmatrix}$$

$$\text{player B} = \begin{bmatrix} B_1 & B_2 \\ q_1 & q_2 \end{bmatrix} = \begin{bmatrix} B_1 & B_2 \\ \frac{3}{5} & \frac{2}{5} \end{bmatrix}$$

$\therefore$ The value of the game $v = \underline{\underline{\frac{17}{5}}}$

106R- BS Short Notes

UNIT-1

calculate mean deviation from the following data.

Age (years) :	00-10	10-20	20-30	30-40	40-50	50-60
Frequency :	3	61	223	137	53	19

Given data.

Age	Frequency (f)	Mid values (x_i)	Deviation $d_i = \frac{x_i - A}{c}$	$f_i d_i$
0-10	3	5	-3	-9
10-20	61	15	-2	-122
20-30	223	25	-1	-223
30-40	137	(35) A	0	0
40-50	53	45	1	53
50-60	19	55	2	38
	<u>N = 496</u>			<u>$\Sigma f_i d_i = -263$</u>

$$\text{calculate. mean } \bar{x} = A + \frac{\Sigma f_i d_i}{N} \times c.$$

where A = Assumed mean, f = frequency
d = Deviation, N = Sum of the frequency
c = Class Interval.

$$\bar{x} = A + \frac{\Sigma f_i d_i}{N} \times c.$$

$$= 35 + \frac{(-263)}{496} \times 10$$

$$= 35 - 0.5303 \times 10$$

$$= 35 - 5.303$$

$$\bar{x} = 29.697$$

$$\text{Mean } \bar{x} = 29.697$$

$$A = 35$$

$$\Sigma f_i d_i = -263$$

$$N = 496$$

$$c = 10$$

Mean Deviation:

Age	frequency	mid values (x_i)	d_i	$f_i d_i$	$ x_i - \bar{x} $
0-10	3	5	-3	-9	$5 - 29.697 = 24.697$
10-20	61	15	-2	-122	$15 - 29.697 = 14.697$
20-30	223	25	-1	-223	$25 - 29.697 = 4.697$
30-40	137	35	0	0	$35 - 29.697 = 5.303$
40-50	53	45	1	53	$45 - 29.697 = 15.303$
50-60	19	55	2	38	$55 - 29.697 = 25.303$
					$\Sigma x_i - \bar{x} = 90$

$$\text{Mean Deviation } |\bar{x}| = \frac{\Sigma |x_i - \bar{x}|}{n}$$

$$= \frac{90}{6}$$

$$\therefore \Sigma |x_i - \bar{x}| = 90$$

$$\therefore n = 6$$

$$|\bar{x}| = 15$$

mean deviation ($\bar{x}$) = 15

2. calculate standard deviation from the following data.

wages (Rs)	Less than 10	<20	<30	<40	<50	<60	<70	<80
No. of workers	12	30	65	107	157	202	222	230

Sol Given data.

wages	No. of workers (f)	mid values (x_i)	$d_i = \frac{x_i - A}{c}$	d_i^2	$f_i d_i$	$f_i d_i^2$
0-10	12	5	-4	16	-48	2304
10-20	30	15	-3	9	-90	8100
20-30	65	25	-2	4	-130	16900
30-40	107	35	-1	1	-107	11449
40-50	157	(45) *	0	0	0	0
50-60	202	55	1	1	202	40804
60-70	222	65	2	4	444	197136
70-80	230	75	3	9	690	476100
$N = 1025$						

$$\Sigma f_i d_i = 961 \quad \Sigma f_i d_i^2 = 752193$$

Standard deviation

$$\sigma = \sqrt{\frac{\sum f_i d_i^2}{N} - \left(\frac{\sum f_i d_i}{N}\right)^2} \times C.$$

where.

$$N = 1025, \sum f_i d_i = 961, \sum f_i d_i^2 = 752793, C = 10$$

$$\sigma = \sqrt{\frac{752793}{1025} - \left(\frac{961}{1025}\right)^2} \times 10$$

$$= \sqrt{734.4822 - (0.9376)^2} \times 10$$

$$= \sqrt{734.4822 - 0.8791} \times 10$$

$$= \sqrt{733.5531} \times 10$$

$$= 27.0842 \times 10$$

$$\sigma = 270.842.$$

Standard deviation $\sigma = 270.842.$

$$M.C.A.R(x) = A + \frac{\sum f_i d_i}{N} \times C.$$

$$= 45 + \frac{961}{1025} \times 10$$

$$= 45 + 0.9375 \times 10$$

$$= 45 + 9.375$$

$$\bar{x} = 54.375$$

$$\text{Co-efficient of variance (CV)} = \frac{\sigma}{\bar{x}} \times 100$$

$$= \frac{270.842}{54.375} \times 100$$

$$= 4.9810 \times 100$$

$$= 498.10\%$$

1. Calculate Rank Correlation Coefficient from the following data

X :	48	33	35	48	16	16	24	57	35
Y :	13	13	24	24	15	09	06	06	09

Sol Given Information:

X	Y	Rank (R ₁)	Rank (R ₂)	D = R ₁ - R ₂	D ²
48	13	2.5	4.5	-2	4
33	13	6	4.5	2	4
35	24	4.5	1.5	3	9
48	24	2.5	1.5	1	1
16	15	8.5	3	5.5	30.25
16	09	8.5	6.5	2	4
24	06	7	8.5	-1.5	2.25
57	06	1	8.5	-7.5	56.25
35	09	4.5	6.5	-2.0	4

$$\sum D^2 = 113$$

Rank Correlation Coefficient

$$r = 1 - \frac{6 \left[\sum D^2 + \left(\frac{m^3 - m}{12} \right) + \left(\frac{n^3 - n}{12} \right) + \left(\frac{m^3 - m}{12} \right) + \left(\frac{m^3 - m}{12} \right) + \left(\frac{m^3 - m}{12} \right) + \left(\frac{m^3 - m}{12} \right) \right]}{N(N^2 - 1)}$$

$$= 1 - \frac{6 \left[113 + \left(\frac{2^3 - 2}{12} \right) + \left(\frac{2^3 - 2}{12} \right) + \left(\frac{2^3 - 2}{12} \right) + \left(\frac{2^3 - 2}{12} \right) + \left(\frac{2^3 - 2}{12} \right) + \left(\frac{2^3 - 2}{12} \right) \right]}{9(9^2 - 1)}$$

$$= 1 - \frac{6 [113 + 0.5 + 0.5 + 0.5 + 0.5 + 0.5 + 0.5]}{9(81 - 1)}$$

$$= 1 - \frac{6[113 + 3.5]}{9(80)}$$

$$= 1 - \frac{6[116.5]}{720}$$

$$= 1 - \frac{699}{720}$$

$$= 1 - 0.97$$

$$\boxed{r = 0.03}$$

$\therefore$ The Rank Correlation Coefficient is $r = 0.03$.

