INFORMATION TECHNOLOGY TRENDS(3BCA1)

❖ Paper Introduction

- Information technology is based on any combination of equipment (Hardware) that facilitates the creation, modification, retrieval, storage and transmission of information using electronic media.
- It includes both computing and communication technology.
- Various aspects of information technology are-
  a) Information system such as Hardware & software.
  b) Telecommunication
  c) Science
  d) Human computer interface

UNIT-1

❖ Information System(Hardware)

- Information with the help of computer system.
- Information via computer system that is hardware and software.
- Information system is based on combination of hardware and software that facilitates creation, modification, retrieval, storage and transmission of information using computer system.

❖ The computer structure Architecture

Secondary Memory

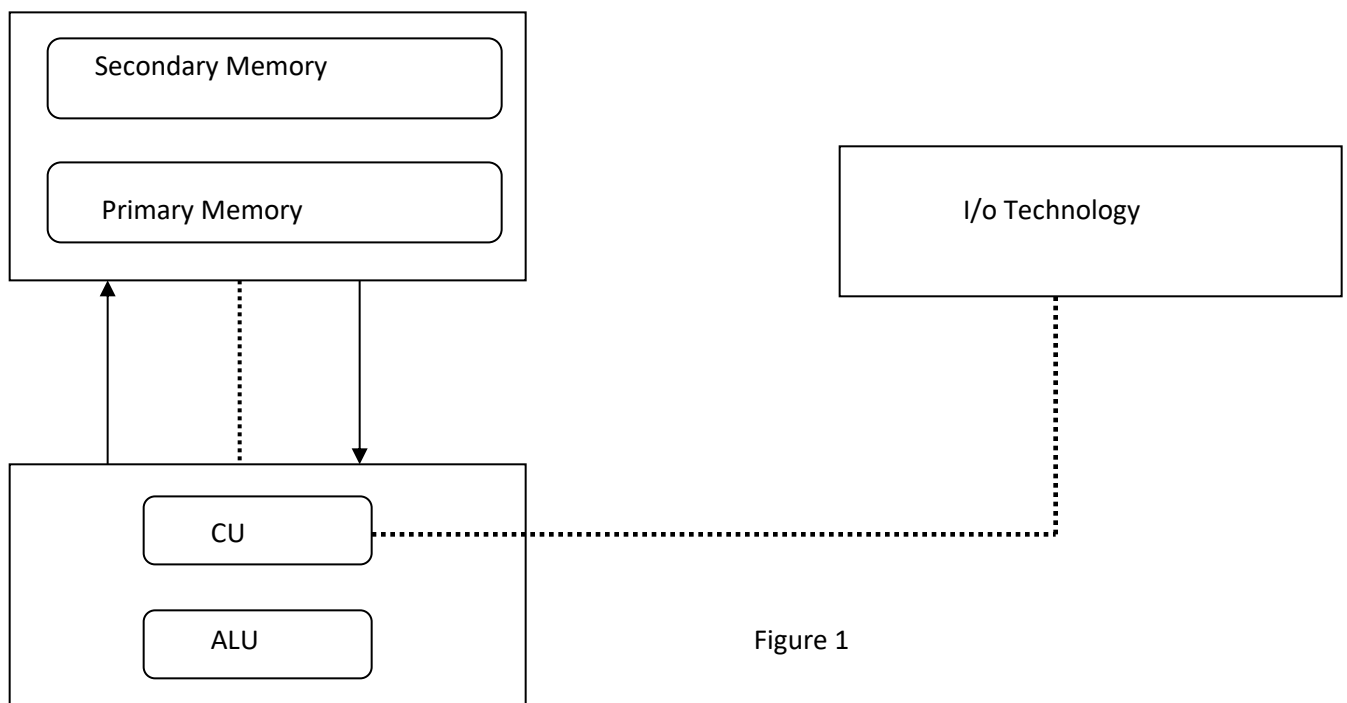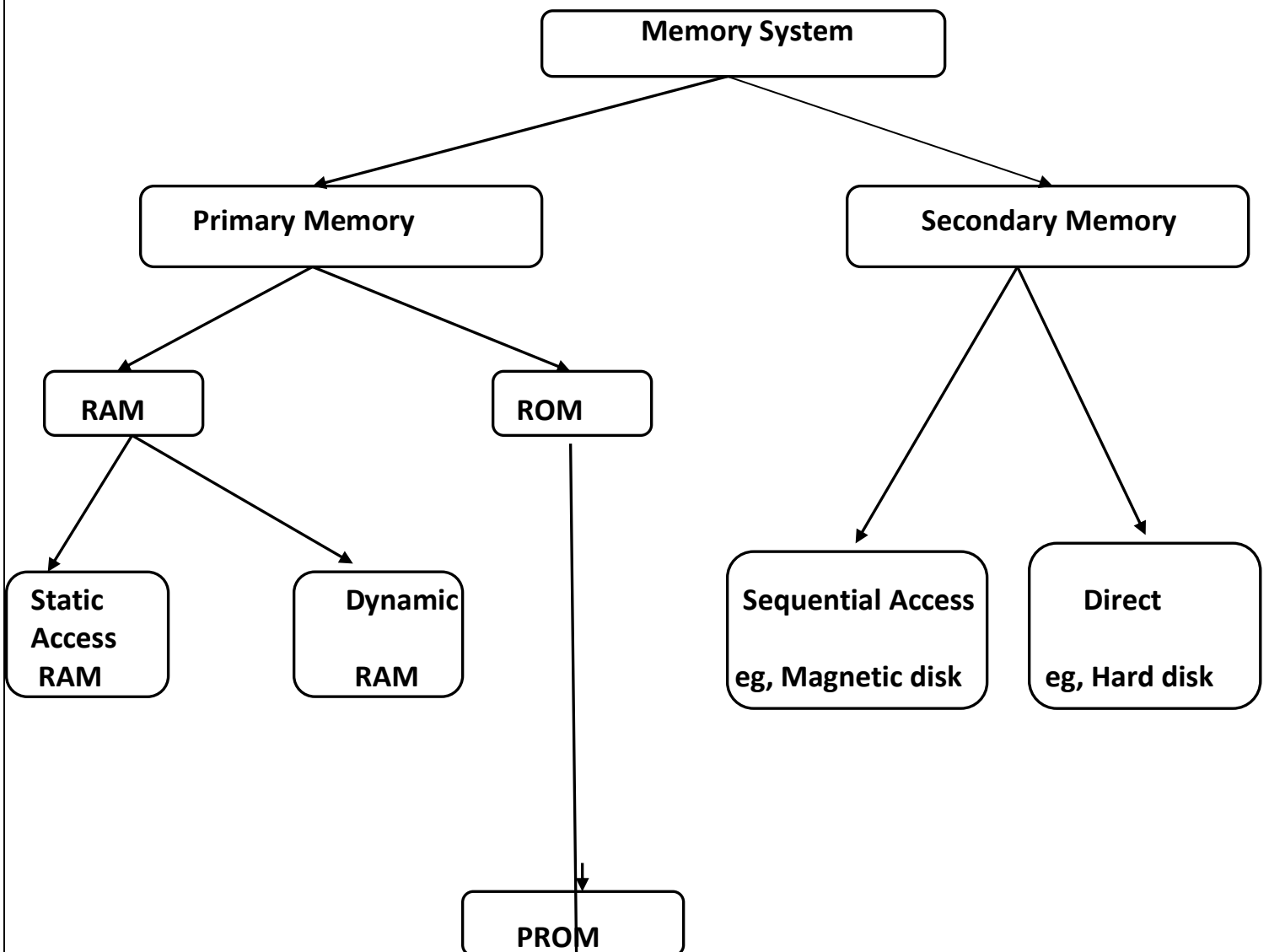Primary Memory

I/o Technology

CU

ALU

Figure 1

Hardware-

1. It is essential part of computer system.
2. It is the physical part of computer system which is tangible in nature.
3. Hardware is I/O system, Memory system or C.P.U system etc.

1. Computer system is made up of five fundamental units- Input units, output units, Memory units, Control units (C.U.) & Arithmetic Logic Units (A.L.U).

2. A computer system accesses the data with the help of input system such as keyboard, mouse etc.

3. Storage unit saves the data for initial processing or later processing.

4. a) then go for processing with the help are two part-
   1) A.L.U.(Arithmetic Logic Unit)   2) C.U(Control Unit)

   1. A.L.U- It is the brain of computer system because it performs the mathematical or logical operation on the data.

   2. C.U- The function of control unit are like
      a) House Master- It decides the sequence of operation for the system.
      b) Memory Unit is used to store the information. Basically there are two types of memory that is
         1. Primary Memory- It is a main memory, volatile memory which temporarily store data for initial or later processing as soon as power is switched off or restart the data is destroyed from this memory.
         2. Secondary Memory- Which store permanently data. It takes care of the limitation of primary memory, when power supply is switched off or restart the data is store in the memory.

5. Output Unit- It is use to retrieve the data the output unit are VDU/Monitor, Printer etc.
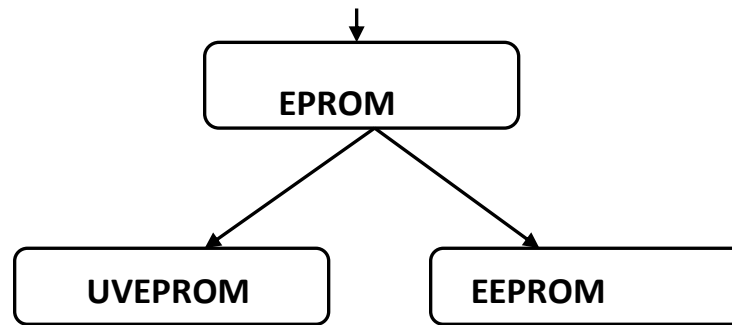
```
                    EPROM
           ↙                    ↘
    UVEPROM              EEPROM
```

Figure 2

- **Primary Memory**- It is also known as prime memory or real memory. It is use to hold pieces of information on and data which the computer system currently working on Primary stage can hold information only when the computer system is on. As soon as the computer is switched off or reset (restart). The information hold in the primary memory/storage disappears. The primary memory has limited storage capacity, because it is expensive in nature. It is made up of semiconductor material.

- **Main Memory of two types-**
    1. RAM(Random Access Memory)
    2. ROM(Read Only Memory)

1. **RAM**-a) RAM is the main memory which is temporary read and write memory.

    b) If a computer system and faster than secondary memory.

    There are two types of RAM
    1. S-RAM(Static RAM)
    2. D-RAM(Dynamic RAM)

1. **S-RAM** -
    - It is a RAM with higher speed.
    - It is costly which store information as long as power supply is on.
    - It consumes more power.

2. **D-RAM**
    - It stores the information a very few short times that is neon second even through the power supply is switched off or reset.
    - It is low speed and cheaper.
    - It consumes less power.

2. **ROM**- Program held in ROM are called from where, they are store permanently in ROM and are ready for use when computer is switched on. The user cannot write into a ROM. It consists of POST (Program on Self-Testing) that is written by manufacturing time.

- PROM (Programmable Read Only Memory) - Program held in ROM are called Programmable Read Only Memory.
- EPROM (Erasable Programmable Read Only Memory) - Once information stored in PROM or ROM chip cannot be altered. However, other types of erasable programmable ROM are develop which erase the stored information and restore the new information program. There are two types of EPROM-
    1. EEPROM(Electrically Erasable Programmable Read only memory)
    2. UVPROM(Ultra violet Programmable Read Only Memory)

- **Secondary Memory-**
    It is of two types-

1. **Sequential access storage device-**
    A sequential access storage device is one in which at the location desire may be proceeded by sequentially through other location.
    e.g. / Magnetic Disk

2. Direct access storage device-
    A direct storage device is one in which the information is literally available at random that is at is available in any order.
    e.g. / optical disk, CD-ROM, WORM PVT, Magnetic disk, Hard-disk, Removable disk, Pen-drive, Memory-card etc.

