

SYLLABUS

Class – B.Com IV (Hons.) Sem

Subject – MIS AND DBMS

Unit I	Meaning and use MIS: System view of Business, Process of MIS, Development of MIS within the organization, Management Process, Information needs, System approach in Planning, Organizing and Controlling MIS.
Unit II	MIS Planning and System Design: Planning Implementation and Controlling of Management Information System, Managerial Decision Making, Characteristics and components of Decision support Systems. System Design, Input/ Output design, Forms design.
Unit III	Introduction: Purpose of Database System, Advantages and Disadvantages of DBMS, Basic Database concepts, Instances and Schema, Data Independence, 3 Level architecture, Database Administrator, Database Users.
Unit IV	Data Modeling: Data models, Introduction of E-R Model, Entity Sets, Attributes and Keys, Relationship (ER), Weak and Strong entity types, Entity Relationship Diagram, Design of an E-R Database schema.
Unit – V	Introduction to SQL: Basic queries in SQL, Data Definition Language, Data manipulation Language, Data transition language, Data Control Language.

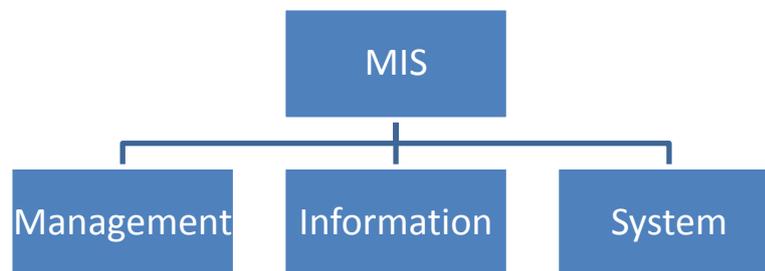
Unit - 1
Definition of MIS

A system that collects, process, stores the data and distributes information to help in decision making for managerial function. It is also defined as the integrated user machine system for providing information to supports the decision making operations & achieving organizational goal.

According to **Jerome** “A system that aids management in making, carrying out and controlling decisions”.

According to **Kelley**, “A combination of human and computer based resources which results in collection, storage, retrieval, communication and use of efficient management of operations and for business planning”.

Right Information → To the right person → At the right place → At the right time → In the right form → At the right cost



Management:- Management covers the planning, control and administration of the operations of a concern.

Information:- Information, in MIS, means the processed data that helps the management in planning, controlling and operations.

System:- data is processed into information with the help of a system.

Need of MIS

MIS helps the management at various levels and it is mean of communication where data are collected, processed, stored and retrieved for making decisions regarding planning, operation and control of an organization.

Characteristics of MIS

- Management Oriented
- Management Directed
- Integrated System
- Avoid Redundancy
- Common Data Flow
- Heavy Planning Element
- Subsystem Concept
- Common Database
- Flexibility
- Computerization

Components of MIS

Management information system refers to the data, hardware and the computer programs that are used to develop information for managerial use.

- **People** – it is the only living component of MIS which operates, controls the other components of MIS.
- **Procedure** – procedure explain people how to operate the computer hardware.
- **Data** – Data provide interface between the user and computer.
- **Hardware** – It is the machine part of the system which executes the instruction in programs.
- **Programs** – The program is the set of instruction written in logical order for performing specific task related to information production.

Function of MIS

It is used to collect the data and present the information to the managers. MIS is the combination of computer and procedures for providing information that manager's use in making decision.

- **Collect Data** – Data can be obtained from sources within organization and outside world.
- **Store & Process Data** – After creation of the data, a database must be stored and process in the form useful to manager's data is generally stored to CD ROM or hard disk.
- **Present Information to Managers** – After collection, storing and processing of data, the next step is to present information to the managers.

Role of MIS

1 MIS ensure that appropriate and relevant data is collected from various sources, processed and is sent further to the needy destination.

2 It fulfills the need of individual, workgroup and management.

3. MIS satisfies the diverse need of various systems like query, Analysis, Modeling, DSS.

4 MIS helps in strategic planning, management control, operational control and transaction processing level.

5 MIS play important role in information generation, communication, problem identification and decision making administration.

6 With good MIS support marketing, finance, production, and personal functions increases efficiently.

7 MIS helps in streamlining of the operations.

8 MIS creates structured database and therefore saves the time.

9 MIS bring clarity in communication and understanding this help in bringing high degree of professionalism.

10 MIS helps in systemization of business operation through tools and techniques of the computer, which makes task simpler, accurate and faster.

Process of MIS

The process of MIS starts by knowing MIS objectives. The objectives of MIS should be compatible with the company's objectives.

Management comprises process or activities they are as follows:-

1. Recognition of a problem and an opportunity
2. Define problem or opportunity
3. Develop alternative course of action



4. Decision
5. Implementation of plan
6. Control performance against plan

For its smooth functioning and achieving of its predetermined goals through optimal utilization of its resources like men, money, material and machines.

System View of Business

The systems approach provides an overall view of an organization's activities whereby an organization is separated into identifiable subsystems or departments. All such departments are interdependent and perform specific tasks of work which contribute to the organization's goals. The simplest model of a business system consist of basic elements, they are input, processes, output and feedback.

A systems view regards business operations as systems embedded within a larger environmental setting. It's an abstract way of thinking, but it has potential value to the manager. The systems view:

1. reduces complexity
2. requires good objectives
3. emphasizes working together
4. acknowledges interconnections
5. values feedback

Eg. Computer

Elements of computer are: - Monitor, CPU, Printer etc

Basic goals: Data Processing

Development of MIS within the Organization

If MIS is to assist managerial decision making at all level of company then low organization level information systems must be integrated in MIS. Next stage is planning & control. Next stage of MIS development is integration of subsystems. Management plans to integrate existing sub system to unified system. The management focuses attention to database administration. Next stage is MIS maturity. This is to state when MIS department is agreed up to plan future needs for organization.

Management Process

Management comprises process or activities via planning, organizing, controlling, directing and initiating operation of an organization. For its smooth functioning and achieving of its predetermined goals through optimal utilization of its resources like men, money, material and machines.

Concept of Data & Information

Data – Data is a set of characters or symbols like numeric, alphabetic or alphanumeric, audio, video, images or any combination of these. Raw facts & figure are known as data.

Information –Processed data is known as information.

System – System is set of components which interact with each other to accomplish a specific goal.

1 Human body and its subsystem could be nervous system, digestive system and cardiac system etc
2 Computer system and it has various subsystem like ALU, CU, Memory, Input unit and Output unit etc.

Characteristics of system

- Every system has a purpose.
- Every system is made up of components like input process output, feedback and control etc.
- System is made up of subsystem, whose goals are referred to as sub goals.
- Goal of a system is more important than subsystem goal.
- Systems whether open or closed have an element of control associated with them.

Types of System

There is several way of classifying systems that emphasizes the differences. Classification of system is as follows-

Open & Closed Systems –An open system interfaces and interacts with other system. An open system needs to receive feedback to change and continue to exist in its environment. Example – A marketing system is an open system.

A closed system does not exchange the information with its environment. It does not have any connection to the other system. Example – Research & development of organization, ICU dept. of hospital, etc.

Physical & Abstract System – Physical system are tangible entities that may be static or dynamic in operations. For example the physical parts of the computer center are the computers, desk, chair, etc. that facilitate operation of the computer.

Abstract systems are conceptual and non physical entities. They may be formulas of relationship among set of variables or models, software / program.

Deterministic & Probabilistic System – A deterministic system works with certainty in predictable manner. The interaction among its subsystem is known in advance. One state of the system determines the next state of the system.

Example – A computer system which works on the principal GIGO.

A **probabilistic system** operates with uncertainty as certain degree of error is always attached with prediction of what the system will do.

Example – A student admission system in a college is probable in nature.

Systems approach is an organized way of dealing with a problem.

Information system

Information system are a set of people, procedure and resources that collects , transforms and disseminates information in an organization

There are six building block of information system, is the input, output, technology, models, database and control.