From the following data obtained the two regression equation and calculate the correlation coefficient.

x	1	2	3	4	5	6	7	8	9
y	9	8	10	12	11	13	14	16	15

Given data.

x	y	x^2	y^2	xy
1	9	1	81	9
2	8	4	64	16
3	10	9	100	30
4	12	16	144	48
5	11	25	121	55
6	13	36	169	78
7	14	49	196	98
8	16	64	256	128
9	15	81	225	135
$\Sigma x = 45$	$\Sigma y = 108$	$\Sigma x^2 = 285$	$\Sigma y^2 = 1356$	$\Sigma xy = 597$

$$\bar{x} = \frac{\Sigma x}{n} = \frac{45}{9}$$

$$= 5$$

$$\bar{y} = \frac{\Sigma y}{n} = \frac{108}{9}$$

$$\bar{y} = 12$$

$$\sigma_x = \sqrt{\frac{\Sigma x^2}{n} - \frac{(\Sigma x)^2}{n}}$$

$$= \sqrt{\frac{285}{9} - \frac{(45)^2}{9}}$$

$$= \sqrt{31.6 - \frac{2025}{9}}$$

$$= \sqrt{31.6 - 225} = \sqrt{-193.4} = -13.90$$

$$\begin{aligned}
 \sigma_y &= \sqrt{\frac{\sum y^2}{n} - \frac{(\sum y)^2}{n^2}} \\
 &= \sqrt{\frac{1356}{9} - \frac{(108)^2}{9}} \\
 &= \sqrt{150.6 - \frac{11664}{9}} \\
 &= \sqrt{150.6 - 1296} \\
 &= \sqrt{-1145.4} \\
 &= -33.8
 \end{aligned}$$

Correlation Coefficient.

$$\begin{aligned}
 r &= \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sqrt{\sum x^2 - \frac{(\sum x)^2}{n}} \cdot \sqrt{\sum y^2 - \frac{(\sum y)^2}{n}}} \\
 &= \frac{597 - \frac{45(108)}{9}}{\sqrt{285 - \frac{(45)^2}{9}} \cdot \sqrt{1356 - \frac{(108)^2}{9}}}
 \end{aligned}$$

$$\begin{aligned}
 &= \frac{597 - 540}{\sqrt{285 - 225} \cdot \sqrt{1356 - 1296}} \\
 &= \frac{57}{\sqrt{60} \cdot \sqrt{60}} = \frac{57}{7.7 \times 7.7} = \frac{57}{59.29}
 \end{aligned}$$

$$r = 0.96$$

$$b_{xy} = \frac{\sigma_y}{\sigma_x} \cdot r = \frac{+33.8}{+13.9} \times 0.96 = 2.33$$

$$b_{yx} = \frac{\sigma_x}{\sigma_y} \cdot r = \frac{+13.9}{+33.8} \times 0.96 = 0.39$$

Regression Equations:

$$x \text{ on } y \Rightarrow (x - \bar{x}) = \frac{\sigma_y}{\sigma_x} \cdot r \cdot (y - \bar{y})$$

$$x - 5 = \frac{+33.8}{+13.9} \times 0.96 (y - 12)$$

$$x - 5 = 2.43 \times 0.96 (y - 12)$$

$$x - 5 = 2.33 (y - 12)$$

$$x - 5 = 2.33y - 12(0.233)$$

$$x - 5 = 2.33y - 27.96$$

$$x = 2.33y - 27.96 + 5$$

$$x = 2.33y - 22.96$$

$$y \text{ on } x \Rightarrow (y - \bar{y}) = \frac{\sigma_x}{\sigma_y} \cdot r \cdot (x - \bar{x})$$

$$(y - 12) = \frac{+13.9}{+33.8} \times 0.96 (x - 5)$$

$$y - 12 = 0.41 \times 0.96 (x - 5)$$

$$y - 12 = 0.39 (x - 5)$$

$$y - 12 = 0.39x - 5(0.39)$$

$$y - 12 = 0.39x - 1.95$$

$$y = 0.39x - 1.95 + 12$$

$$y = 0.39x + 10.05$$

$$r = \sqrt{b_{xy} \cdot b_{yx}}$$

$$= \sqrt{0.39 \times 2.33}$$

$$= \sqrt{0.9087}$$

$$= 0.953$$

UNIT-3

The sales of Company in thousands of rupees for the years 1980 through 1984 are given below.

Year :	1980	1981	1982	1983	1984
Sales :	32	47	65	92	132

Estimate the sale figures for the year 1985 and 1986.

using an equation of the form $y = a + bu$.

Given data.

Least Squares $y = a + bu$

$$u = \frac{t - \text{middle year}}{\text{class interval.}}$$

$$b = \frac{\sum uy}{\sum u^2}$$

$$a = \frac{\sum y}{n}$$

$\therefore$ Let year denoted the "t" and sales be "y" we are given add no. of values $\Rightarrow u = \frac{t - 1982}{1}$

t	y	$u = t - 1982$	u^2	uy
1980	32	$1980 - 1982 = -2$	4	-64
1981	47	$1981 - 1982 = -1$	1	-47
1982	65	$1982 - 1982 = 0$	0	0
1983	92	$1983 - 1982 = 1$	1	92
1984	132	$1984 - 1982 = 2$	4	264
$\sum y = 368$			$\sum u^2 = 10$	$\sum uy = 245$

$$a = \frac{\sum y}{n} = \frac{368}{5} = 73.6$$

$$b = \frac{\sum uy}{\sum u^2} = \frac{245}{10} = 24.5$$

Estimation of the year 1985 $\Rightarrow u = \frac{t - \text{middle year}}{C.I.}$

$$= \frac{1985 - 1982}{1}$$

$$= 1985 - 1982$$

$$= 3$$

Estimation of the year 1986 $\Rightarrow u = \frac{t - \text{middle year}}{C.I.}$

$$= \frac{1986 - 1982}{1}$$

$$= 1986 - 1982$$

$$= 4$$

$$\Rightarrow ay = a + bu$$

$$= 73.6 + 24.5(3)$$

$$= 73.6 + 73.5$$

Estimation of the year 1985 = 147.1

$$\Rightarrow y = a + bu$$

$$= 73.6 + 24.5(4)$$

$$= 73.6 + 98$$

$$= 171.6$$

Estimation of the year 1986 = 171.6

Construct with the help of the data given below. Fisher's ideal index and show how it satisfies the time reversal test.