- ❖ **I/O Technology-** This technology is important part of hardware, it consist of two systems such as Input Unit, Out Unit
- ▪ Input Unit- The data and instructions must enter the computer system before any computer can be performed. This task is performed by the input unit for   which data and instruction depend upon the particular device use.
    E.g. / Keyboard, Mouse, Joystick, Scanner, Track ball, etc.
- ▪ Output Unit- The job of output unit is just reverse of that of an input unit. It supply the information obtained for the data processing to the outside of the computer. It converts this information to human acceptable (readable form) output systems are Monitor, Printer (Impact printer and Non-Impact printer).
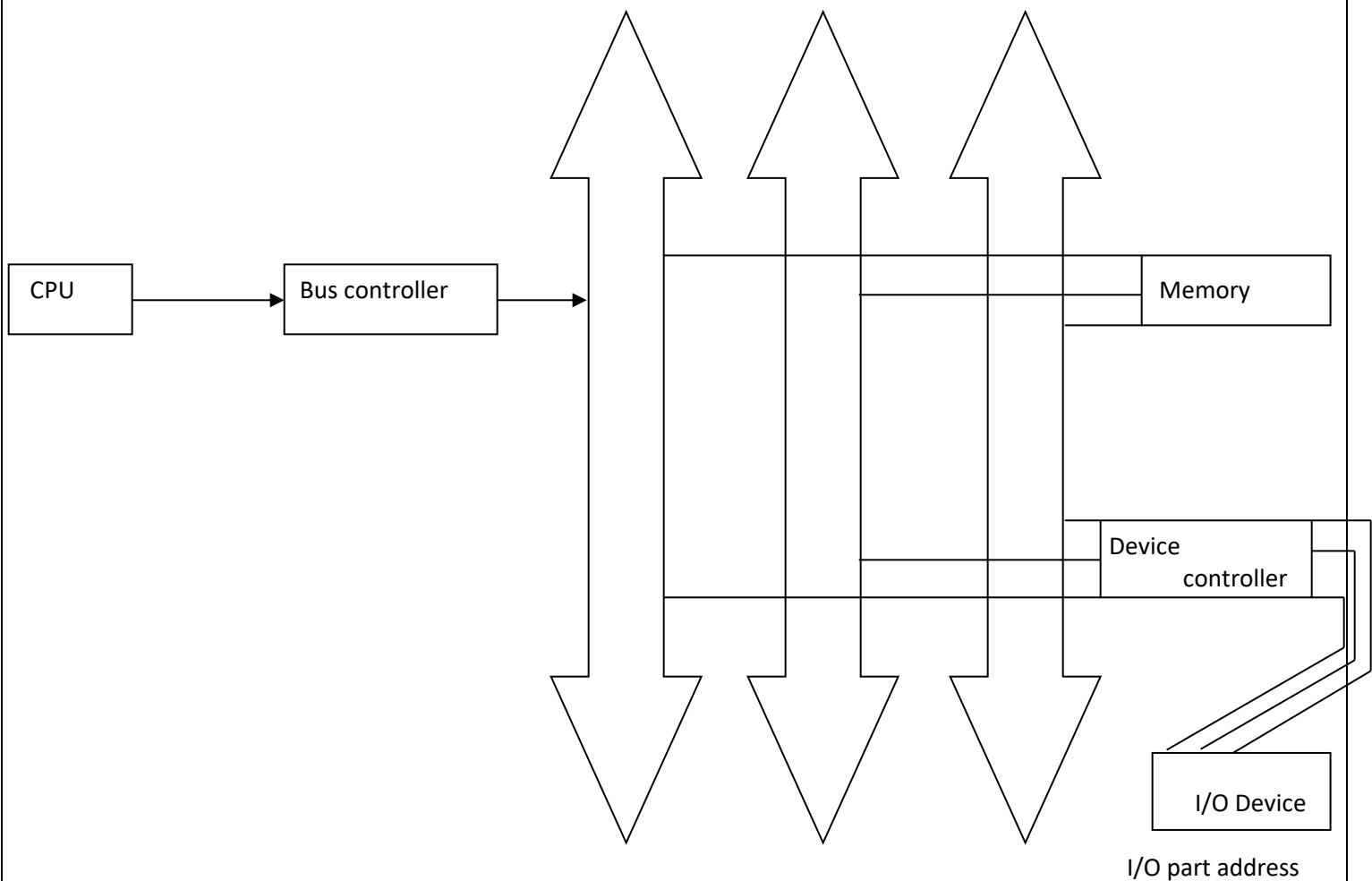- ❖ **Communicating system hardware-**

| CPU | Bus controller | | Memory |

Device controller

I/O Device

I/O part address

Figure 3

There are three main buses the cup uses to communicating system with hardware are-
    1> Address Bus
    2> Data Bus
    3> Control Bus

1> Address Bus-

* Address Bus consist 16, 20, 24 or more parallel signal line.
CUP consist uses these lines to send the address of the memory location. The CUP address is determine by number of address line example-

CUP with 16 address lines, 2^{16} = 65536

CPU with 20 addresses lines, $2^{20} = 1048567$ memory location.

CPU with 24 address lines, 2^{24} = 16777216 memory location.

When the CPU read data from or writes data to a part, the part address is also send on the address Bus.

2> Data Bus-

* Data Bus consist of 8,16,32 or more parallel signal line the data buses are always indicated by double ended arrows because they are diclerationally which means that CPU can read or write the data from the memory or I/O part through the some line.

3> Control Bus-

* The control Bus consist of 4-8 parallel signal line, the CPU control the signal output to the control bus with respect to its own requirement. The typical bus signal are memory read-

To read the data from the memory

- Memory Write- To write the data in to the memory.
- I/O Read- To read the data from I/O part.
- I/O Write- To write the data into I/O part.

Whenever the CPU wants to read write the data to memory or on I/O part. It has sent the address of that memory location or part then the respective signal to communication as require.

Selection of Computer System

The following factors should be considered while selection of a computer system-

1. Performance
2. Speed
3. Reliability & Stability
4. Energy consumption & Controlling
5. S/W support
6. H/W support
7. Mother board support

1. Performance – The processor capabilities dedicate maximum performance of the system. It is the most important signal determinate of system performance line term of speed, cost, accuracy etc.
2. Speed – Speed of a processor defines how fast it can perform operation there are many ways to indicate speed but the obvious way to measure is through clock (clk) of the CPU. The fasten speed of the internal clock (clk) of the processor the faster CPU will work.
3. Reliability & Stability – The Reliability of the computer system depends on the type and quality of the processor.
4. Energy Consumption & Controlling- All through processor consume reliability little power compare to the other system device newer processor consume a great details of power, resulting in the impact of everything from cooling methods and selection to overall system reliability.
5. Software Support- New and faster software support resource consuming software which was not supported on earlier machine.
6. Other Hardware Support- Power supply (SMPS with modulate power supply) part interface, network interface card video card, ribbon, cables, memory chip are essential for selecting the system.
7. Mother Board Support – Type of processor used in system is a measure determining system factor of chip set used on the motherboard in term, detect memory facilities of the system's capacities and performance.

Unit-2   INFORMATION SYSTEM (SOFTWARE)

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❖ Software-
  ∗ Software is essential requirement for any computer system for creation, modification, retrieval of any information.
  ∗ It is set of program associated with the computer.
  ∗ Without software computer is just like a car without petrol or T.V. without film.
  ∗ There are two types of software-
    1. Application Software   2. System software

1. Application Software- Application software where may be provide by the computer manufacture, or supplier and in many cases the user produces his own application program called user program some common application software, database software, graphic software, personal assistance software, education software, Entertainment software such as video game, songs(multimedia) etc.

2. System software- By system, we mean computer system the uses of a computer system is disposal a large amount of software provided by the manufacture. Much of this software will program which contribute to control and performance of the computer system.
   In general a computer system software perform one or more following functions-
   a) Support the development of application software.
   b) Support the execution of various software.
   c) Monitor the effective use of various hardware such as CPU memory, peripherals.
   d) Communicate and control the operations O/S peripherals such as printer, hardware etc. hence the system software of make the operation of a computer more effective and efficient.
      • The program included in the system are called system program and the programmer who prepare system software are said to be system programmer.

❖ Types of system software-
   1. OS (Operating System)
   2. Programming Language Translator
   3. Network Software/Communication software
   4. Utilities Program

1) Operating system- It is a system software that manages the entire resources of the computer system such as input unit, output unit, memory unit, file, disk, application software, system software etc.
   There are two types of operating system software are available the
   a) CUI (Command User Interface/ Character User Interface)- CUI not friendly and allow us to typing each and every command for interacting with O/S
      E.g. Such as UNIX, DOS, etc.
   b) GUI(Graphical User Interface)- It is user friendly that eliminates the need of typing command and allow us to enter command by pointing then on the computer screen such as LINUX, XP, VIST,WINDOW 98 etc.

2) Programming Language Translator- System software which transfer the instruction prepared by programmer in a programming languages into a form which can computer system understand or i.e. Machine Language.
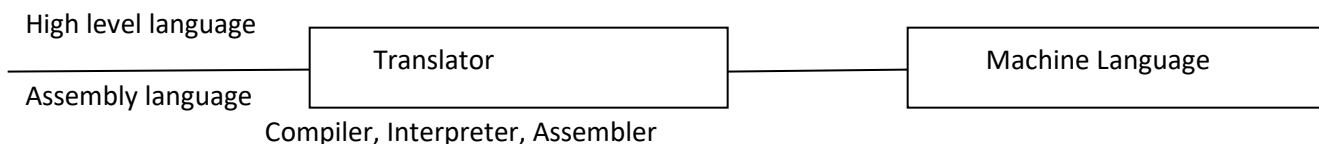   E.g. / Assembler, Interpreter, Compiler.

High level language

| | Translator | | Machine Language |

Assembly language

Compiler, Interpreter, Assembler

Figure 1

3) Network Software/Communication Software- Where is proceeded by in a N/W software environment (when multiple computer are the inter connected together by communication network). Network software enables transform of data program from one computer to another
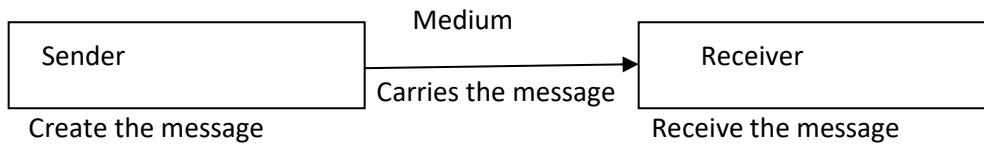
```
          Medium
┌──────────────┐              ┌──────────────┐
│   Sender     │─────────────▶│   Receiver   │
│              │ Carries the  │              │
└──────────────┘  message     └──────────────┘
Create the message             Receive the message
```
Figure 2

4) Utilities Program- Utilities program also known as utilities are set of program which helps user is system maintenance task and in performing the task routine nature. Some task commonly perform b utilities program includes formatting of floppy disk taking backup of files stared in hard-disk sorting, record stored in a file network security.

❖ Password- A password is a recreate word of phrase, that gives a user access to a particular program of a system however system programmer or their technology competent individuals we intimately have access to these codes.
❖ Purpose of Security –
  ∗ To prevent unauthorized individual from examining, sensitive information/program.
  ∗ To prevent unauthorized individual from modifying important information.
  ∗ To prevent malicious individual from disrupting the normal operation of the system.
❖ Types of Network Security
  1. Share Level Security- In share level security access control to the file, printer or other network resources is based on knowing the password of that resource.
  2. User Level Security- In user level security access control to a file, printer or other network resources is based on user name it provide greater protection then share level security because user identified individually with in a group user level permission are stared in central server and managed by network administrator.
❖ File –
  ∗ It is the smallest unit containing the information on a topic in a p.c.
  ∗ A file is a collection of related information
  ∗ Each file has its name, data and its attribute.
  ∗ A file name as uniquely identifier for the user to access it.
  ∗ Data is the contains of a file
  ∗ File is always store in the secondary storage device
  ∗ Every file has named its data & attributes.
  ∗ We get to example of all certain Akela file, AM file etc.
  ∗ Files are stared permanently on secondary storage device such as hard-disk.
❖ Directory
  ∗ Container of the file.
  ∗ All files can be stared under one directory.
  ∗ Whenever we saved in a type latter in our p.c. & give it a nature O/S will save. It can store our hard-disk or secondary memory device in the form of electronic file into an electronic folder is called directory.
  ∗ It works as a drawer for the file as for example ABC.
  ∗ There are three type of directory structure such as file name, extension that is used often after a file name to slow the type of file.
  There are describe does below-
1. Text file(.txt)
2. Back up file(.bak)
3. Help file(.hlp)

4. Document file(.doc)
5. Graphics file(.bmp)
6. MS Excel (.xls)
7. C file (.c)
8. C++ file(.cpp)
9. FoxPro(.dbf)
10. MS Access(.mdf)

1) Single Level structure directory-
   * In single level directory structured there is one directory which contain certain number of files.
   * It is the simplest form of directory structure having only one level of directory. Ths entire files are contain in the some directory.
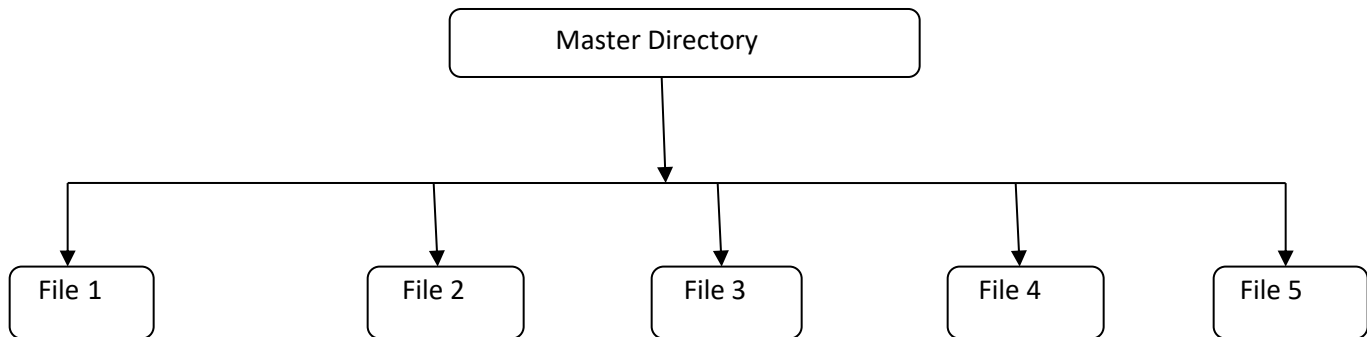   * It appears list of files are sequential name serving as the key.