Types of Information System- there are two types of information system.

1 **Operation Information system** – it process the data generated by and used in business operation. It is of two types:-

- Transaction processing system
- Office Automation system

2 **Management information System** – MIS provide information to support management decision making.

- Decision Support System
- Executive information System

Business organization as a system

An organization is an open, adaptive system in a business environment. A business consist of following system component –

1 Input	2 Processing	3 Outputs
4 Feedback	5 Control	6 Environment

System approach in planning, organizing & Controlling MIS

System Approach in Planning – The important function of management is planning. Planning means deciding in advance, what has to be done, who has to do it, when is to be done and how it is to be done. The planning process consist of two steps –

- 1) Developing the strategic
- 2) Formulating the steps, timing and cost, required to achieve the strategy.

System Approach in Organizing – Organizing is important to manager because it helps in effective group action. It also helps in maintaining the people to work together. It consist of following points –

- 1 The formal organization system as described in chart policies and procedure.
- 2 The informal organizing.
- 3 The individual as a system
- 4 The organizational communication system.
- 5 The power system.
- 6 The functional system.
- 7 The management process system.
- 8 The material logistic system.

The different phases of organizing are:

- Develop a technical organization
- Start with total company objectives and develop a hierarchy of systems required.
- Involve specialists in developing a team, matrix or a system.

System Approach in Controlling – Controlling is important because it is needed to achieve the desire result. The most common process consist of three step-

- 1 **Setting standard for performance** – It involves what level of performance we need. These criteria can be quantitative or qualitative.
- 2 **Measuring performance against this standard** – once standard have been established it is necessary to measure performance against standards.
- 3 **Deviation Control** – we know that for measuring the deviation, first comparison of standard with actual performance is made.

Why MIS Fails?

MIS failures can be expensive and bring bad publicity to all parties. They can arise due to:

- Inadequate analysis- problems, needs and constraints aren't understood in the early stages.
- Lack of management involved in the design – wrong expectations of a new system / no-one understands the system.
- Emphasis on the computer system – Need procedures for handling input and output / select the right hardware and software
- Concentration on low-level data processing – Information must be easily accessible and understood
- Lack of management knowledge of ICT systems and capabilities – managers know what they want from the system but don't understand the technology
- Lack of teamwork – An ICT manager must co-ordinate the accounts, marketing, sales etc. departments and help everyone understand the benefits of the system



- Lack of professional standards – All systems need clear documentation that all users can understand (not just the ICT literate)

Unit II

General Business Planning

Starting point for MIS planning is general business planning. No MIS department can decide what they should do or how they should do it without the groundwork provided by objectives and plans for the company they are supporting.

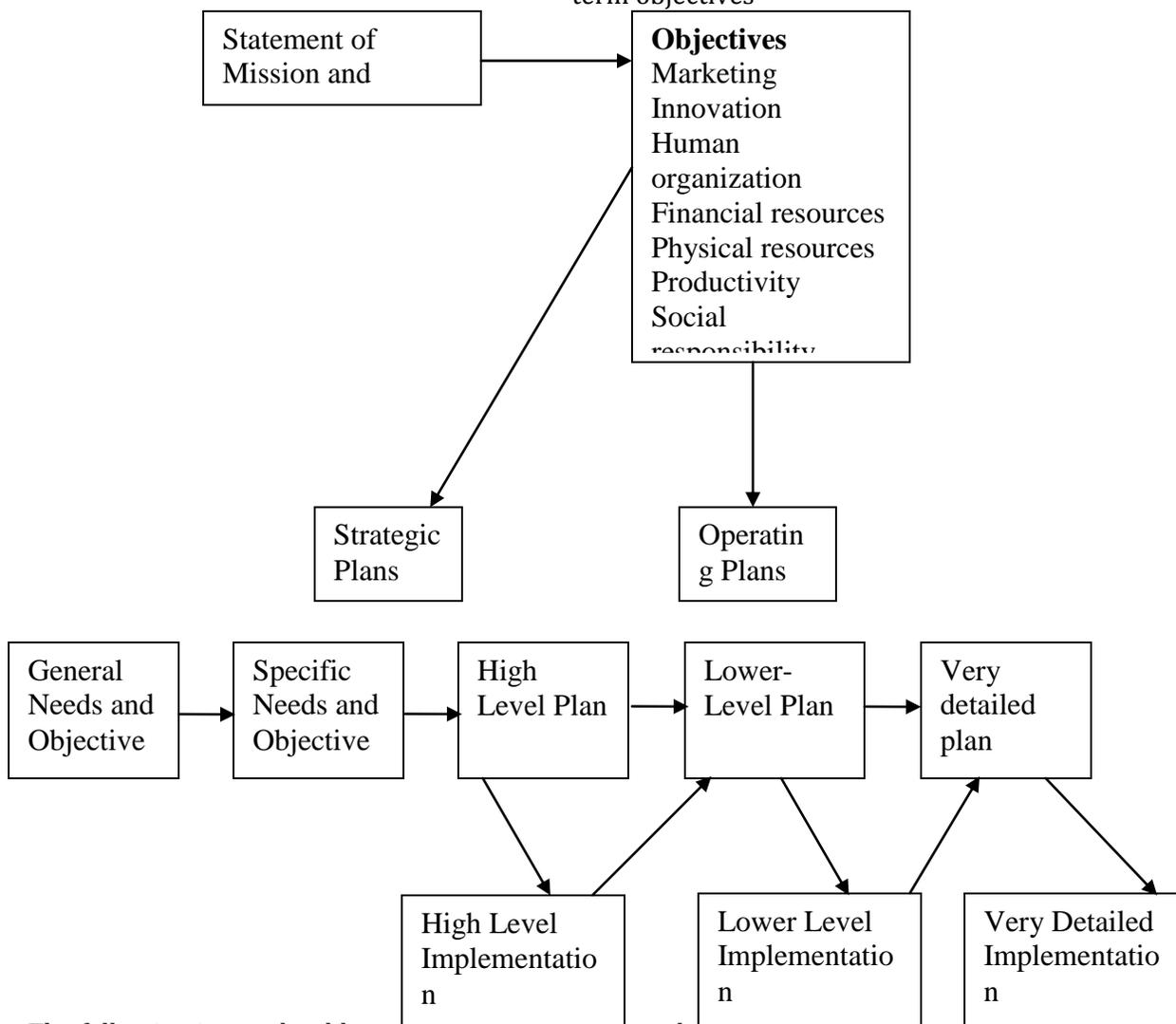
General Business Item

- Statement of mission or purpose
- Objectives
- Strategic plans
- Operating plans

Importance

Clearly defines the business of the firms.
 set goals for the company in all key performance areas

Provide general guidance on how to get to the long-Range objective
 provide detailed guidance on how to get to the short-term objectives



The following items should certainly be included to understand what planning constitute-

1. Summary statement of the problem being solved by this project is required.

2. A breakdown of the work to be done (as detailed as practical) is required. Also estimates of how long each piece will take are needed. Documentation, testing, and maintenance efforts should be included.
3. A list of dependencies on outside groups with target dates for “delivery” of services or equipment is required.
4. A list of outside group that depend on this project with target dates for delivery is required.
5. A list of interdependencies of various pieces within this project with dates of need/delivery is required.
6. The skills needed to complete the project should be listed. Eventually, the people who work on the project must match this list exactly.
7. Other resources needed to complete the project must be identified (e.g., space, computer hardware, and telephones). Dates these items are needed must be specified.
8. A budget covering salaries, rent, capital expenditure, and so on must be part of the plan.
9. A statement of the reporting and tracking system to be used must be included.
10. A schedule of activities reflecting all the above work and interdependencies is required.
11. A backup plan if any piece of the plan fails must be supplied.

Planning Techniques

Most of the techniques and tools have been borrowed from engineering project management theory and practice, where they originated.