Commodity	1998		2004	
	price	quantity	price	quantity
A	4.5	20	10.50	22
B	7.0	40	13.00	45
C	14.00	04	32.00	05
D	16.50	03	28.00	02
E	5.00	02	09.00	1.5

Given data.

Commodity	1998		2004		P_{198}	P_{19}	P_{09}	P_{090}
	price (P_0)	quantity (Q_0)	price (P_1)	quantity (Q_1)				
A	4.5	20	10.5	22	210	231	99	90
B	7.0	40	13.00	45	520	585	315	280
C	14.00	04	32.00	05	128	160	70	56
D	16.5	03	28.00	02	84	56	33	49.5
E	5.00	02	09.00	1.5	18	13.5	7.5	10

$$\Sigma P_{198} = 960 \quad \Sigma P_{19} = 1045.5 \quad \Sigma P_{09} = 524.5 \quad \Sigma P_{090} = 485.5$$

(i) Fisher's ideal index test:

$$P_{CI} = \sqrt{L \times P}$$

$$= \sqrt{\frac{\Sigma P_{198} Q_0}{\Sigma P_{090} Q_0} \times \frac{\Sigma P_{19} Q_1}{\Sigma P_{09} Q_1}}$$

$$= \sqrt{\frac{960}{485.5} \times \frac{1045.5}{524.5}}$$

$$= \sqrt{1.9773 \times 1.9933}$$

$$= \sqrt{3.9413} = 1.9852$$

(ii) Time Reversal Test is:

$$P_{01} \times P_{10} = 1$$

$$P_{01} \times P_{10} = \sqrt{\frac{\sum P_1 q_0}{\sum P_0 q_0} \times \frac{\sum P_1 q_1}{\sum P_0 q_1} \times \frac{\sum P_0 q_1}{\sum P_1 q_1} \times \frac{\sum P_0 q_0}{\sum P_1 q_0}}$$

$$= \sqrt{\frac{960}{485.5} \times \frac{1045.5}{524.5} \times \frac{524.5}{1045.5} \times \frac{485.5}{960}}$$

$$= \sqrt{1}$$

$$= 1$$

$$P_{01} \times P_{10} = 1$$

(iii) Factor Reversal Test:

$$P_{01} \times q_{01} = \frac{\sum P_1 q_1}{\sum P_0 q_0}$$

$$P_{01} \times q_{01} = \sqrt{\frac{\sum P_1 q_0}{\sum P_0 q_0} \times \frac{\sum P_1 q_1}{\sum P_0 q_1} \times \frac{\sum q_1 P_0}{\sum q_0 P_0} \times \frac{\sum q_1 P_1}{\sum q_0 P_1}} = \frac{\sum P_1 q_1}{\sum P_0 q_0}$$

$$= \sqrt{\frac{960}{485.5} \times \frac{1045.5}{524.5} \times \frac{524.5}{485.5} \times \frac{1045.5}{960}} = \frac{1045.5}{485.5}$$

$$= \sqrt{\frac{(1045.5)^2}{(485.5)^2}} = \frac{1045.5}{485.5}$$

$$= \sqrt{\left(\frac{1045.5}{485.5}\right)^2} = \frac{1045.5}{485.5}$$

$$\Rightarrow \frac{1045.5}{485.5} = \frac{1045.5}{485.5}$$

UNIT-4

In a certain factory manufacturing razor blades, there is small chance $\frac{1}{50}$ for any blade to be defective. The blades are placed in a packets, each containing 10 blades. using the poisson distribution, calculate the approximate number of packets containing not more than 2 defective blades in a consignment of 10000 packets.

Given data.

$$N = 10000$$

$$p = \frac{1}{50}, \quad n = 10$$

$$m = n \cdot p = 10 \cdot \frac{1}{50} = 0.2$$

$$p_0 = e^{-m} = e^{-0.2} = 0.8187$$

$$N(p_0) = (p_0) \times 10000 = 0.8187 \times 10000 = 8187$$

$$N(p_1) = N(p_0) \times m = 8187 \times 0.2 = 1637.4$$

$$N(p_2) = N(p_1) \times \frac{m}{2} = 1637.4 \times \frac{0.2}{2} = 163.74$$

$\therefore$ The approximate number of packets containing not more than 2 defective blades in a consignment of 10000 packets is

$$10000 - [8187 + 1637.4 + 163.74] = 10000 - 9988.14$$

$$= 11.86 \text{ (or) } \underline{\underline{12}}$$

2. A result of certain Experiment the data obtained was:

Verity:	0	1	2	3	4
Frequency:	8	32	34	24	5

calculate the expected frequencies based on a Binomial distribution.

Sol Given data.

x	f	fx
0	8	0
1	32	32
2	34	68
3	24	72
4	5	20
$N=103$		$\Sigma fx=192$

Binomial Distribution $P(X=x) = {}^n C_x (\hat{p})^x \cdot (\hat{q})^{n-x}$.

$$\text{where } \hat{p} = \frac{\bar{x}}{n}$$

$$\hat{q} = 1 - \hat{p}$$

Expected frequency $P(X=x) = N \cdot {}^n C_x (\hat{p})^x \cdot (\hat{q})^{n-x}$

$$\bar{x} = \frac{\Sigma fx}{N} = \frac{192}{103} = 1.8640.$$

$$\hat{p} = \frac{\bar{x}}{n} = \frac{1.8640}{5} = 0.3728.$$

$$\hat{q} = 1 - \hat{p} = 1 - 0.3728$$

$$= 0.6272.$$

Expected frequency.