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                    ┌─────────────────────┐
                    │   Master Directory  │
                    └─────────────────────┘
```

| File 1 | File 2 | File 3 | File 4 | File 5 |

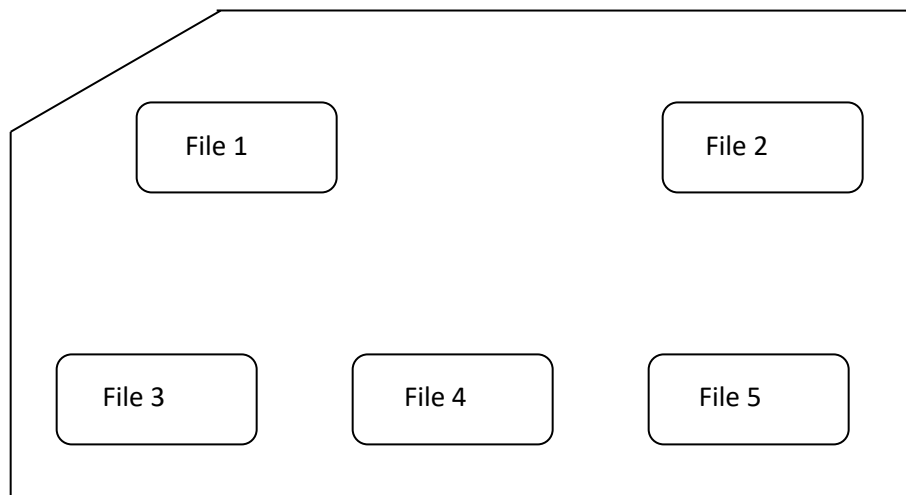Figure 3

| File 1 | | File 2 |
| File 3 | File 4 | File 5 |

Figure 4

2) Two Level direcdtory structure

* As the name suggest this structure is divided into two level of directories ie, the master directories ie, the master directories and the user directory.
* A separate directory is provided to each user and all these directories contain and indexed in master directory.
* User directory represent a simple list of file of that directory.
* Two level struck look like a tree of height two root of this tree of master directory having user directory as its branches and files are the leaves of these branches
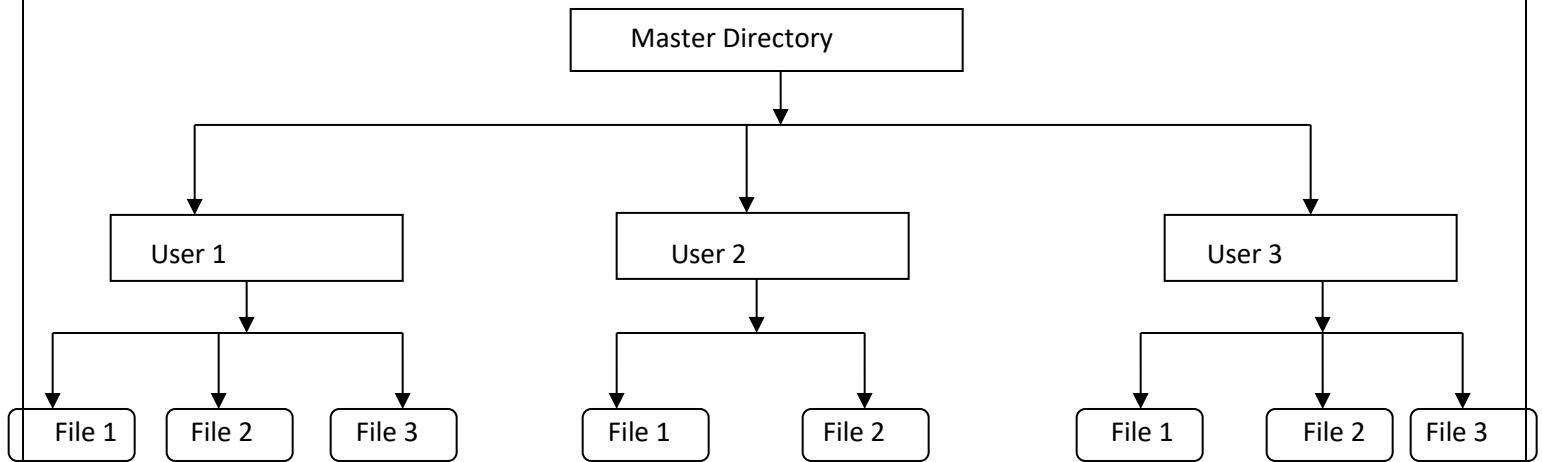
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                    ┌─────────────────────┐
                    │  Master Directory   │
                    └─────────────────────┘

   ┌──────────────┐      ┌──────────────┐      ┌──────────────┐
   │    User 1    │      │    User 2    │      │    User 3    │
   └──────────────┘      └──────────────┘      └──────────────┘

 [File 1][File 2][File 3]   [File 1][File 2]    [File 1][File 2][File 3]
```

Figure 5

```
      ┌──────────────────────────────────┐
      │   [File 1] [File 2]    [File 1] [File 2]   │
      │       [File 3]             [File 3]        │
      │                                            │
      │        [File 1]     [File 2]               │
      │             [File 3]                       │
      └──────────────────────────────────┘
```
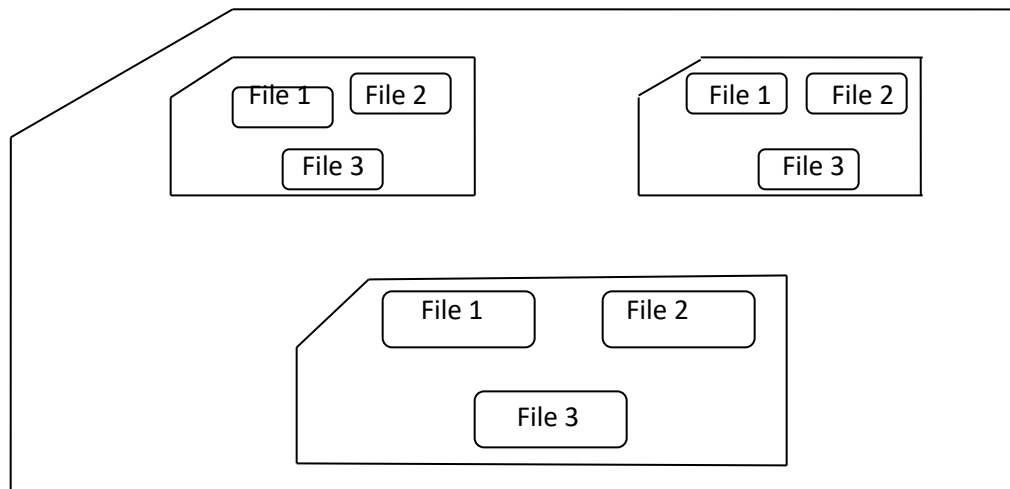
Figure 6

3) Hierarchical Structure Directory

* Hierarchical directory structure works like a tree structure which has root, branches and sub-branch with leaves.
* In case of hierarchical structure the sub dir of master directory also contain the directories.
* After two level directory structures in any directory level created a then it is said to be hierarchical structure.
* This is the most powerful and flexible structure and implemented in almost every operation software.
* Two level structure is extended into more advanced hierarchical structure of arbitrary level.
* It uses some concept of two level structure of master directory having user directory as sub directory. In addition user directory in turned as sub directory file and its branches and laves.
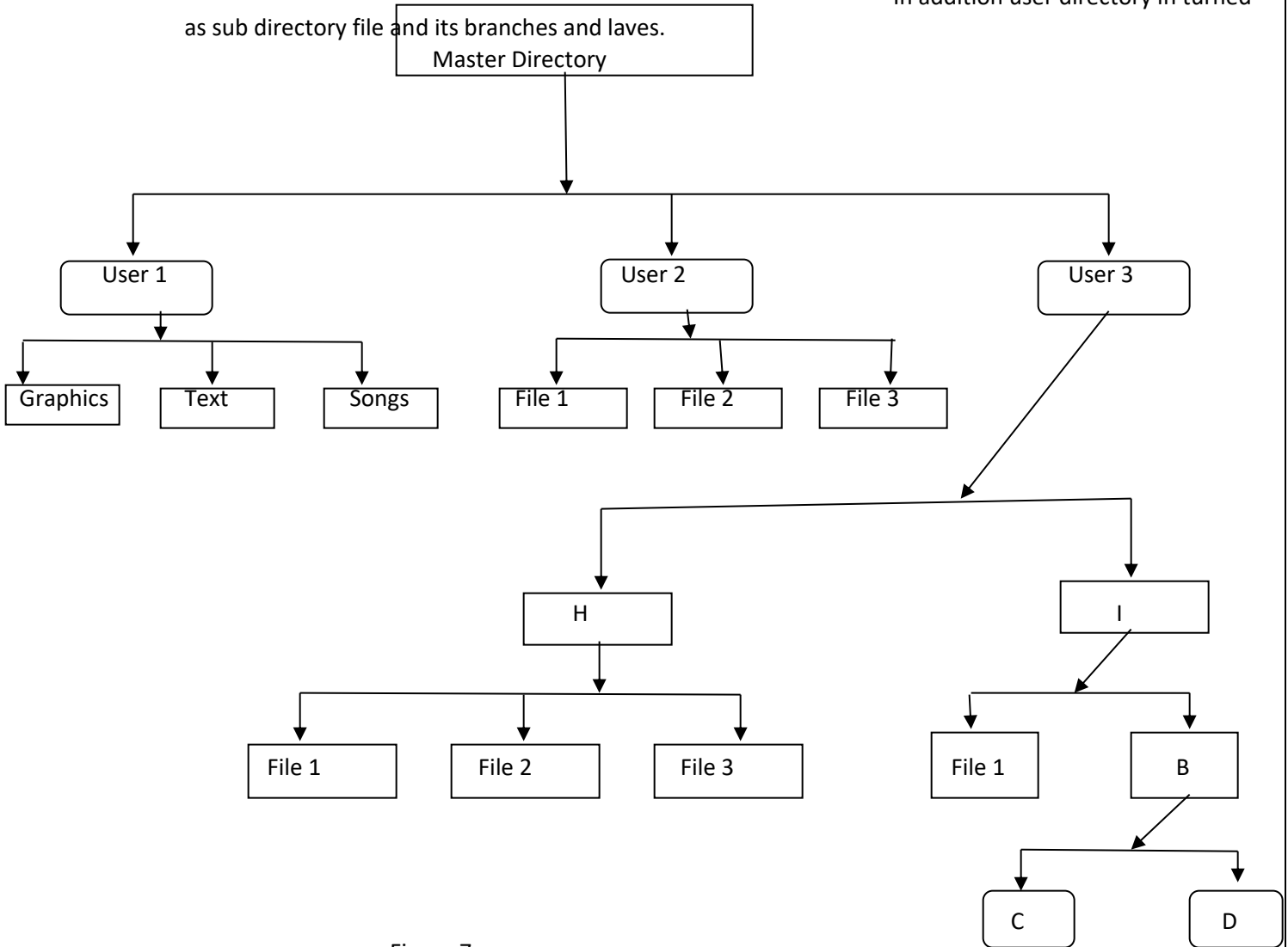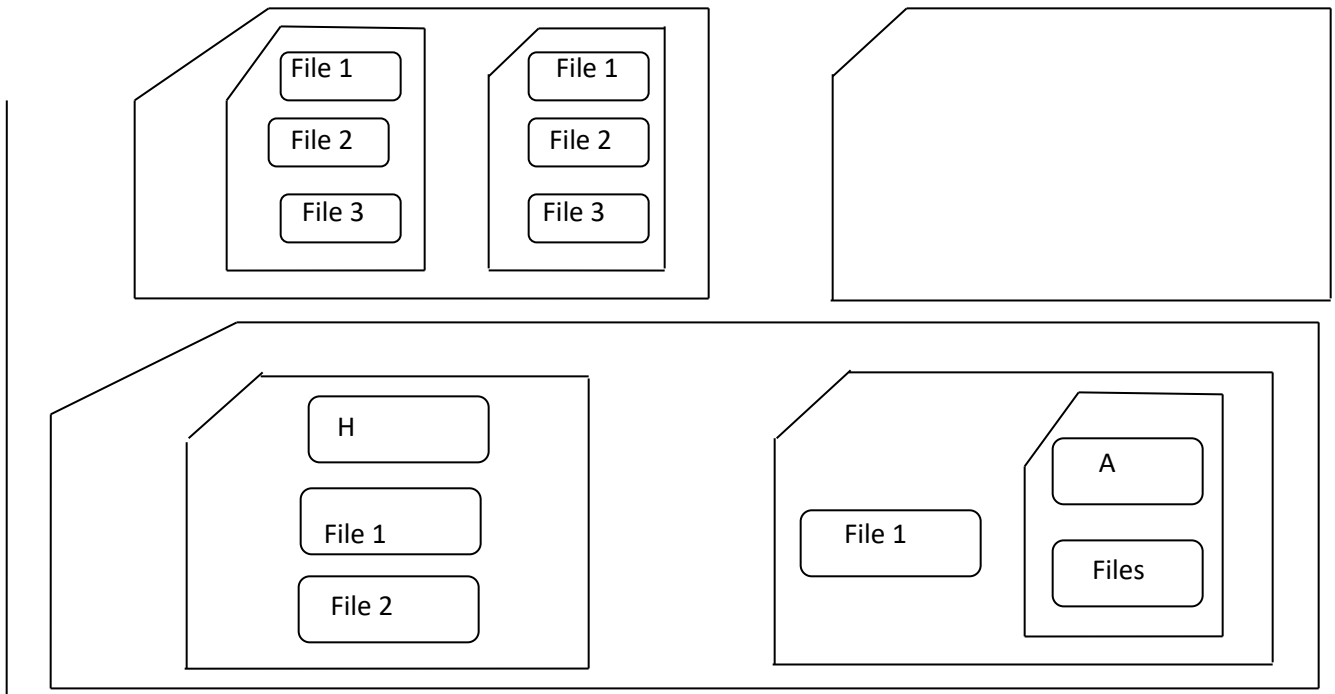
Figure 7