Work Breakdown structure

A fundamental concept in project management is the work breakdown structure, which starts with the total end result desired and terminates with the individual detailed tasks. The project breakdown structure is a natural decomposition of the project end result. It is created in a level-by-level breakdown from –

1. System to subsystem
2. Subsystem to task
3. Task to subtask
4. Subtask to work package

Sequence Planning

The relationships among tasks must be set forth by a chronological ordering, starting with the terminal task of the project and working backward. As each task is set down, it is necessary to determine what immediately preceding tasks must first be completed. When a network of events has been established, estimates of the time required to complete each event, based upon the work package information, may be entered. There are a number of time paths through a network that run from the starting event to the terminal event. The longest is called the critical path.

Master Program Schedule

The master program schedule (MPS) is a management document giving the calendar dates for milestones (major tasks and critical path minors tasks), thus providing the control points for management review. The MPS may be in the form of a Gantt chart for small MIS projects or in machine (computer) printout for large projects whose networks have been programmed for computer analysis and reporting.

Budgeting

The establishment of cost and resource targets for a planned series of periods in advance is project budgeting. Although cost constraints may be applied in a top-down fashion during planning, such constraints must be reconciled with a bottom-up approach through the work breakdown structure.

Reporting and controlling

Control of the project means control of performance/cost/time (P/C/T). These elements, P/C/T, must be reported in a way that ties them all together, otherwise the report is meaningless.

Reporting Techniques

The reporting system for a project is its own MIS. Some methods of project reporting are

1. Integrated P/C/T charts as shown in Figure 6-4
2. Financial schedules and variance reports.
3. Time-scaled network plans and computerized based on them.
4. Problem analysis and trend charts
5. Project control room and computerized room and computerized graphic systems.

Implementation of MIS

There are four basic methods for implementing the MIS once the design has been completed. This are–

1. Cut off the old system and install the new. This produces a time gap during which no system. Small is n operation. It is practical only for small companies or small systems where installation required one or two dates. An exception to this would be the installation of a larger system during a plant's vacation shut down or some other period of inactivity.
2. Cut over by segments. This method is also referred to as “phasing in” the new system. Small parts or subsystems are substituted for the old. If this method is possible, some careful questions should be asked about the design of the new system. Is it really just an automation of isolated groups of clerical activities? Generally, new systems are not substitutable piece by piece for previous non systems. However, in the case of upgrading old system, this may be a very desirable method.
3. Operate in parallel and cut over. The new system is installed and operated in parallel with the current system until it has been checked out; then the current system is cut out. This method is expensive because of personnel and related costs. However, it is required in certain essential systems, such as payroll or customer billing. Its big advantage is that the system is fairly well debugged when it becomes the essential information system of the company.

Identity the Implementation Tasks

The major implementation tasks, or milestones, usually consist of

1. Planning the implementation activities.
2. Acquiring and laying out facilities and offices
3. Organizing the personnel for implementation
4. Developing procedures for installation and testing
5. Developing the training program for operating personnel
6. Completing the system's software
7. Acquiring required hardware
8. Generating files
9. Designing forms
10. Testing of the entire system
11. Completing cutover to the new system
12. Documenting the system
13. Evaluating the MIS
14. Providing system maintenance (debugging and improving)

Planning the implementation activities

- Establish Relationships among Tasks
- Establish a schedule

- Prepare a Cost schedule Tied to tasks and time
- Establish a reporting and control system

Acquire Floor space and Plan space layout

To replace a current one may require a major revision of facilities as well as completely new office, computer room, and production layouts. The MIS project manager must prepare rough layouts and costumes of particular floor areas he or she feels will be needed. The manager should then prepare cost estimates and submit a proposal for management's approval. Facilities and space planning should being as soon as approval of gross space allocations has been obtained.

Organize for implementation

Once the implementation tasks have been defined in the planning phase, management usually assign a project manager to guide the implementation. A manager of management information systems may assume this responsibility by virtue of a permanent assignment. In smaller companies, someone from the finance.

Development Procedures for implementation

The project leader has available the network plan for proceeding with the implementation. The leader must now call upon key people in the project to prepare more detailed procedures for system installation.

Train the operating personnel

Should be developed to impress upon management and support personnel the nature and goals of the MIS and to train operating personnel in their new duties.

Computer-related Acquisitions

The management of automation of logic, communication, and display is important as a basis for systems design and as a factor in system implementation. One complicating factor in system installation is that a new computer is often required along with the new MIS.

Acquisition consists of bringing on site

1. Hardware
2. Software
3. Personnel
4. Materials

Development forms for data collection and information dissemination

A vast amount of detailed data, both external and internal to the company, must be collected for input to the MIS. If control marketing is to be exercised or sales forecasting is carried out, then somewhere, every day, a salesperson must sit in a room and fill out a form summarizing the day's activities.

Develop the Files

The specification for the files has been developed in the detailed design stage. In the implementation stage, the actual data must be obtained and recorded for the initial testing and operation of the system. This collection of data used in routine operations is often called the master file.

Test the System

Each part of the total system is installed, test should be performed in accordance with the teat specifications and procedures describes earlier. Tests during the installation stage consist of component tests, subsystem tests, and total system acceptance test. Components may consist of –

1. Equipment, old or new
2. New forms'
3. New software programs
4. New data collection methods
5. New work procedure

6. New reporting formats

Cutover

Cutover is the point at which the new component replaces the old component or the new system replaces the old system. This usually involves a good deal of last-minute physical transfer of files, rearrangement of office furniture, and movement of work stations and people. Old forms, old files and old equipment are suddenly retires.

Document the system

“Documentation” of the MIS means preparation of written description of the scope, purpose, information flow components and operating procedures of the system. Documentation is not a frill; it is a necessity – for troubleshooting, for replacement of subsystems, for interfacing with other systems, for training new operating personnel, and also for evaluating and upgrading systems.

Evaluate the MIS

After the MIS has been operating smoothly for a short period of time, an evaluation of each step in the design and of the final system performance should be made.

Control and Maintain the System

Control and maintenance of the system are the responsibilities of the line managers. Control of the system means the operation of the system as it was designed to operate. Maintenance is closely related to control. Maintenance is that ongoing activity that keeps the MIS at the highest levels of effectiveness and efficiency within cost constraints.

Decision Making

Decision making is a cognitive process that results in the selection of a course of action among several alternative scenarios.

Decision making is a daily activity for any human being. There is no exception about that. When it comes to business organizations, decision making is a habit and a process as well.

Effective and successful decisions make profit to the company and unsuccessful ones make losses. Therefore, corporate decision making process is the most critical process in any organization.

In the decision making process, we choose one course of action from a few possible alternatives. In the process of decision making, we may use many tools, techniques and perceptions.

In addition, we may make our own private decisions or may prefer a collective decision.

Usually, decision making is hard. Majority of corporate decisions involve some level of dissatisfaction or conflict with another party.

Decision Making Process:

Following are the important steps of the decision making process. Each step may be supported by different tools and techniques.



Process and Modeling in Decision Making

There are two basic models in decision making:

- Rational models
- Normative model

Decision support systems

Decision support systems are interactive software-based systems intended to help managers in decision making by accessing large volume of information generated from various related information systems involved in organizational business processes, like, office automation system, transaction processing system etc.

DSS uses the summary information, exceptions, patterns and trends using the analytical models. Decision Support System helps in decision making but does not always give a decision itself. The decision makers compile useful information from raw data, documents, personal knowledge, and/or business models to identify and solve problems and make decisions.

Programmed and Non-programmed Decisions

There are two types of decisions - programmed and non-programmed decisions.