$$P(X=x) = N \cdot {}^n C_x (\hat{p})^x (\hat{q})^{n-x}$$

$$= 103 \cdot {}^5 C_x (0.3728)^x (0.6272)^{5-x}$$

$\therefore$ where $x = 0, 1, 2, 3, 4, \dots$

$$P(X=0) = N \cdot {}^n C_x (\hat{p})^x (\hat{q})^{n-x}$$

$$= 103 \cdot {}^5 C_0 (0.3728)^0 (0.6272)^{5-0}$$

$$= 103 \cdot 1 \cdot 1 \cdot (0.0970)$$

$$= 103 (0.0970)$$

$$= 9.991 \approx \underline{10}$$

$$P(X=1) = 103 \cdot {}^5 C_1 (0.3728)^1 (0.6272)^{5-1}$$

$$= 103 \cdot 5 \cdot (0.3728) \cdot (0.1547)$$

$$= 103 \cdot (0.2883)$$

$$= 29.70 \approx \underline{30}$$

$$P(X=2) = 103 \cdot {}^5 C_2 (0.3728)^2 (0.6272)^{5-2}$$

$$= 103 \cdot 10 \cdot (0.1389) \cdot (0.6272)^3$$

$$= 103 \cdot 10 (0.1389) \cdot (0.2467)$$

$$= 35.29 \approx \underline{35}$$

$$P(X=3) = 103 \cdot {}^5 C_3 (0.3728)^3 (0.6272)^{5-3}$$

$$= 103 \cdot 10 (0.0518) \cdot (0.3933)$$

$$= 20.98 \approx \underline{21}$$

$$\begin{aligned}
 p(x=4) &= 108 \cdot {}^5C_4 \cdot (0.3728)^4 (0.6272)^{5-4} \\
 &= 108 \cdot 5 \cdot (0.0193) (0.6272) \\
 &= 6.23 \approx \underline{\underline{6}}
 \end{aligned}$$

x	F	fx	Expected frequency.
0	8	0	10
1	32	32	30
2	34	68	35
3	24	72	21
4	5	20	<u>6</u>

UNIT-5

A market survey of 600 consumers for brand preference reveals following information.

Income (Rs. per month)	Brand I	Brand II	Brand III
< 10000	132	128	50
10000-15000	62	60	28
15000-20000	30	30	26
> 20000	16	22	16

Does Income has any association with the brand preference?

Income	Brand - I	Brand - II	Brand - III	Total
< 10000	132	128	50	310
10000 - 15000	62	60	28	150
15000 - 20000	30	30	26	86
> 20000	16	22	16	54
Total	240	240	120	600

+ Grand Total.

O_i	E_i	$O_i - E_i$	$(O_i - E_i)^2$	$\frac{(O_i - E_i)^2}{E_i}$
132	$\frac{310 \times 240}{600} = 124$	$132 - 124 = 8$	64	0.5161
128	124	4	16	0.1290
50	62	-12	144	2.3225
62	60	2	4	0.0666
60	60	0	0	0
28	30	-2	4	0.1333
30	34.4	-4.4	19.36	0.5627
30	34.4	-4.4	19.36	0.5627
26	17.2	8.8	77.44	4.5023
16	21.6	-5.6	31.36	1.4518
22	21.6	0.4	0.16	0.0074
16	10.8	5.2	27.04	2.5037

$$\sum \frac{(O_i - E_i)^2}{E_i} = 12.7581$$

χ^2 calculated value = 12.7581

χ^2 table value.

$$\begin{aligned} \text{Degrees of freedom} &= (r-1)(c-1) \\ &= (4-1)(3-1) \\ &= 3 \cdot 2 \\ &= 6 \end{aligned}$$

At the level of significance is $\alpha = 0.05$.

Table value is 12.6.

$\therefore \chi^2$ calculated value $\leq \chi^2$ table value

$$12.7581 \leq 12.6.$$

$\therefore H_0$ is Rejected.

2) The following data represent the sale (Rs. 000) per month of four brands of a toilet soap allocated among four cities.

Brand	city.			
	A	B	C	D
I	12	48	30	29
II	42	57	54	39
III	19	42	21	36
IV	28	39	44	50

Test whether

- i) The mean sales of the three brands are equal.
- ii) The mean sales of toilet soap in each city are equal.

Given data.

Brand	city				Total
	A	B	C	D	
<u>I</u>	12	48	30	29	119
<u>II</u>	42	57	54	39	192
<u>III</u>	19	42	21	36	118
<u>IV</u>	28	39	44	50	161
Total	101	186	149	154	590 → Grand total.

$$\begin{aligned}
 \text{Correction factor (C.F.)} &= \frac{(\text{Grand Total})^2}{N} \\
 &= \frac{(590)^2}{16} \\
 &= \frac{348100}{16} \\
 &= 21756.25.
 \end{aligned}$$

$$\begin{aligned}
 \text{Total sum of squares} &= [(12)^2 + (48)^2 + (30)^2 + (29)^2 + (42)^2 + (57)^2 \\
 &\quad + (54)^2 + (39)^2 + (19)^2 + (42)^2 + (21)^2 + (36)^2 \\
 &\quad + (28)^2 + (39)^2 + (44)^2 + (50)^2] - \text{C.F.} \\
 &= [144 + 2304 + 900 + 841 + 1764 + 3249 \\
 &\quad + 2916 + 1521 + 361 + 1764 + 441 + 1296 \\
 &\quad + 784 + 1521 + 1936 + 2500] - \text{C.F.} \\
 &= 24242 - 21756.25 \\
 &= 2485.75.
 \end{aligned}$$

$$\begin{aligned}
 \text{Row Sum of Squares (R.S.S)} &= \left(\frac{x_1^2}{n} + \frac{x_2^2}{n} + \frac{x_3^2}{n} + \dots + \frac{x_n^2}{n} \right) - C.F. \\
 &= \left(\frac{(119)^2}{4} + \frac{(192)^2}{4} + \frac{(118)^2}{4} + \frac{(161)^2}{4} \right) - 21756.25 \\
 &= \left(\frac{14161}{4} + \frac{36864}{4} + \frac{13924}{4} + \frac{25921}{4} \right) - 21756.25 \\
 &= (3540.25 + 9216 + 3481 + 6480.25) - 21756.25 \\
 &= 22717.5 - 21756.25
 \end{aligned}$$

$$\begin{aligned}
 &= 961.25 \\
 \text{Column Sum of Squares (C.S.S)} &= \left(\frac{c_1^2}{n} + \frac{c_2^2}{n} + \dots + \frac{c_n^2}{n} \right) - C.F. \\
 &= \left(\frac{(101)^2}{4} + \frac{(186)^2}{4} + \frac{(149)^2}{4} + \frac{(154)^2}{4} \right) - 21756.25 \\
 &= \left(\frac{10201}{4} + \frac{34596}{4} + \frac{22201}{4} + \frac{23716}{4} \right) - 21756.25 \\
 &= (2550.25 + 8649 + 5550.25 + 5929) - 21756.25 \\
 &= 22678.5 - 21756.25 \\
 &= 922.25
 \end{aligned}$$

$$\begin{aligned}
 \text{Error Sum of Squares (E.S.S)} &= \text{Total Sum of Square} - \text{Row.S.S} - \text{C.S.S} \\
 &= 2485.75 - 961.25 - 922.25 \\
 &= 602.25
 \end{aligned}$$