Figure 8

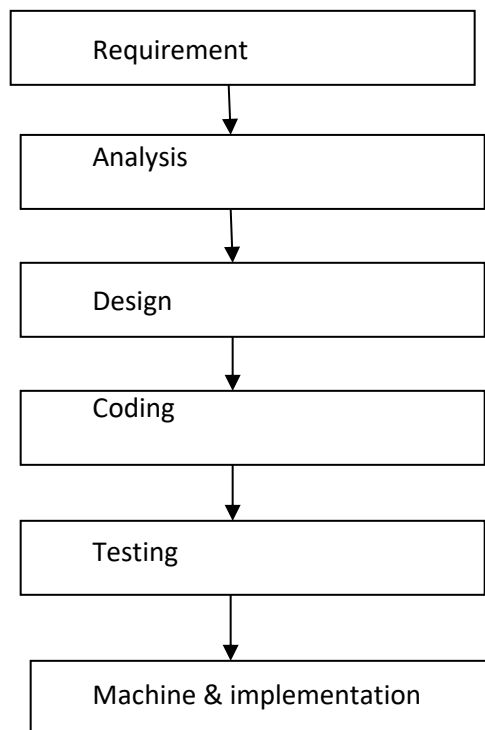Hierarchical level directory structure

Unit 3

❖ SOFTWARE ENGINEERING

* It is the field of computer science. That deals with the construction of large, complex, industrial strength software system.
* It is a systematic approach to the development and retirement of software.
* Software engineering is the application of science and mathematics by which the computer equipment machine are model useful to main via computer program procedure and associated documents or via a software development.
* Software engineering is defined as establishment and use of s/w engineering principals in order to obtain the software that economical reliable and work efficiently on real machine.
* Software engineering taxonomy(method) provide. Vast number of task such as project management system software requirement analysis, designing of data structure, program architecture, algorithm coding etc.
* The basic objective of software engineering is to develop method and procedural of software development that can scale of for large system.
* Software engineering focuses on the development process that control quality consistency productivity of software product.

❖ Software development file cycle/paradigm/predesigns

* During the period of software development software under goes several phases. Each of these phases results in the development of entire the part of the system or preparation of a test plan or a user manual for the development software.
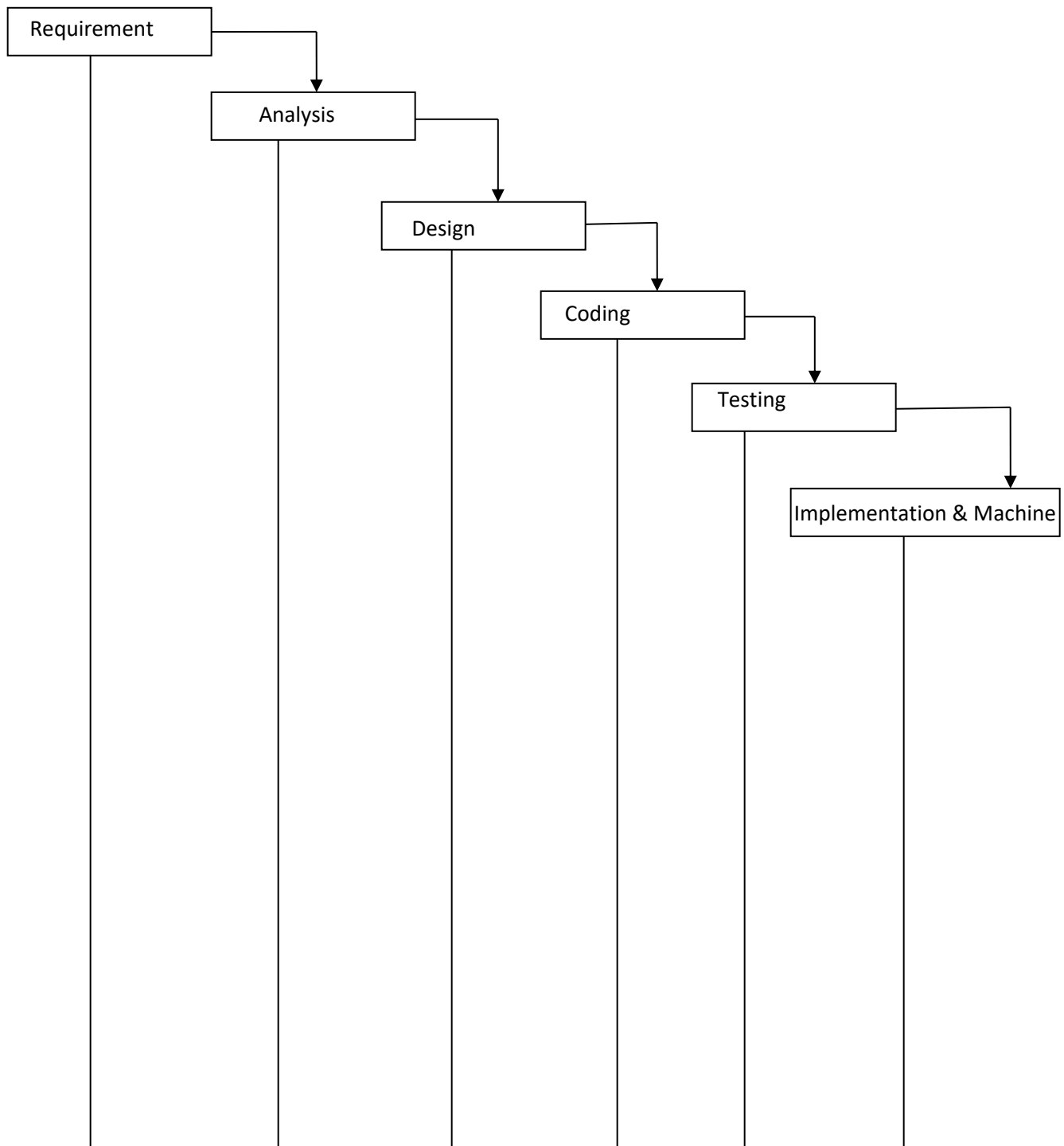 There are several models such as-
  1. Water fall model
  2. Prototype model
  3. Spiral model

```
┌──────────────────────────┐
│       Requirement        │
└──────────────────────────┘
             │
             ▼
┌──────────────────────────┐
│        Analysis          │
└──────────────────────────┘
             │
             ▼
┌──────────────────────────┐
│         Design           │
└──────────────────────────┘
             │
             ▼
┌──────────────────────────┐
│         Coding           │
└──────────────────────────┘
             │
             ▼
┌──────────────────────────┐
│         Testing          │
└──────────────────────────┘
             │
             ▼
┌──────────────────────────┐
│ Machine & implementation │
└──────────────────────────┘
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1) Water fall model
   * It is the simplest software process model paradising.
   * The water fall model the most widely used process model.
   * It is well switch for routine type of project where the entire requirements are well understand.
   * It is also known as linear sequential model because se the phases are organized in a linear order.
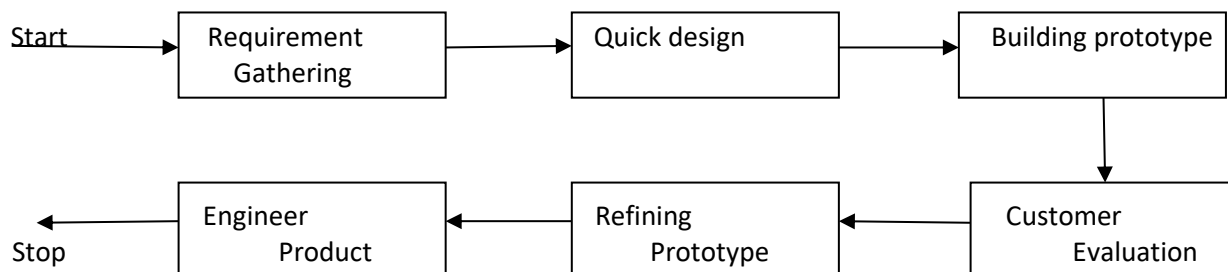
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┌──────────────┐
│ Requirement  │──────┐
└──────────────┘      ▼
              ┌──────────────┐
              │   Analysis   │──────┐
              └──────────────┘      ▼
                          ┌──────────────┐
                          │    Design    │──────┐
                          └──────────────┘      ▼
                                      ┌──────────────┐
                                      │    Coding    │──────┐
                                      └──────────────┘      ▼
                                                  ┌──────────────┐
                                                  │   Testing    │──────┐
                                                  └──────────────┘      ▼
                                                              ┌──────────────────────────┐
                                                              │ Implementation & Machine  │
                                                              └──────────────────────────┘
```

Water fall model

Figure 4

1. Requirement- The first phases of model is estimating requirement for all the system element and what are the requirement of the software.
2. Analysis- Analysis to understand the nature of the program to build the system analysis must understood the information domain for the software as well as required function performance, interfacing, requirement for system are documented and received with the customer.
3. Designing- The design process translate the requirement into the representation of the software designing is actually a multi stepped process that focuses on four distinct attributes of the program that data structure software architecture.
4. Coding- The design must be translated into machine language readable form the coding step has perform the task.
5. Testing- Once the code has been generated and compile the program testing is usually refers to as model testing of the system.
6. Maintenance- Software is undoubtedly under goes changes after it is implemented software steps to an existing program rather than a new one.

2) Prototype Model-
   ∗ Introduction- Water fall model is a sequential approach where prototype iterative (changing approach).
   ∗ A prototype is a working system like develop to test idea the new system.
   ∗ Prototype is a process of building a model of a system is to be developed; it is figure of prototype model.

Start → Requirement Gathering → Quick design → Building prototype

Stop ← Engineer Product ← Refining Prototype ← Customer Evaluation

   ∗ In this approach there are concept of client and develop, client meet developer to the software development.
   ∗ This approach is used when it is difficult to know all the requirement in the binging of the project such situation arise the following comes-
      a) The user can't provide the entire requirement.
      b) No other system like purpose system was build earlier.
      c) This model can be also used in a situation when the customer wants a quick delivery the complete system is based on iterative model, where customer always changes to build a batter model

3) Spiral Model-
   Introduction -
   ∗ This model is proposed by Boem Recently.
   ∗ This model is combine approach of both classic life cycle and prototyping.
   ∗ The activities in this model organized like a spiral that has many cycle.
   ∗ The radial dimension represents the communicative cost in occurred in an accomplishing achieving then steps along so far.
   ∗ The angular dimension represents the progress made in completing each cycle of spiral.
   ∗ The figure of spiral model.