Programmed decisions are basically automated processes, general routine work, where:

- These decisions have been taken several times
- These decisions follow some guidelines or rules

Attributes of a DSS

- Adaptability and flexibility
- High level of Interactivity
- Ease of use
- Efficiency and effectiveness
- Complete control by decision-makers.
- Ease of development
- Extendibility
- Support for modeling and analysis
- Support for data access
- Standalone, integrated and Web-based

Characteristics of a DSS

- Support for decision makers in semi structured and unstructured problems.
- Support for managers at various managerial levels, ranging from top executive to line managers.
- Support for individuals and groups. Less structured problems often requires the involvement of several individuals from different departments and organization level.
- Support for interdependent or sequential decisions.
- Support for intelligence, design, choice, and implementation.
- Support for variety of decision processes and styles
- DSSs are adaptive over time.

Benefits of DSS

- Improves efficiency and speed of decision making activities
- Increases the control, competitiveness and capability of futuristic decision making of the organization
- Facilitates interpersonal communication
- Encourages learning or training
- Since it is mostly used in non-programmed decisions, it reveals new approaches and sets up new evidences for an unusual decision
- Helps automate managerial processes

Components of a DSS

Following are the components of the Decision Support System:

- **Database Management System (DBMS)** : To solve a problem the necessary data may come from internal or external database. In an organization, internal data are generated by a system such as TPS and MIS. External data come from a variety of sources such as newspapers, online data services, databases (financial, marketing, human resources).
- **Model Management system:** It stores and accesses models that managers use to make decisions. Such models are used for designing manufacturing facility, analyzing the financial health of an organization. Forecasting demand of a product or service etc.
- **Support Tools:** Support tools like online help; pull down menus, user interfaces, graphical analysis, error correction mechanism, facilitates the user interactions with the system.

Classification of DSS

There are several ways to classify DSS. Hoi Apple and Whinstone classify DSS in following:

- Text Oriented DSS

- Database Oriented DSS
- Spreadsheet Oriented DSS
- Solver Oriented DSS
- Rules Oriented DSS
- Rules Oriented DSS
- Compound DSS

Design

System design:-

A system can be most simply defined as a group of interrelated or interacting elements forming a unified whole.

Basic components of a system:

- Input
- Processing
- Output

The main objective of general system design:

- Specify the logical design
- Support business activities
- Ensure that system meets user requirements
- Easy to use
- Provide detailed software development specification
- Conform to design standards

Input/output Design

Input Design

The data base is the data that must be obtained and stored for later retrieval for managerial decision making. The most common cause of error during the data processing is inaccurate input. The inaccurate input is entered by data entry operators but it can be controlled by input design.

Objectives of input design:

- Avoiding errors in data
- Avoiding delay
- Avoiding duplication of data
- Avoiding extra steps
- Controlling the amount of input required
- Keeping the process simple

Activities involved in input design:

- Collection of data
- Conversion of the input data to computer acceptable form
- Checking the conversion
- Transmitting the data to computer
- Checking the input data
- Correct the error if error occur

Output design:-

The most important source of information is the output, efficient, intelligible output design should improve the system's relationship with the user and help in decision making.

Objectives of output design:-

- Carry information about past activities, current affairs or projection of the future
- Mark important events
- Take an action

- Confirm an action

Principles of output design:-

- Too many details should be avoided
- Design should be used from top to bottom approach
- All pages must have heading and page number
- All column must be labeled
- Abbreviations should be avoided

Types of output

- Report
- Document
- Message

Form design

Forms provide information and are a request for action.

Types of forms:

- Hot forms
- Continuous strip/fanfold forms



UNIT-III

Introduction:-

There are a number of characteristics to distinguish the database approach from the traditional approaches of programming with files.

In traditional file processing, each user defines and implements the files needed for a specific application as part of programming the application.

In database approach, a single repository of data is maintained that is defined once and then is accessed by various users.

The main characteristics of the database approach versus the file processing approach are as follows:-

- Self-describing nature of a database system
- Insulation between programs and data, and data abstraction
- Multiple views of the data
- Sharing of data and multiuser transaction processing

Advantages of database approach versus traditional file approach are as follows:

- Controlled redundancy and reduced inconsistency
- Data independence
- Concurrent access with multiple user views
- Data integrity
- Data security
- Backup and recovery
- Easy accessing of data
- Data isolation
- No atomicity problem

Database Management System –

A Database Management System is a collection of program that enable users to store, create, modify & extract information from a database. The DBMS is hence a general propose software system that facilitate the process of defining, constructing & manipulating database for various applications.

The major activities, operations & services provided by DBMS are as follows –

- 1) Transaction Management
- 2) Concurrency Control
- 3) Recovery Management
- 4) Security Management
- 5) Language Interface
- 6) Storage Management
- 7) Data Catalog Management.

Purpose of Database System –

The database system should be repository of the data needed for an organization data processing. The data should be accurate, private & protected from damage. It should be organized so that diverse application with different data requirements can employ the data when needed

Advantages of DBMS –

- 1) Database reduced the data redundancy to a large extent.
- 2) Database can control inconsistency to a large extent.
- 3) Database facilitate sharing of data.
- 4) Database enforces standards.
- 5) Database can ensure data security & privacy.



- 6) Integrity can be maintained through database.
- 7) Conflicting requirement can be balance through database

Disadvantages of DBMS

1. Cost of Hardware and Software
2. Cost of data conversion
3. Cost of staff training
4. Appointing technical staff
5. Data damage

Applications of DBMS – There are different applications of Database Management System as its competitive era the DBMS is used in following areas.

- 1) Banking
- 2) Airlines
- 3) Organization
- 4) Universities,
- 5) Credit Card Transactions
- 6) Tele Communications
- 7) Finance
- 8) Sales
- 9) Human Resources
- 10) Manufacturing etc.

Basic Database Concept

Data:-

The raw facts that can be stored or recorded and that have a clear meaning is called data.

Database:-

A collection of data designed to be used by different people is called a database. It is collection of interrelated data stored together with controlled redundancy to serve one or more applications in an optimal fashion. A database system is basically a computer based record keeping system. The collection of data, usually referred to as the database, contains information about one particular enterprise.

Characteristics of data – The data stored in database should have this characteristics –

- 1) Shared
- 2) Persistence
- 3) Validity / integrity
- 4) Security
- 5) Consistency
- 6) Non-redundancy
- 7) Data independence.

Instances and Schema

The collection of data stored in the database at a given time is called as instance of the database .instances never exist without schema.

The overall design of the database is called schema. Schema normally remains constant , they change very rarely.

Example in structure definition

Struct Emp e1=(101,"vikas arora", 45000)

That describe codeno , name , salary

In above example collection of variable e1 is called as instance, whereas struct Emp is schema.

Types:

1. Physical schema
2. Logical schema



Data independence: -

The ability to modify a schema definition at a level without affecting the next higher level is called independence.

1. **Physical data independence:** - it is possible to modify the physical schema without affecting the application program. Of course the application program is called physical schema
2. **Logical data independence:** - for the database alteration sometimes it is necessary to modify the logical schema. It is possible to modify the logical schema without affecting application program. This modification to the logical schema result in logical independence.

3 level architecture:

1. **Physical level :** - this is the lowest level of architecture . it describe the actual storage of data. The complex low level data structure are detailed in this level.
2. **Logical level :** - Next higher level of data abstraction is logical level. It describe the data stored in the database. It also describes the relationship or associating among those data.
3. **View level:** - this is the highest level. It describe the many view for the same database. The complexity if any that exist in the logical level can be removed here. This complexity may be due to large size of the database.