Source of Variance:

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Sum of Squares	F - Ratio F calculate value	F table value
Rows	$(7-1)$ $= 4-1 = 3$	961.25	$\frac{961.25}{3} = 320.4166$	$\frac{320.4166}{66.9166} = 4.78829$	$F(3,9) = 3.86$
Column	$(2-1)$ $= 4-1 = 3$	922.25	$\frac{922.25}{3} = 307.4166$	$\frac{307.4166}{66.9166} = 4.5940$	$F(3,9) = 3.86$
Error	$(7-1)(2-1)$ $= 3 \cdot 3 = 9$	602.25	$\frac{602.25}{9} = 66.9166$		
Total	$7-1$ $= 16-1 = 15$	2485.75			

F calculate value $\leq$ F table value for Rows.

$$4.78829 \leq 3.86$$

$\therefore$ The H_0 is rejected.

F calculate value $\leq$ F table value for Columns.

$$4.5940 \leq 3.86$$

$\therefore$ The H_0 is rejected.

8. In an experiment to determine which of three different missiles is preferable, the propellant burning rates was measured. The data after coding is given below.

System I : 24.0 16.7 22.8 19.8 18.9

System II : 23.2 19.8 18.1 17.6 20.2 17.8

System III : 18.4 19.1 17.3 17.3 19.7 18.9 18.8 19.3

Use the Kruskal-Wallis test to test the hypothesis that propellant burning rates are the same for the three missiles.

Sol Given data.

Arranging the data jointly according to size and assigning ranks, we get:

values	Ranks.	Rank of System-I	Rank of System-II	Rank of System-III
16.7	1			
17.3	2.5	19	18	7
17.3	2.5			
17.6	4	1	14.5	11
17.8	5	17	6	2.5
18.1	6	14.5	4	2.5
18.4	7	9.5	16	13
18.8	8		5	9.5
18.9	9.5			8
18.9	9.5			12
19.1	11			
19.3	12			
19.7	13			
19.8	14.5			
19.8	14.5			
20.2	16			
22.8	17			
23.2	18			
24.0	19			
		$\Sigma R_1 = 61$	$\Sigma R_2 = 63.5$	$\Sigma R_3 = 65.5$

Applying the formula for H

$$-H = \frac{12}{n(n+1)} \left(\frac{R_1^2}{n_1} + \frac{R_2^2}{n_2} + \frac{R_3^2}{n_3} \right) - 3(n+1)$$

$$= \frac{12}{19(19+1)} \left(\frac{(61)^2}{5} + \frac{(63.5)^2}{6} + \frac{(65.5)^2}{8} \right) - 3(19+1)$$

$$= \frac{12}{19(20)} \left(\frac{3721}{5} + \frac{4032.25}{6} + \frac{4290.25}{8} \right) - 3(20)$$

$$= \frac{12}{380} (744.2 + 672.0416 + 536.2812) - 60$$

$$= 0.0315 (1952.5228) - 60$$

$$= 61.5044 - 60$$

$$H = 1.5044$$

$$\text{Table value } = v = 3 - 1 = 2$$

$$v = 2$$

χ^2 at the level of significance is 0.05

the value is 5.991.

Calculated value $\leq$ table value

$$1.5044 \leq 5.991$$

$\therefore H_0$ is accepted.

The following arrangement shows the rise (U) or fall (D) in the price of an equity share on 40 consecutive trading days on which its price did not remain the same.

UU DD UUU D UUU DD U DDD U DD U DD UUUU DDDD UU D UU

DDD U Test the hypothesis that this arrangement of U's and D's is random at $\alpha = 0.05$ level of significance.

Given data:

UU DD UUU D UUU DD U DDD U DD U DD UUUU DDDD

UU D UU DDD U

$r = 19$ (number of runs)

$$n_1 (U) = 20$$

$$n_2 (D) = 20$$

$$\mu_r = \frac{2n_1n_2}{n_1+n_2} + 1 = \frac{2(20)(20)}{20+20} + 1 = \frac{80}{40} + 1 = 21$$

standard error of the r statistic

$$\sigma_r = \sqrt{\frac{2n_1n_2(2n_1n_2 - n_1 - n_2)}{(n_1+n_2)^2(n_1+n_2-1)}}$$

$$= \sqrt{\frac{2(20)(20)(2(20)(20) - 20 - 20)}{(20+20)^2(20+20-1)}}$$

$$= \sqrt{\frac{800 \times 760}{1600 \times 39}}$$

$$= \sqrt{\frac{608000}{62400}} = \sqrt{9.7435} = 3.1$$

$$z = \frac{r - \mu_r}{\sigma_r} = \frac{19 - 21}{2.1} = \frac{-2}{2.1} = -0.645$$

$\therefore$ The critical value of z for 0.05 level of significance is ± 1.96 . As the calculated value of z falls in the acceptance region, H_0 is accepted.

107R- Modeling with Excel

107R- Modeling with Excel

Unit- 1:

1. What is Modelling? Explain Types and purposes of business models.

Ans: A financial model is a mathematical representation of the financial operations and financial statements of a company.

Financial modelling involves combining key accounting, finance, and business metrics to build an abstract representation, or model, of a company's financial situation.