2 Planning

1
Customer communication

3 Risk Analysis

4
Engineering

6
Customer Evaluation

5
Construction & Release
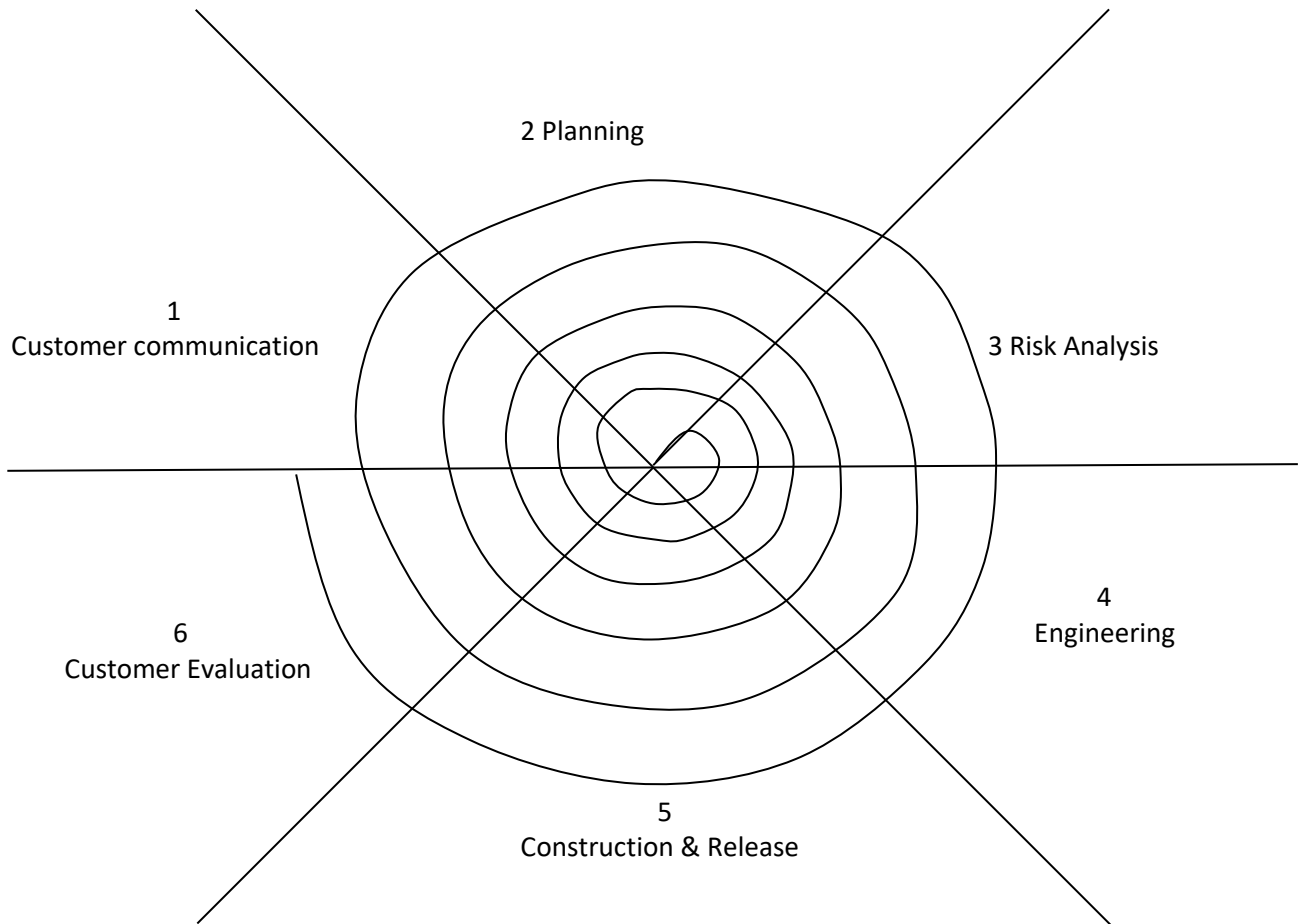
Each cycle of a spiral model contain six measure activities

1.   Customer communication- The customer communication task and developer.
2.   Planning- The determination of objectives alterative constant.
3.   Risk Analysis- Identification of both technical and management risk.
4.   Engineering- Development of the next level of product.
5.   Construction & Release- To construct test, install, and provided to user supports.
6.   Customer Evaluation- Assessment of the result of reengineering &Customer feedback).

❖ SRS (Software Requirement and Specification)
    ∗   It is set of document that contains the consign (step by step) and clear specification of the functional, performance, design and interface requirement of the perpase system.
    ∗   SRS established the basis for agreement between the client & developer through SRS client clearly specifies the capabilities to be provided by the software developer understand what capabilities to be built to the software.
    ∗   Developer can use SRS to convenience the client that software provides all the specified capabilities.
    ∗   A high quality SRS means to high quality software.
    ∗   A good quality SRS reduces the project cost.

❖ Components of SRS
1. Functional Requirement- It should specify the given input operation condition to be performed and corresponding output of operation.
2. Performance Requirement- There two type of performance requirement.
     1) Static   2) Dynamic
1) Static Requirement- Static requirement include number of computers numbers of users number of files and sizes to be supported.
2) Dynamic Requirement- It include behavior of the system the response time, expected time and term round time.
3. Design Requirement/ constants- It includes specification of operating in environment (firm) security and resource limit.
4. External Interface Requirement- All possible interaction of the software and hardware with the user clearly specified.

❖ Characteristics of SRS
The based objectives of SRS to specify the important requirement to the purpose system. That are gather, during the system analysis some desirable characteristics of SRS are-
1) Correctness
2) Completeness
3) Un-ambiguous
4) Verifiable
5) Consistent
6) Modifiable
7) Traceable

1. Correctness- Every requirement in the SRS must be true requirement of the system.
2. Completeness- SRS should contain all the short of input and it provided the features. The handling all function of the system.
3. Un-ambiguous- Every requirement specified in SRS document should have only one interpretation.
4. Verifiable- SRS in verifiable if and only if there exist some cost effective process that can check weather the final product meet the requirement.
5. Consistent- SRS should show use consistent terminology so that there is known requirement conflict with other.
6. Modifiable- The structure and style should be such that any necessary change can be made easily.
                                                                            While maintaining its completeness and consistency.
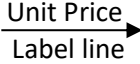7. Traceable- The origin of each requirement in a SRS most be cleared.
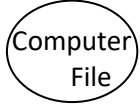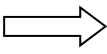
❖ System Analysis
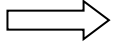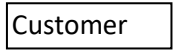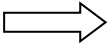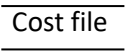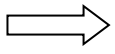➢ An analysis is a detailed study of the various operation performed by a system and their relationship with in the outside of the system.
➢ Analysis is a study of processes of the system.
➢ A key question what should be done to show the problem.
➢ It is the planning of software that is to be developed.
➢ During analysis data are collected on the available, files, decision making, decision point, and transaction handed by the presents systems.
➢ System analysis is based on structure analysis there are several tools and techniques use in the system analysis including the following.
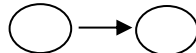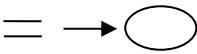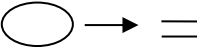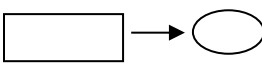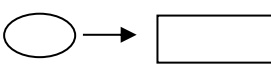   a. DFD   b. ERD   c. DD

a) DFD(Data flow diagram)-
  ∗ It is an important tool used by an analysist.
  ∗ DFD is first time develop by "Lary Constiane".
  ∗ It is a way of expressing system requirement in graphical thought.
  ∗ It is based on structure analysis of the system.
  ∗ It is also known as Bubble chart.
  ∗ A DFD consist of series of bubble joint by line.
  ∗ Bubble represent the data transformation of process and line represent the data flow in the system.

Symbol used in Data Flow Diagram (DFD)-

∗ (Computer File) ⟹ To represent the Process.

∗ Unit Price / Label line ⟹ To represent the data flow.

∗ [Customer] ⟹ To represent the name of rectangular entity or external interface.

∗ Cost file ⟹ To represent the data store or File parallel line.

Data flow can take Place

1) Between Process   ◯→◯

2) File to process   = →◯

3) Process to file   ◯→ =

4) External Entity to process   ▭→◯

5) Process to External Entity   ◯→▭

❖ Process
  ∗ Process so that what system do.
  ∗ Each process as one or more inputs and produce one or more output.
  ∗ Each process has a unique name or number.
❖ File
  ∗ A file and data store is a repository of data they contain data i.e; written in the system. Process can enter data into the a data store or retrieve data from the data store.

File information flow system
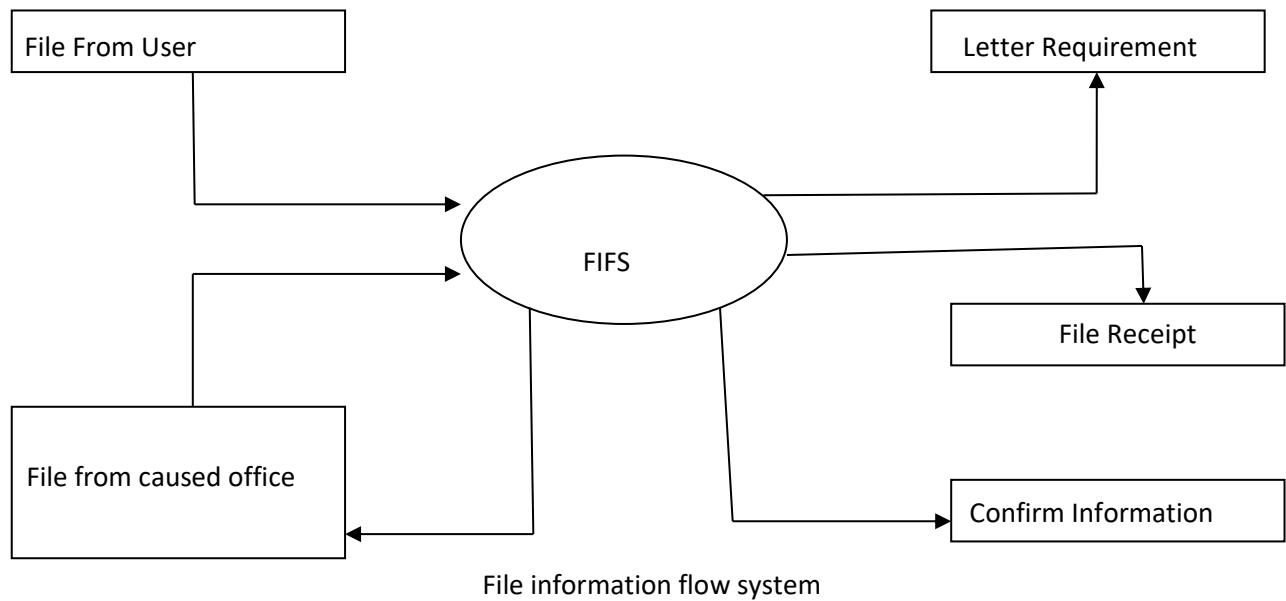
There are two type of DFD.
1. Context Diagram
2. Top Level Diagram