Database Administrator –

The person who has central control over the system is called database Administrator. The function of DBA include –

- 1) Schema definition
- 2) Storage structure and access method definition
- 3) Schema and physical organization, modification
- 4) Granting of Authorization for data access.
- 5) Integrity – Constraints specifications
- 6) Routine maintenance

Database Users –

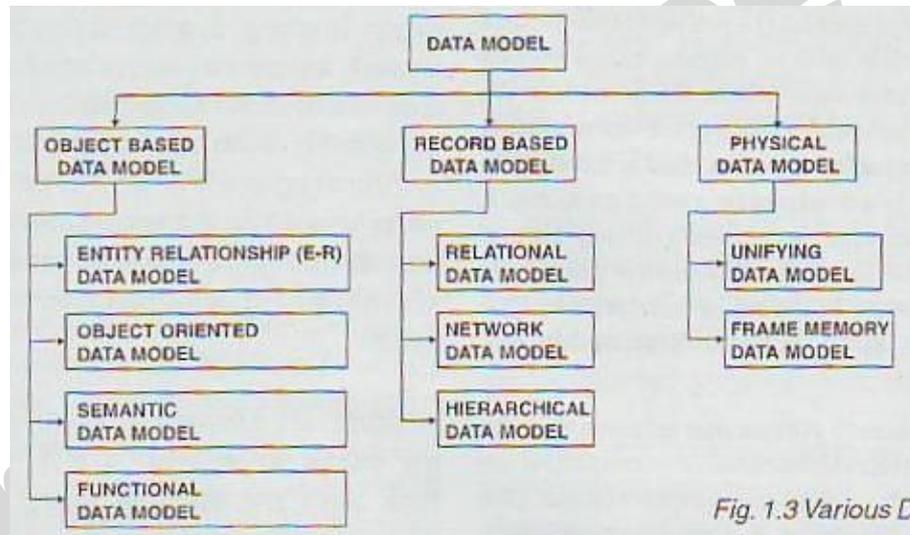
A primary goal of database system is to provide an environment for retrieving information from and storing new information into the database. There are four different types of database users, differentiated by the way that they expect to interact with the system –

- 1) Application programmer
- 2) Sophisticated users
- 3) Specialized users
- 4) Naïve Users



UNIT-IV

Data Models – Data models are different models that can be used to design a database. Design a database includes describing data, data relationship, data semantics and consistency constraints. Various data models are as follows –

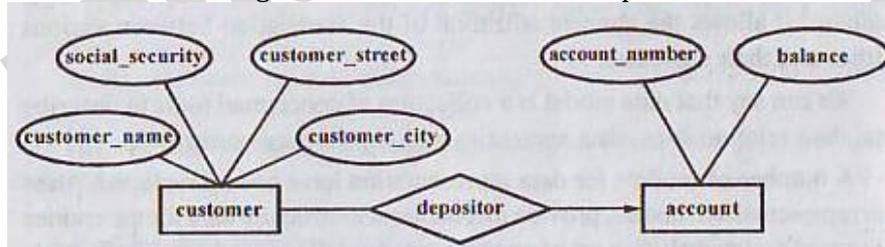


Object based data Model – Object based logical model are used in describing data at a logical & view levels. They are characterized that they provide fairly flexible structure in capabilities & allow data constraints to be specified explicitly. This model emphasis on the fact that everything is a object having a setoff attributes. There are different data models that utilizes this characteristics –

- 1) The entity relationship model
- 2) The object oriented model
- 3) The semantic data model
- 4) The functional data model

- 1) **The entity relationship model** – Entity relationship model moves around three things–
a) Entity, b) Relationship & c) Attribute.

ER-Model is based on perception that everything that have physical properties that is entity, every two entities can be distinguish from other. Relationship exists between these entities.



- 2) **The object oriented model** – Object Oriented Model as name indicates takes everything as object is based on collection of object. Object contains values stored in instance variable within the object. An object also contained bodies of code that operate on the object. These bodies of code are called method.

- 3) **The semantic data model**
- 4) **The functional data model**

Record Based Data Model –



Record based logical model are used in describing data at the logical and view level. In contrast to object based data model they are used both to specify the overall logical structure of the database and to provide a higher level description of implementation. Record based model are so named because the database is structured in fixed format records of several type.

The three most widely used record based data models are –

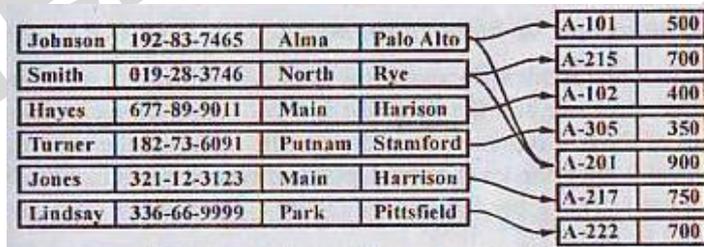
- 1) Relational Model
- 2) Network Model
- 3) Hierarchical Model

- 1) **Relational Model** – This is most popular among the various record based data model. This model uses a collection of table to represent both data and the relationship among those data.

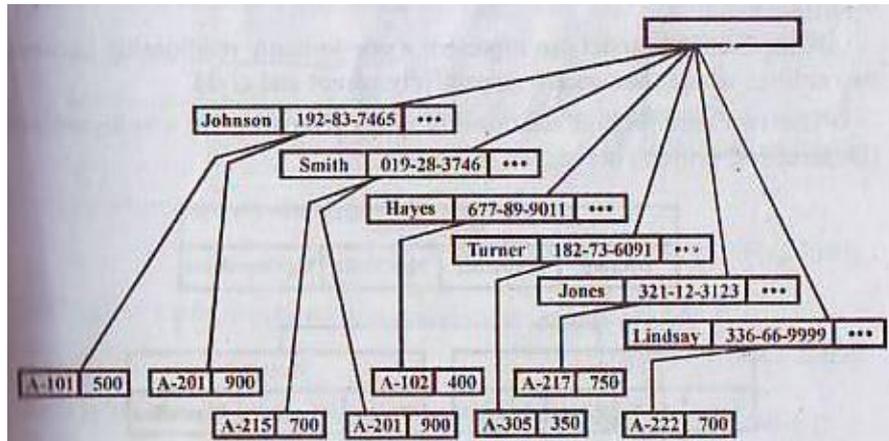
customer_name	social_security	customer_street	customer_city	account_number
Johnson	192-83-7465	Alma	Palo Alto	A-101
Smith	019-28-3746	North	Rye	A-215
Hayes	677-89-9011	Main	Harrison	A-102
Turner	182-73-6091	Putnam	Stamford	A-305
Johnson	192-83-7465	Alma	Palo Alto	A-201
Jones	321-12-3123	Main	Harrison	A-217
Lindsay	336-66-9999	Park	Pittsfield	A-222
Smith	019-28-3746	North	Rye	A-201

account_number	balance
A-101	500
A-215	700
A-102	400
A-305	250
A-201	900
A-217	750
A-222	700

- 2) **Network Model** – Data in network model are represented by collection of records and relationship among the data are represented by links (Pointer). A Pointer is a physical address which identifies where the next record can be found on the disk.



- 3) **Hierarchical Model** – It is very similar to network model. In this data model records are organized as collection of tree rather than arbitrary graphs.



Physical Data Model – This model is used to describe data at the lowest level that is to describe to behavior of data at the disk level i.e. the way of data and the data relationship are maintain by storing them on the disk. This deciding the way the DBMS is going to used secondary storage devices for storing and accessing database.

The widely used data models are –

- 1) Unifying model
- 2) Frame memory model

Entity Relationship Data Model

Entity Relationship Data Model was introduced in a key article by Chen (1976) in which he describe the main construct of the ER-Model. – Entities & relationships and their associates attribute. An Entity Relationship Model is a detailed logical representation of the Data for an organization or a business area. An Entity Relationship Model is normally expressed as an Entity Relationship Diagram.

Components of ER-Model:

- 1) **Entity** – An Entity is a person, place, object, event or concept in the real world i.e. distinguishable from all other objects.
- 2) **Entity Sets** – An Entity set of Entities of the same type that share the same properties or attributes.
 - a. **Strong Entities** – A strong entity set is one that exists independent of other entity sets. A strong entity set that has primary key.
 - b. **Weak Entities** – A weak entity is an entity whose existence depends on some other entities. A strong entity set that has no primary key.
- 3) **Attributes**– An entity can be simply defined as property or characteristics of an entity.
 - a. **Simple Attribute** – Simple attributes is an attributes that cannot be broken into smaller subparts.
 - b. **Composite Attribute** – Composite Attribute is an attributes that can be broken into smaller subparts.
 - c. **Single Valued Attribute** – An attribute is said to be single valued attribute if it can have only one value.
 - d. **Multi Value Attribute** - An attribute is said to be single valued attribute if it can have only more than one value.
 - e. **Stored Attribute** – An attribute which is already present as an attribute for an entity is a stored attribute.
 - f. **Derived Attribute** - An attribute which is derived from stored attribute as it is not present as an attribute for an entity is a derived attribute.



g. Null Attribute – An attribute that can have null value is a null attribute.