Types of business models:

Three Statement Model
Discounted Cash Flow (DCF) Model
Merger Model (M&A)
Initial Public Offering (IPO) Model
Leveraged Buyout (LBO) Model
Sum of the Parts Model
Forecasting Model
The comparable company analysis (CCA) model
Option Pricing Model
Asset and Liability Management **Purposes**

of business models:

Executives typically use financial models to make decisions regarding:

Budgeting and forecasting
Organic business growth
Valuing the company
Raising capital in the form of debt or equity
Acquiring new assets or other businesses
Ranking projects
Distributing the organization's financial resources
Risk management

2. Explain the Steps to building a model?

Ans: The building is the process of designing and developing a new financial model with a logical flow and structural compactness to the point that it can transform a given set of assumptions into trustworthy projections that describe and illustrate a deal in a quantitative manner.

Steps to building a model:

1. Define and structure the problem
2. Define the input and output variables of the model
3. Decide who will use the model and how often
4. Understand the financial and mathematical aspects of the model
5. Design the model
6. Create the spreadsheets
7. Test the model
8. Protect the model
9. Document the model
10. Update the model

Preparing and presentation of Model results:

- ✚ Use MS Excel Spread sheet or VBA code
- ✚ Use white space instead of gridlines
- ✚ Assumptions and drivers
- ✚ Income statement
- ✚ Balance sheet
- ✚ Cash flow statement
- ✚ Supporting schedules
- ✚ Company Valuation
- ✚ Sensitivity analysis
- ✚ Charts and graphs

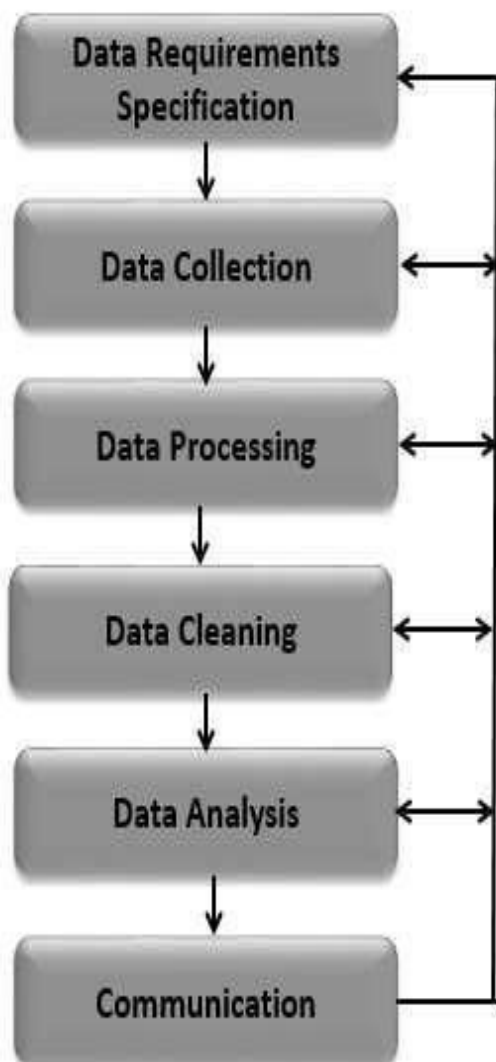
Unit- 2

3. What is Data Analysis? Explain the Types and process of Data Analysis.

Ans: Data Analysis with Excel is a comprehensive tutorial that provides a good insight into the latest and advanced features available in Microsoft Excel.

- ✚ Data Mining
- ✚ Business Intelligence
- ✚ Statistical Analysis
- ✚ Predictive Analytics
- ✚ Text Analytics

Data Analysis Process



Types:

4. What is Function? Explain Financial Functions.

Ans: Functions are *predefined formulas that perform calculations by using specific values, called arguments, in a particular order, or structure.*

- [FV](#) Calculates the future value of an investment with periodic constant payments and a constant interest rate
- [NPER](#) Returns the number of periods for an investment with periodic constant payments and a constant interest rate
- [PV](#) Calculates the present value of an investment (i.e. the total amount that a series of future periodic constant payments is worth now)

Functions for a Series of Periodic Variable Cash Flows

- [IRR](#) Calculates the internal rate of return for a series of periodic cash flows
- [MIRR](#) Calculates the internal rate of return for a series of periodic cash flows, considering the cost of the investment and the interest on the reinvestment of cash
- [NPV](#) Calculates the net present value of an investment, based on a supplied discount rate, and a series of periodic cash flows

Functions for a Series of Non-Periodic Variable Cash Flows

- [XIRR](#) Calculates the internal rate of return for a schedule of cash flows occurring at a series of supplied dates
- [XNPV](#) Calculates the net present value for a schedule of cash flows occurring at a series of supplied dates

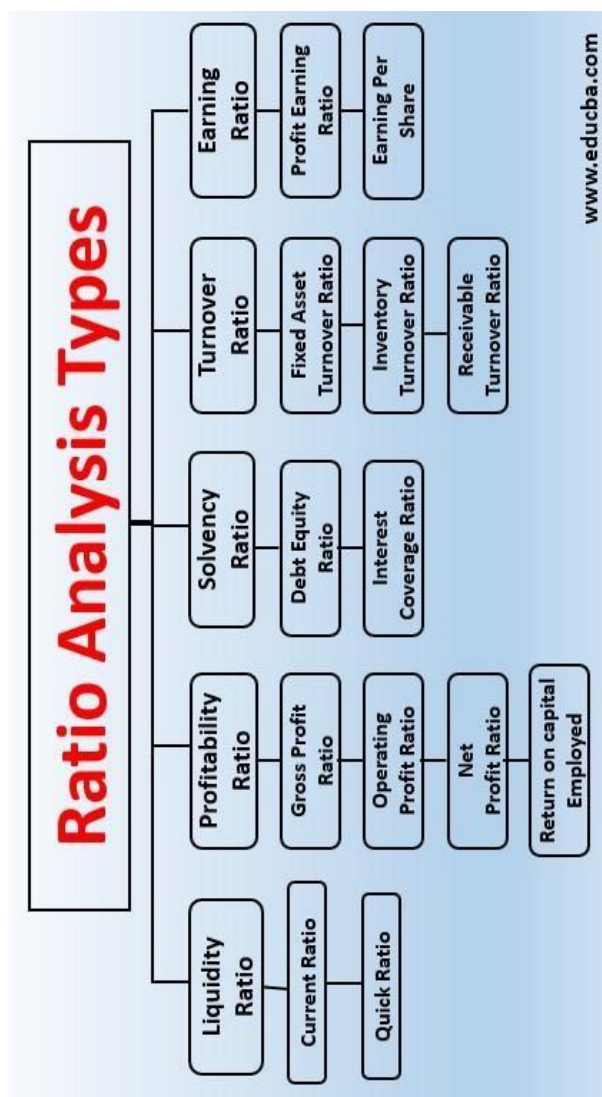
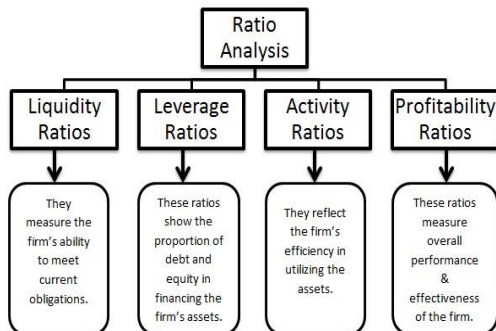
Interest Rate Conversion Functions