1. Context Diagram-
   - On entire system is deprecated/represented by one DFD, which gives a system as over view, it is called context diagram.
   - Context diagram tries/treats entire system as a single process will all its inputs, outputs linked and source are identified.
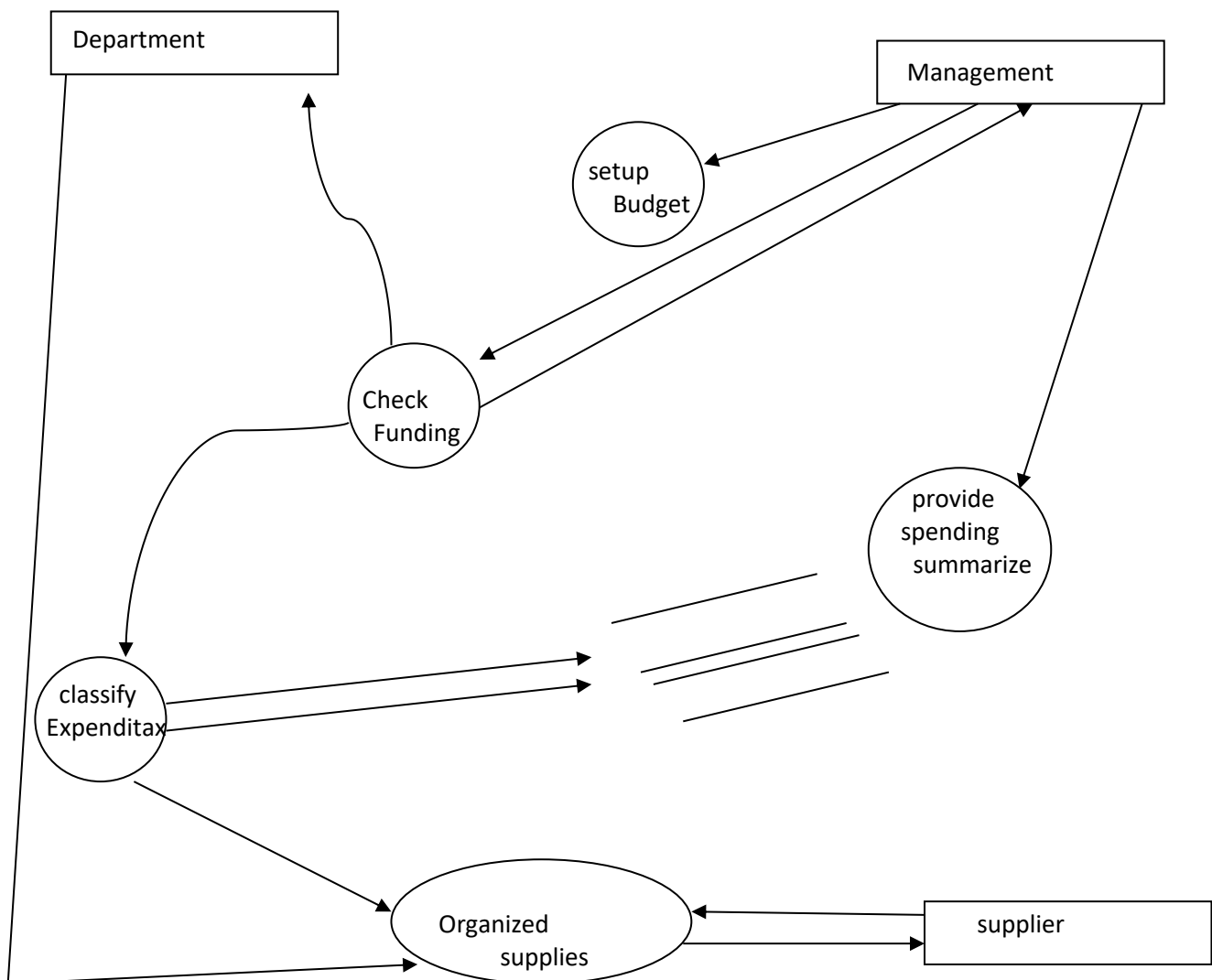   Example- The context diagram for budget main tracing system diagram.
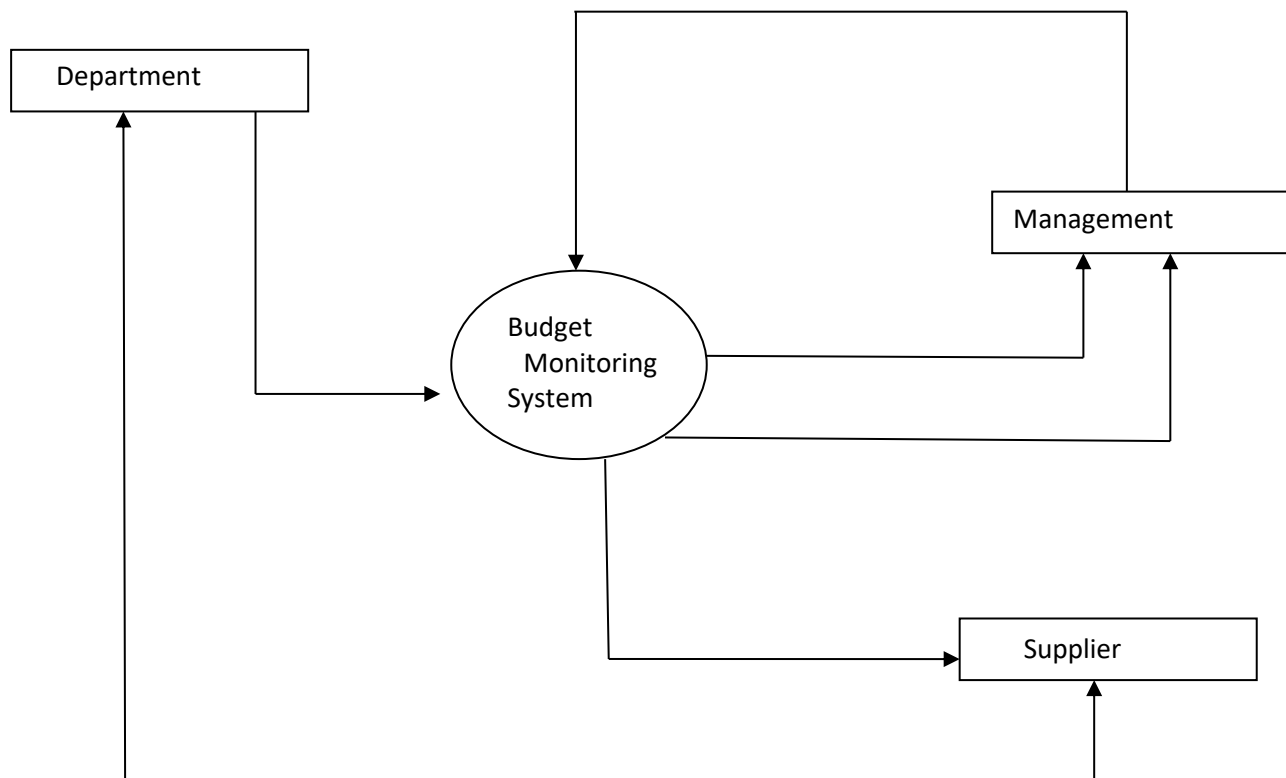
> The context Diagram for budget monitoring system.
> This interact with three external entity department management & supplier.
> The main data flows for department data are "spending request in response department get reject request or for opprovale. For with respond management also sent "budget allocation. Data flows to the system and get spending summaries" and returned the delivery note.

❖ Top Level DFD
  ∗ The top level DFD if the context diagram does not describe the system in details for more details, it is necessary to identified the measure system process and draw DFD showing this processes and Data Flow between then the DFD that source measure process is called top level DFD monitoring system.

Department

Management

setup Budget

Check Funding

provide spending summarize

classify Expenditax

Organized supplies

supplier

Budget Monitory DFD (Top Level)

❖ Data Dictionary
  ➢ In DFD data item that flows between the process are identify by unique name.
  ➢ Data Dictionary is a repository of various data flow define in a DFD.
  ➢ It contains the details of the structure of the data item (entity) and File used in DFDs.
  ➢ Enteries in a data dictionary include the name of the data item and attributes such as DFD where it is used its purpose/drivel from, its sub items and any nodes that may be appropriate each name data item. On each DFD should appear in DD such as Data Flow , files process, entity such data dictionary define department.

  • Symbols used in Data Dictionary
    1. + ⟶ AND
    2. = ⟶ Equivalent to
    3. [ ] ⟶ Either OR
    4. ( ) ⟶ Optional

Example of Data Dictionary of Department

                Department =   Department – Name +
                                Department – Address +
                                Department – Phone +
                                (Department-Contact No) + Department – email

 To generate E-R Model-
 1. Identify the Entity
 2. Find Relationship
 3. Identify the key attribute for every entity.
 4. Identify other relevant attributes.
 5. Complete E-R Diagram.
 6. Preview your result with your business user.
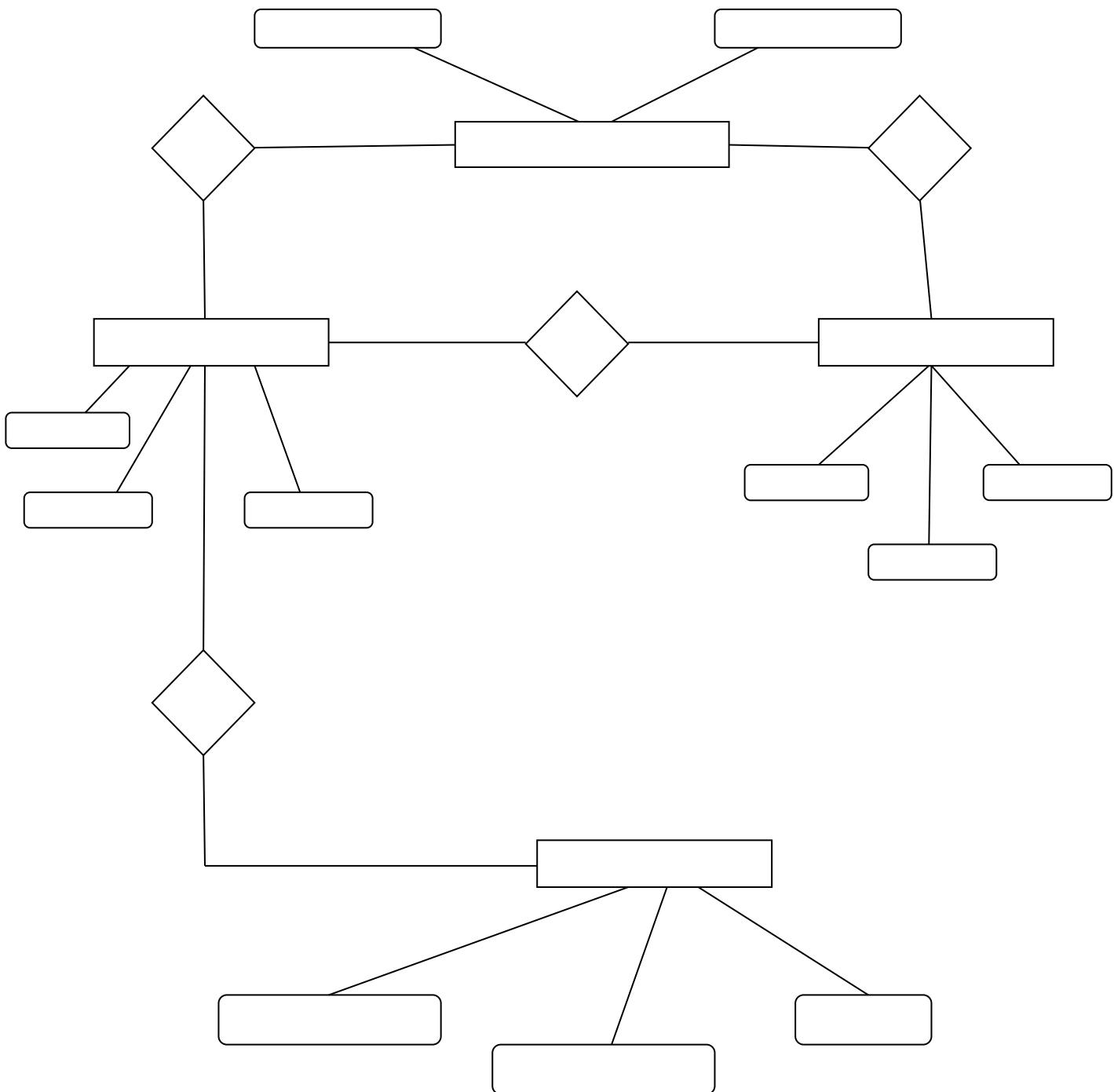
- E-R Diagram- We see that spending request from department goes to "check Funding process". This process check whether & "spending request" for approval is required or not. if a spcial approval required is needed, it places the request for approval the classify a expenditure process received the approved request and data they are entered into data store department A/C & type A/C/
- Finally, top required order with the supplier and get the delivery.

Entity Relationship Diagram-
∗ Entity Relationship Diagram was first defined in 1876 by P.P Chain since the Charles Bachman and Jamep Martine have added some small refinement to basic E-R diagram due to its simplicity and case of use this techniques attracted considerable attention during 1990 in both industry and research community.
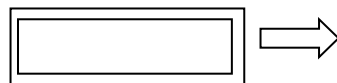   1. It is a logical too.

22

2. It is use to DB design to use the DB,
3. We can show all entities & relationship among entity. We can use the E-R Diagram for ER modeling.

1) Rectangular Box
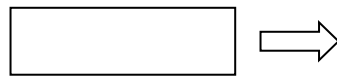
⬜ ⟹ Which represent Entity set.