Keys:

Keys are attributes or set of attributes used to distinguish one entity from another in an entity set.

- 1) **Super Key:** A super key is set of one or more attributes that can uniquely identify an entity in an entity set.
- 2) **Candidate Key:** All the attributes or set of attribute, when can uniquely identify an entity are candidate keys. Only those key can be candidate key whose no proper subset is a superkey.
- 3) **Primary Key:** The primary key is the term used for the candidates key that is chosen by the database designer as the principal means of identifying an entity.
- 4) **Alternate Keys:** The alternate key is term used for the candidate keys that are remaining after the primary key has be chosen by database designer.
- 5) **Foreign Key:** A foreign key is an attribute or set of attribute in a relation of database that serve as the primary key of another relation in the same database.
- 6) **Composite Key:** A primary key that consists of more than one attribute is called composite key.

Relation (or Table):

The terms Relation & Table can be used interchangeably. Each relation consists of a set of named columns. An attribute is a named column of a relation.

A relation has the following properties:-

- 1) In any given column of a table, all items are of the same kind whereas items in different columns may not be of the same kind.
- 2) For a row, each column must have an atomic (indivisible) value and also for a row, a column cannot have more than one value.
- 3) All rows of a relation are distinct. That is, a relation does not contain two rows which are identical in every column. That is, each row of the relation can be uniquely identified by its contents.
- 4) The ordering of rows within a relation is immaterial. That is, we cannot retrieve any things by saying that from row number 5, column name is to be accessed. There is no order maintained for rows inside a relation.
- 5) The columns of a relation are assigned distinct names and the ordering of these columns is immaterial.

Employee

EmpID	Name	DeptName	Salary
1001	Ravindra Agrawal	Finance	20000
1002	Khelan Nagar	Production	18000
1003	Himanshu Kulkarni	Personnel	25000
1004	Amol Maheshwari	Marketing	30000
1005	Ritesh Singh Chouhan	Advertisement	22000

Relationship Sets:

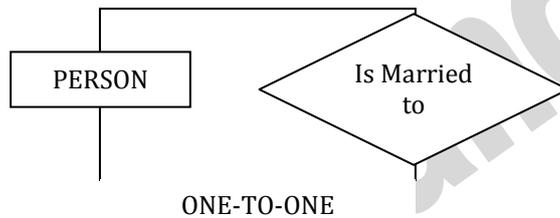
A relationship set is a set of relationships of the same type. For example in a bank, any customer can have any types of loan (Business loan, Personal loan, Home loan) given by the bank. So all the relationship between all the customers and the loan taken by them are together called as relationship set.

Degree of Relationship:

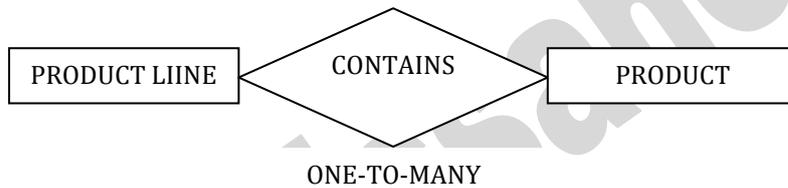
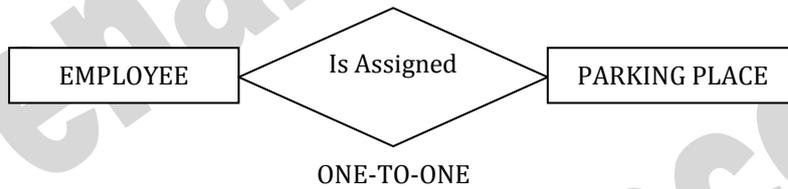


The degree of a relationship is the number of entity types that participate in that relationship. The three most common relationships in E-R-Model are Unary (degree 1), Binary (degree 2) and Ternary (degree 3).

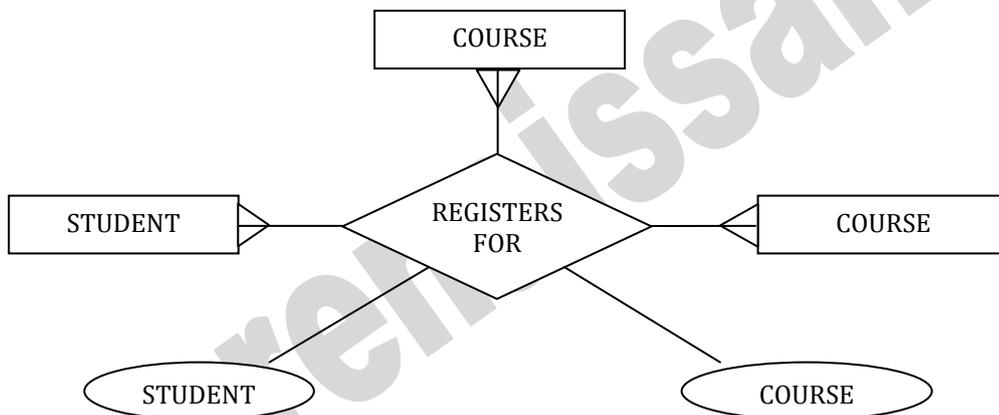
- 1) **Unary Relationship:** A unary relationship is a relationship between the instance of a single entity type.



- 2) **Binary Relationship:** A binary relationship is a relationship between the instances of two entity types and is the most common type of relationship encountered in data modeling.



- 3) **Ternary Relationship:** A ternary relationship is a simultaneous relationship among the instances of three entity types.





E-R Diagram:

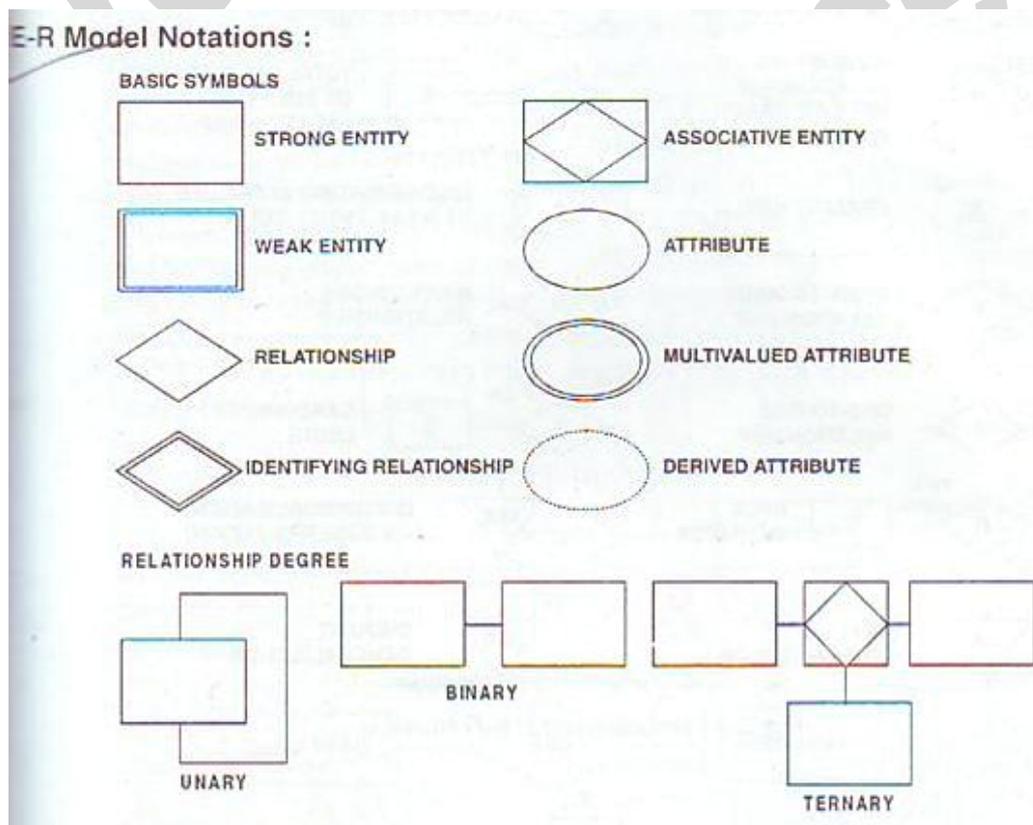
The basic E-R model first introduced during mid 1970s. It has been suitable for modeling most common business problems and has enjoyed widespread use.