Financial Functions:

Functions for a Series of Periodic Constant Cash Flows

EFFECT

Calculates the effective annual interest rate from a supplied Nominal interest rate and number of periods



NOMINAL

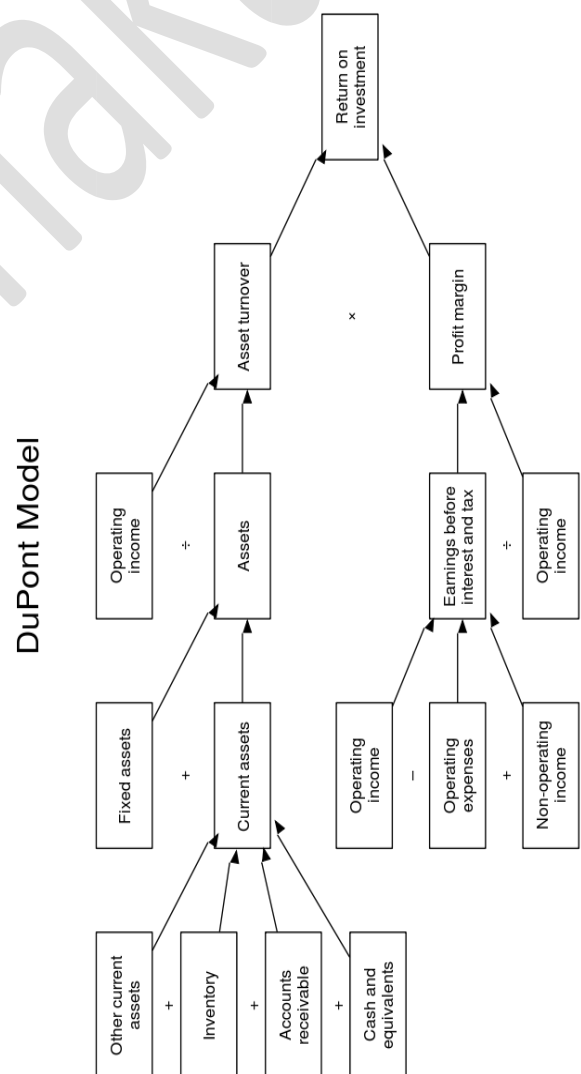
Calculates the annual nominal interest rate from a supplied Effective interest rate and number of periods

Unit: 3

5. What is Ratio? Explain the types of significance of changes in a company's ROE by focusing on the various means that a company has to increase the ROE figures.

Return on Equity
Profit Margin x Total Asset Turnover x Financial Leverage

Calculations:
Profit Margin = Net Income / Net Sales
Total Asset Turnover = Net Sales / Average Total Assets
Financial Leverage = Total Assets / Total Equity



financial ratios.

Ans: Ratio Analysis is a type of Financial Statement Analysis used to obtain a rapid indication of a company's financial performance in key areas.

6. Explain the DuPont Analysis.

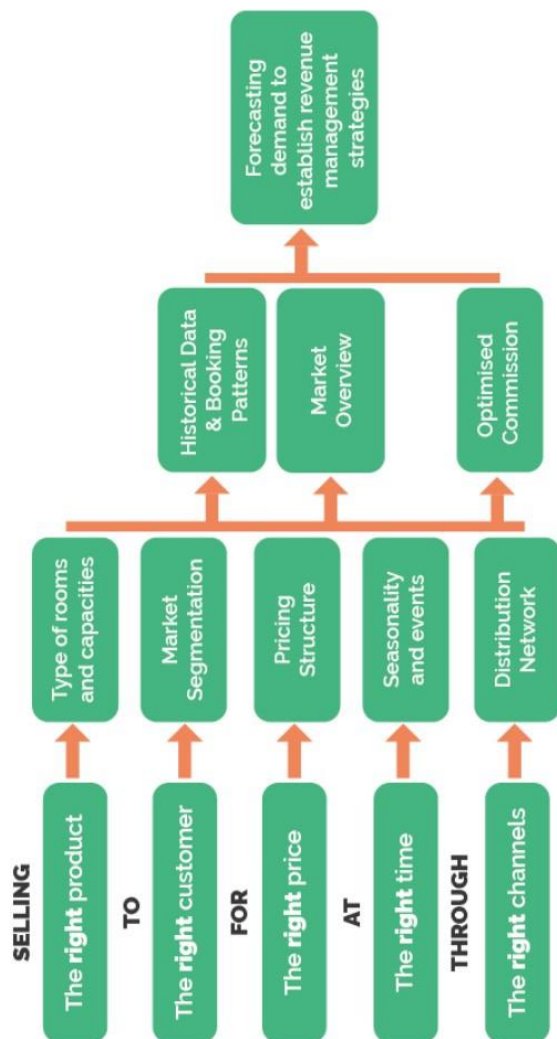
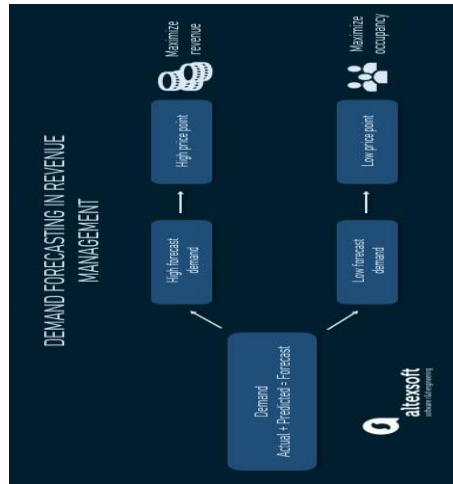
Ans: DuPont analysis is a useful technique used to decompose the different drivers of return on equity (ROE).