2) Double Rectangular Box

⬜ ⟹ Which represent weak Entity set
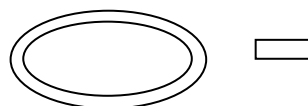
3) Oval/Ellipsis

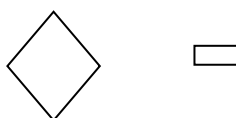⬭ ⟹ Which represent Attributes

4) Desired Attribute

⬭ ⟹ Which represent Derived Attributes

5) Double Ellipsis

◎ ⟹ Which represent multi values Attributes

6) Diamond Shape

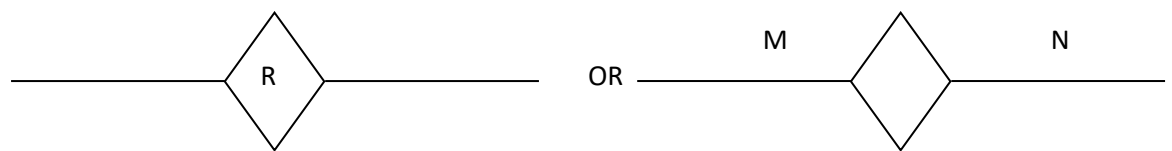◇ ⟹ Which represent Relationship

Relation Diagram so how to entities share information in the data base.

A. ——◇R◇—— OR ——M ◇ N——

Which represent many to relationship
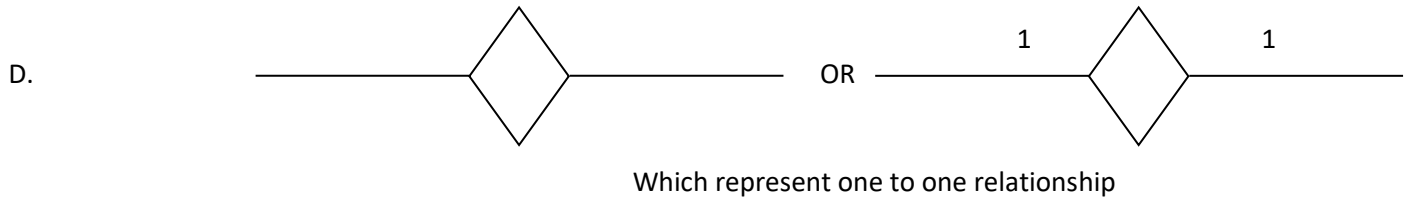
B. ——◇R◇—— OR ——M ◇ 1——
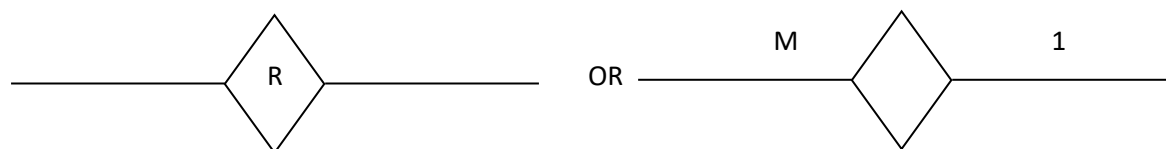
Which represent many to one relationship

C. ——◇R◇—— OR——1 ◇ M——
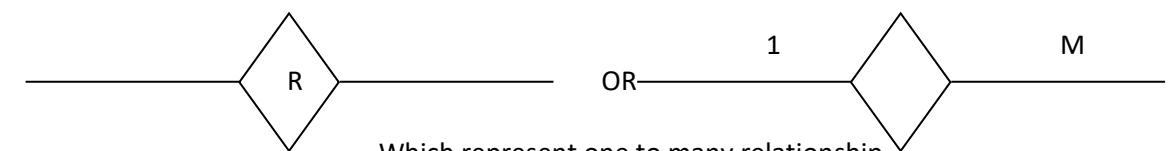
Which represent one to many relationship

By:- Abhay Kumar Mishra, Academic Head Department of Computer Application , Maharaja College,Ara
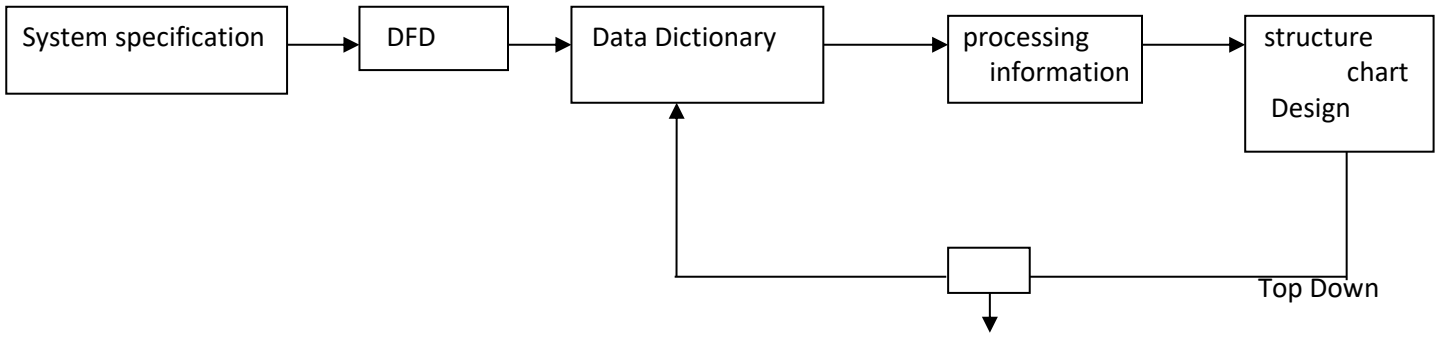
D.   OR

Which represent one to one relationship
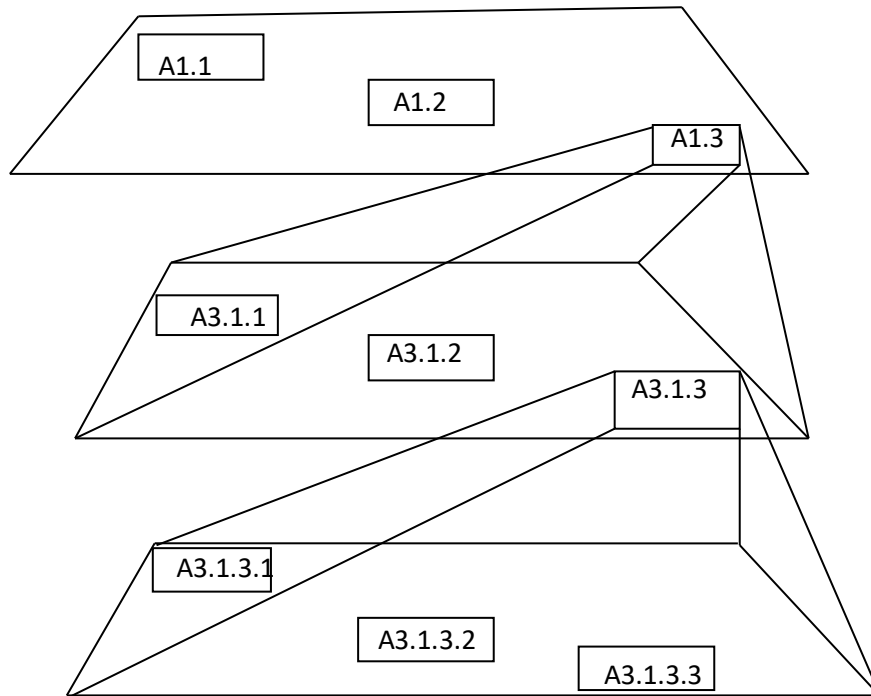
🔸 Step in E-R Modeling
- Module
  - ➤ A relationship or scale down structure of an object usually the following six steps are followed.
- Design Concept
  - ➤ System design focuses on what components are required.
  - ➤ It defines the general structure of the software. The major module the function of module the interface between module major data structure and output format of the system.
- Design Strategies
  - ➤ A system consist of component we have component of their own in other word a system is hierarchical of components with the highest level of the component to the total system.
  - ➤ To such design a hierarchy there is two different approaches possible.
  - 1) Top Down Strategies
  - 2) Bottom up strategies

    1) Top Down Strategies-
       - ➤ Top Down strategies approaches start form the highest level of the component of the hierarchy and proceeds through to low level.
       - ➤ A Top Down approaches strategies start of identify the major component of system, the clown passing their lower level component or illustrating unit.
       - ➤ A Top Down strategies is a design method often results in the form of stepwise requirements.
    2) Bottom up strategies-
       - ➤ Bottom up approaches start with lower level components of the hierarchical and proceeds through to progressively high level to the top down component.
       - ➤ A Bottom up design approaches start with the designing the most basis component and proceed to the higher level component that use there their lower level component/structure.
- Design Methodology/Tools & techniques.
  - ➤ There has been growing move to transfer the "Art" of system analysis and design into an "engineering" type discipline the feeling that there have more clearly define logical method for developing a system that needs/meet users requirement has led to new technique & methodology that fundamentally attempt to design the system.
- Structure Design
  - ➤ It is based on DFD tool or methodology(technique).
  - ➤ On the basis of DFD(graphical represent) system design identify and describes the functional aspects of the system.
  - ➤ The approach begins with a system specification that identified input & output & describe the functional expect of the system.
  - ➤ There are use as a basis for graphical reforestation DFD(of data Flow & processes).
  - ➤ From DFD the Next step is the definition of modules and their relationship to one an other in a using a data dictionary or other tools.

```
┌──────────────────────┐   ┌─────────┐   ┌──────────────────┐   ┌──────────────┐   ┌──────────────┐
│ System specification │──▶│   DFD   │──▶│  Data Dictionary │──▶│  processing  │──▶│  structure   │
└──────────────────────┘   └─────────┘   └──────────────────┘   │  information │   │       chart  │
                                                                 └──────────────┘   │  Design      │
                                                                                    └──────────────┘
```

Top Down

It is relationship of ……………………   DFD/Bottom up

* Structure design method partisan of a program small independent module.
* They are arrange in hierarchy that approximates a moral of business area and is organized in a top manner with the details shown at the bottom.
* The structure design is an attempt to minimize complexity & make a problem manageable by subdividing it smaller system.
* Subdividing into smaller part which called modularization or decomposition.

```
          A1.1
              A1.2
                  A1.3

     A3.1.1
         A3.1.2
             A3.1.3

  A3.1.3.1
      A3.1.3.2
          A3.1.3.3
```

- Technique and Methodology-
  ➢ The documentation tools for structure design hierarchy or structure chart. It is a graphic tools for representing of hierarchy. It has three elements.
  1) Module- It is represented by a rectangle with a name & a contiguous set of statement module- ☐ A

  2) Connection- It is represented by a vector linking two module and has usually means one module has called another module connection.

```
          ┌───┐
          │ A │
          └─┬─┘
        ┌───┴───┐
     ┌──┴─┐   ┌─┴──┐
     │ B  │   │ C  │
     └────┘   └────┘
```
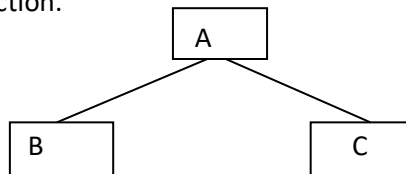
In this figure module A calls module B & C.

3) Couple- it is represented by arrow with a circular tarl and represents data item moved from are module to another couple

Eg,
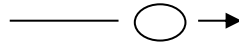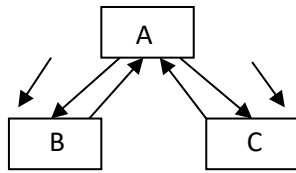
In this figure 0 & P , m & n are couple module A call B passing downward like wise module. A calls (passing downward) and receives n back.