The overall logical structure of a database can be expressed graphically by an E-R diagram.

Design of E-R Diagram Conventions:

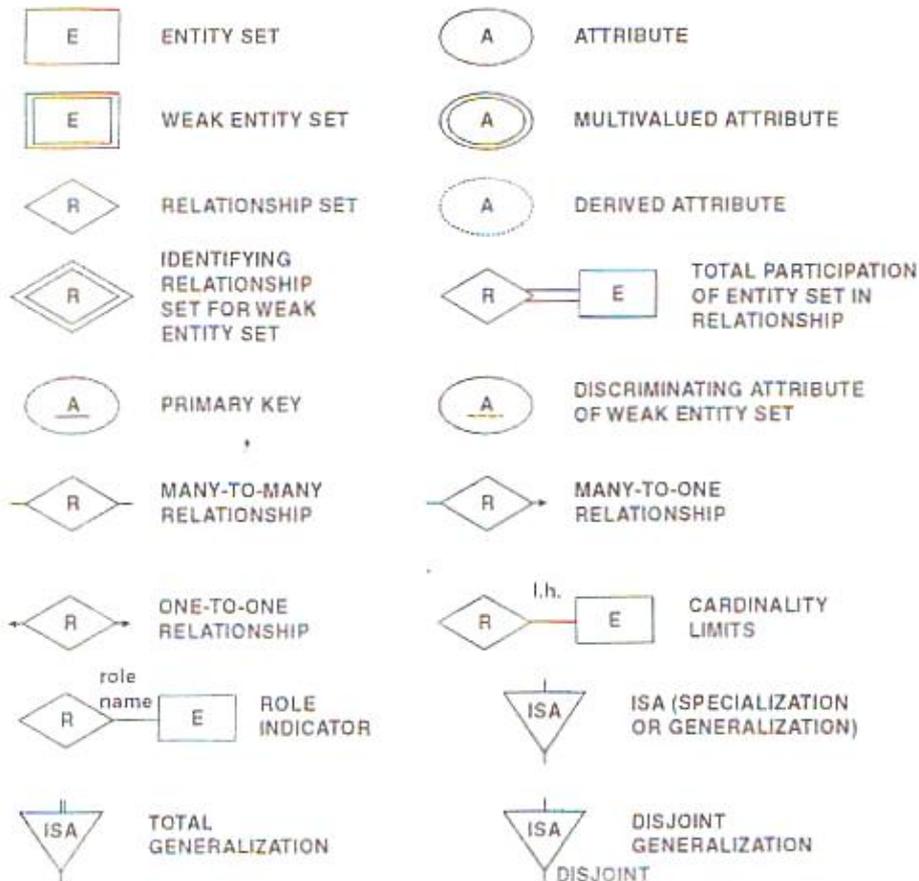
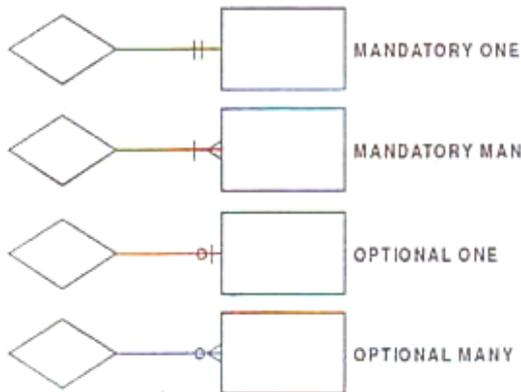
There are conventions for representing the entities and attributes in the E-R diagram.

- The entities are represented by a rectangular box with the name of the entity in the box.
- An attributes is shown as an ellipse attached to a relevant entity by a line and labeled with the attributed name.
- The entity name is written in uppercase where as the attributes name is written in lowercase.
- The primary keys (key attributes) are underlined.
- The attributes are connected using lines to the entities. If the attributes is simple or single valued a single line is used.
- If the attributes is derived a dotted line is used,
- If it is multi-valued than double lines are used.
- If the attributed is composite, its components attributes are shown as ellipses emanating from the composite attribute.





RELATIONSHIP CARDINALITY





ENTITY SET E WITH
ATTRIBUTES A1, A2, A3
AND PRIMARY KEY A1

E
A1
A2
A3

MANY-TO-MANY
RELATIONSHIP



ONE-TO-ONE
RELATIONSHIP



MANY-TO-ONE
RELATIONSHIP





UNIT-V

Introduction to Database Languages

The main objective of a database management system is to allow its users to perform a number of operations on the database such as insert, delete, and retrieve data in abstract terms without knowing about the physical representations of data. To provide the various facilities to different types of users, a DBMS normally provides one or more specialized programming languages called **Database (or DBMS) Languages**.

There are many popular RDBMS available to work. They are as follows:-

- MySQL
- MS SQL Server
- ORACLE
- MS ACCESS

SQL:-

SQL (Structured Query Language) is a database sublanguage for querying and modifying relational databases. It was developed by IBM Research in the mid 70's and standardized by ANSI in 1986.

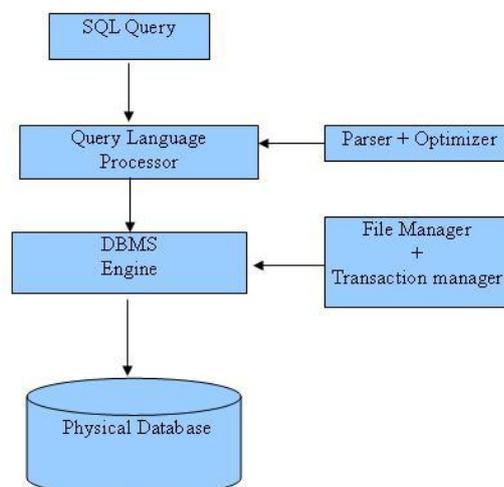
SQL (pronounced "ess-que-el") stands for Structured Query Language. SQL is used to communicate with a database.

SQL statements are used to perform tasks such as update data on a database, or retrieve data from a database. Some common relational database management systems that use SQL are: Oracle, Sybase, Microsoft SQL Server, Access, Ingres, etc.

Characteristics of SQL:-

- Allows users to describe the data.
- Allows users to define the data in database and manipulate that data.
- Allows embedding within other languages using SQL modules, libraries & pre-compilers.
- Allows users to create and drop databases and tables.
- Allows users to create view, stored procedure, functions in a database.
- Allows users to set permissions on tables, procedures, and views

SQL Process:



SQL Functions:-

SQL has many built-in functions for performing calculations on data.



SQL Aggregate Functions

SQL aggregate functions return a single value, calculated from values in a column.

The Useful aggregate functions are as follows:

- AVG() - Returns the average value
- COUNT() - Returns the number of rows
- FIRST() - Returns the first value
- LAST() - Returns the last value
- MAX() - Returns the largest value
- MIN() - Returns the smallest value
- SUM() - Returns the sum

SQL Scalar functions

SQL scalar functions return a single value, based on the input value.