The DuPont analysis model **provides a more accurate assessment of the**

Unit: 4

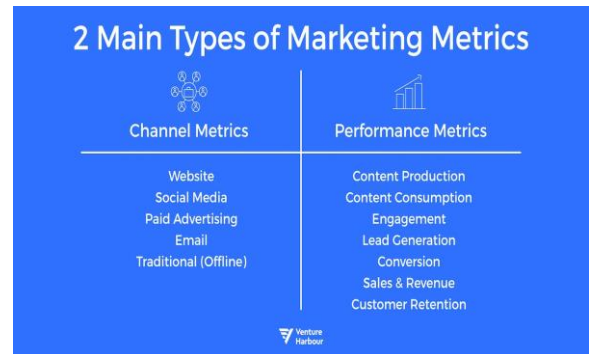
7. Explain Revenue Management.

times and ways to maximize revenue generation based on customer behaviours.



Ans: Revenue management is data-driven strategy meant to predict and inform the best

revenue



Stages	Metrics	Some relevant channels
Awareness	- Brand mentions - Website traffic - Bounce rates - Quality of inbound links - Subscribers	Blog, websites, social media marketing, ads, PR
Consideration/decision	- Click-through rates - Lead conversions - Lead-to-customer conversions - Cost per acquisition - Cost per lead	Emails, forms, surveys, blogs, YouTube
Post-purchase	- Return on investment - Customer lifetime value - Customer churn - Revenue growth - Net promoter score	Chatbots, SMS, push notifications, branded apps

Marketing Metrics to Drive Business Growth - AMA Boston

	Intermediate (Pre-transaction)	End Result (Post-transaction)
External	Brand awareness New concept test scores Click-through rate Share of voice Consumer engagement Share of display Traffic	Sales Volume Share of wallet Net Promoter Score Market share Consumer loyalty Household penetration
Internal	Cost per impression Cost per unique visitor Marketing activities to plan Marketing budget variance Percentage of ad copy tested	Consumer acquisition cost Inventory turnover Payback period Marketing Return on Investment Consumer Lifetime Value Gross margin

8. Explain Marketing Metrics.

Ans: Marketing metrics are a quantifiable way to track performance and are an important marketing measurement tool for gauging a campaign's effectiveness.

Unit- 5:

9. Explain Exponential Smoothing for Time Series Forecasting.

Ans: Material requirements planning (MRP) is a

Ans: Exponential smoothing is a forecasting method for univariate time series data. This method produces forecasts that are weighted averages of past observations where the weights of older observations exponentially decrease.

Types of Exponential Smoothing:

1. Simple Exponential Smoothing (SES)

SES is used for time series anticipation when the data, in particular, doesn't support any of the following;

✚ **Trend:** A slope either inclined upward or downward.

✚ **Seasonality:** Exhibiting a specific pattern due to seasonal factors like hours, days, years, etc.

2. Double Exponential Smoothing (DES)
DES adds support particularly for trends in the univariate time series. Combined with the additive trends, it is conventionally referred to as Holt's linear trend model. The name is derived from the name of developer of the method Charles Holt.

3. Triple Exponential Smoothing (TES)

TES explicitly adds support to the univariate time series for seasonality; it is also referred to as Holt-Winters Exponential Smoothing on the name of two contributors Charles Holt and Peter Winters.

Key Takeaways:

- ✚ These methods are the family of traditional forecasting algorithms that work efficiently when time series data exhibit a clear and seasonal pattern.
- ✚ Exponential smoothing has the elements as Error, Trend, and season that can be either additively or multiplicatively.
- ✚ In order to find the trend, season or error, time series decomposition is an accurate approach as it makes the plot of each component as a distinct subplot.
- ✚ As the trends reflect upward or downward behavior (tendency), applied as additively, and if varies exponentially, it is multiplicative.

10. Explain Material Requirement Planning (MRP).

MATERIAL REQUIREMENT PLANNING

Material Requirements Planning is a tech based system helps to plan production, schedule purchase of raw material and delivery of final product, as well as, manage inventory levels.

OBJECTIVES

- Ensure smooth running of production schedule.
- Helps JIT implementation.
- It ensures that the customer demands are fulfilled on time

ADVANTAGES

- It ensures timely completion of Customer orders.
- It saves cash from getting tied up
- There is no risk of product obsolescence or wastage

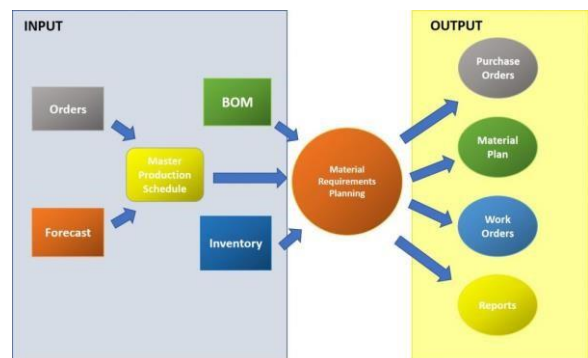
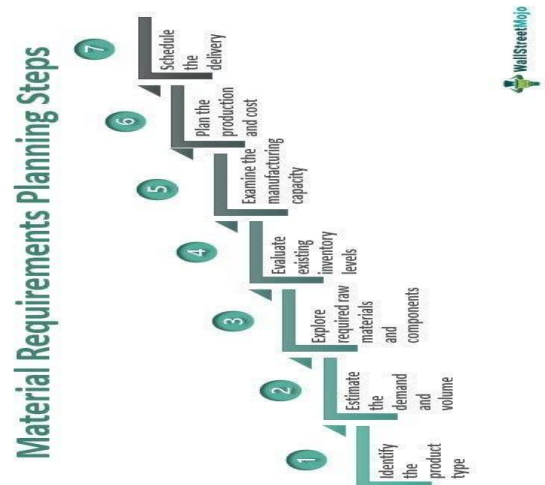
DATA NEEDED

- Bill of materials (BOM)
- Needed quantity of final product
- Shelf life of materials.
- Current stock quantity

DRAWBACKS

- Sometimes increase inventory costs
- It make an organization less flexible
- Efficiency of workers could delay the production process.
- It is highly dependent on data

e Finance Management



system for calculating the materials and components needed to manufacture a product.