The Useful scalar functions are as follows:

- UCASE() - Converts a field to upper case
- LCASE() - Converts a field to lower case
- MID() - Extract characters from a text field
- LEN() - Returns the length of a text field
- ROUND() - Rounds a numeric field to the number of decimals specified
- NOW() - Returns the current system date and time
- FORMAT() - Formats how a field is to be displayed

Components of SQL:-

SQL commands are instructions used to communicate with the database to perform specific task that work with data. SQL commands can be used not only for searching the database but also to perform various other functions like, for example, you can create tables, add data to tables, or modify data, drop the table, set permissions for users. SQL commands are grouped into four major categories depending on their functionality:

- **Data Definition Language (DDL)** - These SQL commands are used for creating, modifying, and dropping the structure of database objects. The commands are CREATE, ALTER, DROP, RENAME, and TRUNCATE.
- **Data Manipulation Language (DML)** - These SQL commands are used for storing, retrieving, modifying, and deleting data. These commands are SELECT, INSERT, UPDATE, and DELETE.
- **Transaction Control Language (TCL)** - These SQL commands are used for managing changes affecting the data. These commands are COMMIT, ROLLBACK, and SAVEPOINT.
- **Data Control Language (DCL)** - These SQL commands are used for providing security to database objects. These commands are GRANT and REVOKE.

Some of the Most Important SQL Commands

- **SELECT** - extracts data from a database
- **UPDATE** - updates data in a database
- **DELETE** - deletes data from a database
- **INSERT INTO** - inserts new data into a database
- **CREATE DATABASE** - creates a new database
- **ALTER DATABASE** - modifies a database
- **CREATE TABLE** - creates a new table
- **ALTER TABLE** - modifies a table
- **DROP TABLE** - deletes a table
- **CREATE INDEX** - creates an index (search key)
- **DROP INDEX** - deletes an index



Some of the Most Important SQL Commands with SQL statement

DML: Data Manipulation Language

SQL-Data Statements -- query and modify tables and columns

- SELECT Statement -- query tables and views in the database
- INSERT Statement -- add rows to tables
- UPDATE Statement -- modify columns in table rows
- DELETE Statement -- remove rows from tables

TCL:- Transaction Control Language

SQL-Transaction Statements -- control transactions

- COMMIT Statement -- commit the current transaction
- ROLLBACK Statement -- roll back the current transaction

DDL:- Data Definition Language

SQL-Schema Statements -- maintain schema (catalog)

- CREATE TABLE Statement -- create tables
- CREATE VIEW Statement -- create views
- DROP TABLE Statement -- drop tables
- DROP VIEW Statement -- drop views
- GRANT Statement -- grant privileges on tables and views to other users
- REVOKE Statement -- revoke privileges on tables and views from other users

The SQL SELECT Statement:-

The SELECT statement is used to select data from a database.

Syntax:

```
SELECT column_name,column_name  
FROM table_name;
```

Or

```
SELECT * FROM table_name;
```

WHERE clause: - It is used to filter records.

```
SELECT column_name,column_name  
FROM table_name  
WHERE column_name operator value;
```

Operators in where clause:-

Operator	Description
=	Equal
<>	Not equal.
>	Greater than
<	Less than
>=	Greater than or equal
<=	Less than or equal



BETWEEN	Between an inclusive range
LIKE	Search for a pattern
IN	To specify multiple possible values for a column

SQL AND & OR Operators:-

- The AND & OR operators are used to filter records based on more than one condition.
- The AND operator displays a record if both the first condition AND the second condition are true.
- The OR operator displays a record if either the first condition OR the second condition is true.

IN

IN operator is used when you know the exact value you want to return for at least one of the columns

SQL ORDER BY Keyword:-

The ORDER BY keyword is used to sort the result-set. The ORDER BY keyword is used to sort the result-set by one or more columns.

The ORDER BY keyword sorts the records in ascending order by default. To sort the records in a descending order, you can use the DESC keyword.

Syntax:-

```
SELECT column_name,column_name  
FROM table_name  
ORDER BY column_name,column_name ASC|DESC;
```

SQL INSERT INTO Statement

The INSERT INTO statement is used to insert new records in a table.

The first form does not specify the column names where the data will be inserted, only their values:

INSERT INTO table_name

```
VALUES (value1,value2,value3,...);
```

The second form specifies both the column names and the values to be inserted:

INSERT INTO table_name (column1,column2,column3,...)

```
VALUES (value1,value2,value3,...);
```

SQL UPDATE Statement

The UPDATE statement is used to update records in a table.

UPDATE table_name

```
SET column1=value1,column2=value2,...
```

```
WHERE some_column=some_value;
```

SQL DELETE Statement

The DELETE statement is used to delete records in a table.

```
DELETE FROM table_name
```

```
WHERE some_column=some_value;
```



SQL CREATE TABLE Statement

The CREATE TABLE statement is used to create a table in a database.

Tables are organized into rows and columns; and each table must have a name.

CREATE TABLE *table_name*

```
(  
  column_name1 data_type(size),  
  column_name2 data_type(size),  
  column_name3 data_type(size),  
  ....  
);
```

The DROP TABLE Statement

The DROP TABLE statement is used to delete a table.

DROP TABLE *table_name*;

The ALTER TABLE Statement

The ALTER TABLE statement is used to add, delete, or modify columns in an existing table.

To add a column in a table, use the following syntax:

```
ALTER TABLE table_name  
ADD column_name datatype
```

SQL GRANT Command

SQL GRANT is a command used to provide access or privileges on the database objects to the users.

The Syntax for the GRANT command is:

```
GRANT privilege_name  
ON object_name  
TO {user_name |PUBLIC |role_name}  
[WITH GRANT OPTION];
```

- *privilege_name* is the access right or privilege granted to the user. Some of the access rights are ALL, EXECUTE, and SELECT.
- *object_name* is the name of an database object like TABLE, VIEW, STORED PROC and SEQUENCE.
- *user_name* is the name of the user to whom an access right is being granted.
- *user_name* is the name of the user to whom an access right is being granted.
- *PUBLIC* is used to grant access rights to all users.
- *ROLES* are a set of privileges grouped together.
- *WITH GRANT OPTION* - allows a user to grant access rights to other users.

SQL REVOKE Command:

The REVOKE command removes user access rights or privileges to the database objects.

The Syntax for the REVOKE command is:

```
REVOKE privilege_name  
ON object_name  
FROM {user_name |PUBLIC |role_name}
```



The COMMIT Command:

The COMMIT command is the transactional command used to save changes invoked by a transaction to the database.

The COMMIT command saves all transactions to the database since the last COMMIT or ROLLBACK command.

Syntax:-

COMMIT;

The ROLLBACK Command:

The ROLLBACK command is the transactional command used to undo transactions that have not already been saved to the database.

The ROLLBACK command can only be used to undo transactions since the last COMMIT or ROLLBACK command was issued.

The syntax for ROLLBACK command is as follows:

ROLLBACK;

SQL Data Types:-

SQL data type is an attribute that specifies type of data of any object. Each column, variable and expression has related data type in SQL.

SQL offers six categories of data types for your use:

- **Exact Numeric Data Types:** int, numeric, bit etc
- **Approximate Numeric Data Types:** Float, real
- **Date and Time Data Types:** Datetime, date, time, smalldatetime
- **Character Strings Data Types:** Char, varchar, varchar(max), text
- **Unicode Character Strings Data Types:** Nchar, nvarchar, ntext
- **Binary Data Types:** Binary, varbinary
- **Misc Data Types**

SQL Operator

An operator is a reserved word or a character used primarily in an SQL statement's WHERE clause to perform operation(s), such as comparisons and arithmetic operations.

Operators are used to specify conditions in an SQL statement and to serve as conjunctions for multiple conditions in a statement.

- Arithmetic operators
- Comparison operators
- Logical operators
- Operators used to negate conditions

Set operators:-

SQL support few of set operators on the SQL tables. They are as follows:-

- Union
- Intersect
- Minus