Example of a structure chart shown in fig(next page).
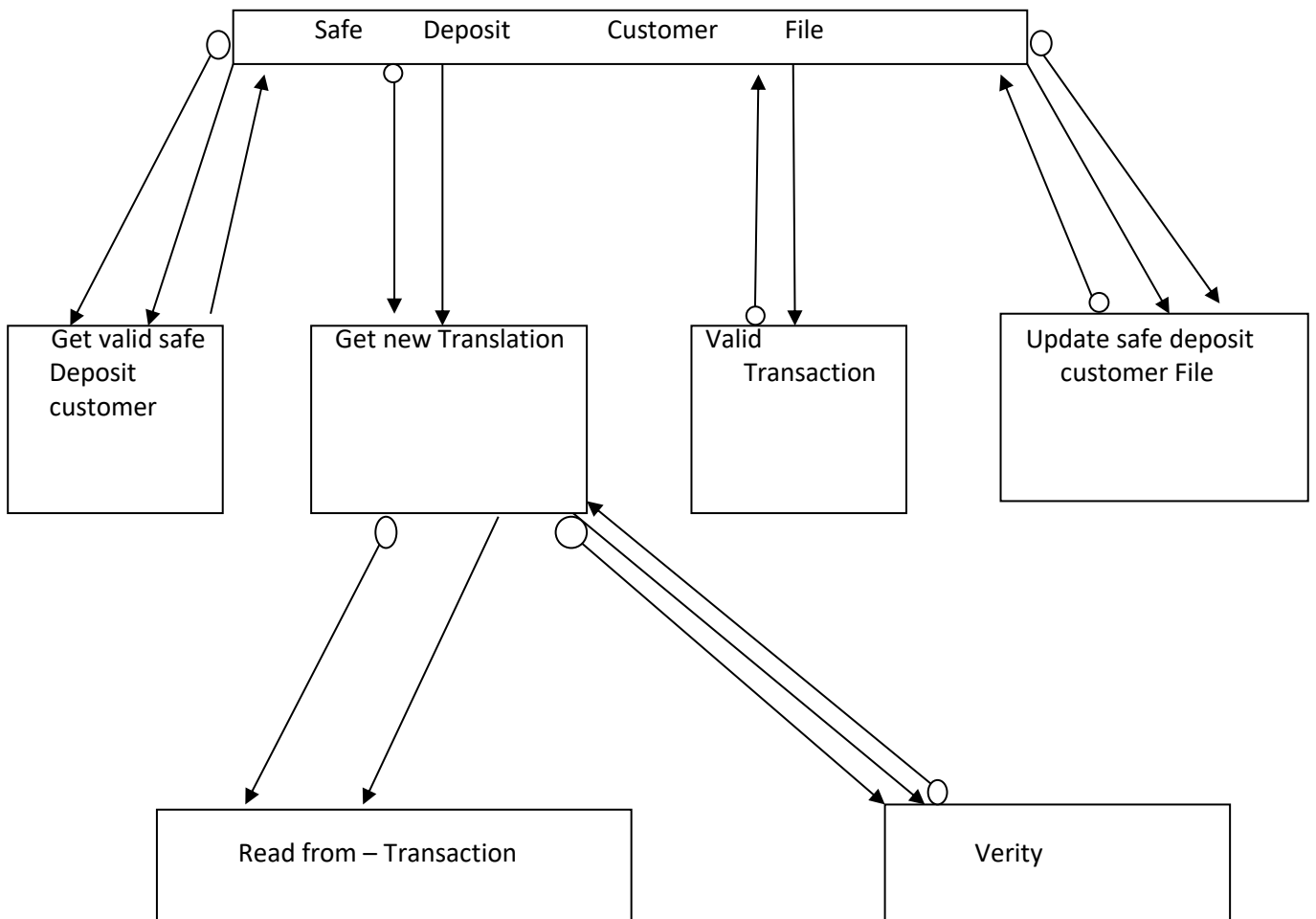
* The structure design method partition a program into a small independent module.
* The structure are arranged in a hierarchic of the software(from top to bottom or bottom to top)

UNIT -4

Operating system

- **Definition**
  - ∗ It is a software
  - ∗ An operating system is system software.
  - ∗ An operating system is manager of the computer system.
  - ∗ An operating system is a setup program that managers the intaire the resources of the computer system such as I/O devices, cpu, system software, application software, memory, file, disk etc.
  - ∗ The most important program that runs own the computer.
  - ∗ It is used to run other program.
  - ∗ An operating system is a software that enable the computer hardware to communicate with each other.
  - ∗ An operating system provides platform to the user to communicate with the computer system.
- **Example of operating system-**
  - ∗ Microsoft operating system-
    Win'3.0, Win'3.1, Win'95, Win'NT, Win'97, Win98(1st edition), Win'98(2nd edition), Win'ME, Win'2000 server, Win'2007, Win'XP(home edition) ie personal vies, Win'XP(perfossional), Win'Vista, Win'7, Win'8.
  - ∗ Non-Microsoft operating system-
    UNIX, DOS, LINUX, OS/2, Palm, Mac, Android etc.

- **Kinds of operating system according to future**
  1. GUI   2. CUI

1. **GUI(Graphical User Interface)-** It is user friendly that eliminates the need of typing command and allow us to enter command by pointing then on the computer screen such as LINUX, XP, VIST,WINDOW 98 etc.

2. **CUI (Command User Interface/ Character User Interface)-** CUI not friendly and allow us to typing each and every command for interacting with O/S
     Eg. Such as UNIX, DOS, etc

- **Multiuser-** A multi user operating system allows or multiple users to use the same computer at the same time and or different time.
  Eg. LINUX, Win200, Win'NT, LNIX, Win2003 etc.

- **Multiprocessing-** Operating system capable of supporting and utilizing more than one computer processor. It supports running a program or more than one CPU.
   Eg. LINUX, UNIX,Win'2000 etc.

- **Multithreading-** An operating system that allows different part of the software program to run con-currently.
  Eg. LINUX, UNIX, Win'2000 etc.

- **Multitasking**- An operating system i.e, capable of allowing multiple program to run at the same time or allow more than one program to run concurrently.
  Eg. Win'2000, Intel RMX-86, UNIX.
- **Multiprogramming**- An operating system in which more than one user executes more than one process in a single CPU.
  A multiprogramming an operating system that allow multiple user to run multiple program to in a single CPU that is called multiple programming. Multiple user + Multiple task + Single.
  Eg. LINUX, Win'2000,UNIX etc.

- FUNCTION OF OPERATING SYSTEM

- **Major Function**- Operating system act as a platform for developing application program. An as main function are-
    1. **Act as a Extended Machine**-The operating system act as an extended machine by translating your command into machine languages instruction on operating system retranslate the output back into a user under tenable languages. So operating system manages the system software translators.
    2. **Acts as Resources Manager**- An operating act as resources manages by controlling and allocating nefarious hardware and software resources to different user in an optional & efficient code. The task of resources manager in the most important function of the operating system.
    3. **Act as a constant Program Interface**- The operating system act as a constant program interface that allow. We to develop an application on a computer and executed it on the other computer. It does not any/produce any dissimilarity in the configuration of computer is different as the application remain at the same time.

- **Other Function of operating system are-**
    1. System Tools(program) user to monitor computer performance develop problems and monitor part of the system.
    2. A set up libraries of function in which program may use to perform specially tasks specially relating to interface with computer component.
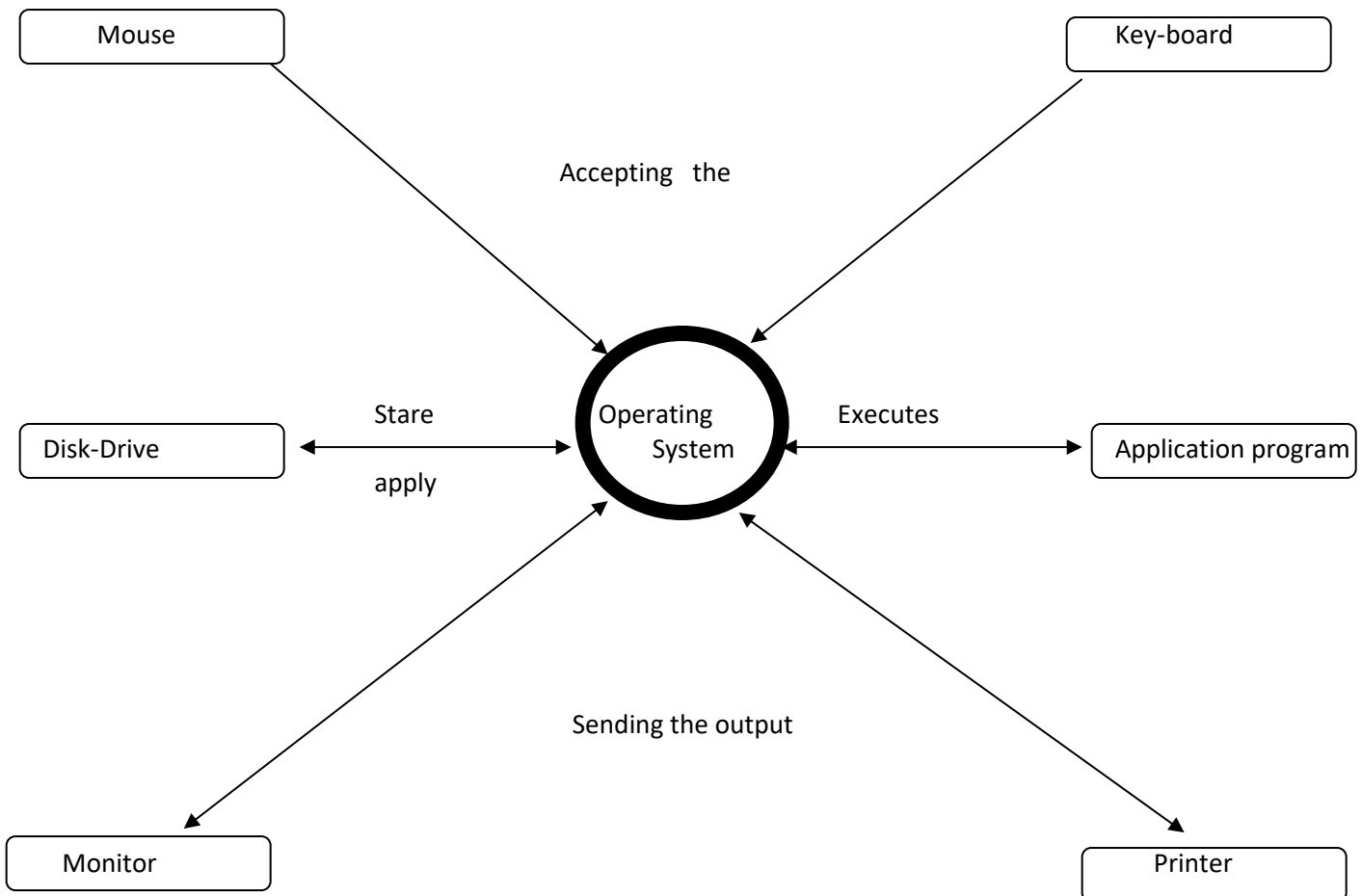
- **Basic Function of operating system(General)**

Figure 1

1. Perform input output operation.
2. Perform the allocation and reallocation of memory.
3. Provides security be ensuring controlled access to resources.
4. Monitor various job running on computer of there security.
5. Deciding the priority of job.
6. Controls the devices deriver attached to the computer.
7. Control the files places on the computer of their security.

- **General Function of operating system**
1. I/O Management
2. Processor Management
3. Device Management
4. File Management
5. Storage Management

- **Distributed operating system-**
  - ➢ A type of operating system.
  - ➢ In a distributed operating system processing user request are carry out independently in more than one location.
  - ➢ In a distributed operating system the work load is separate between two or more computer or linked together by a communication network such as telephone line or based line buses etc.
  - ➢ The processor in distributed operating system has its own resources.
  - ➢ Example- AMOEBA operating system.
  - ➢ The processor in distributed operating system do not share clock memory and peripheral devices.

- **It is based on two model-**
  1. Client server model.   2. Peer to Peer Model
- **1) Client server model-**

```
                    ┌──────────────┐
                    │    Server    │
                    └──────┬───────┘
Network                    │
────────┬─────────┬────────┴────────┬─────────────┬──────
        │         │                 │             │
   ┌────┴───┐ ┌───┴────┐      ┌──────┴──┐   ┌──────┴───┐
   │Client 1│ │Client 2│      │Client 3 │   │Client 4  │
   └────────┘ └────────┘      └─────────┘   └──────────┘
```
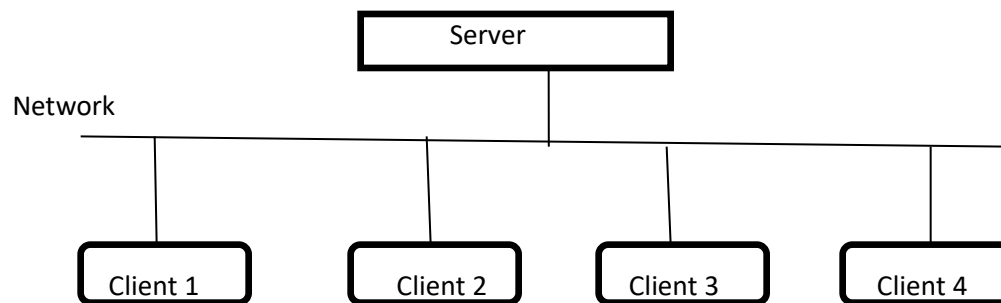
Figure 2

The client sends a resources request to the server and the server in turn provides the request resources as the response back to the client.

- **2) Peer to Peer model-**

```
Network ─────────┬──────────────┬──────────────┬────── Network line based line
                 │              │              │
           ┌─────┴───┐    ┌─────┴───┐    ┌─────┴───┐
           │Client 1 │    │Client 2 │    │Client 3 │
           └─────────┘    └─────────┘    └─────────┘
```
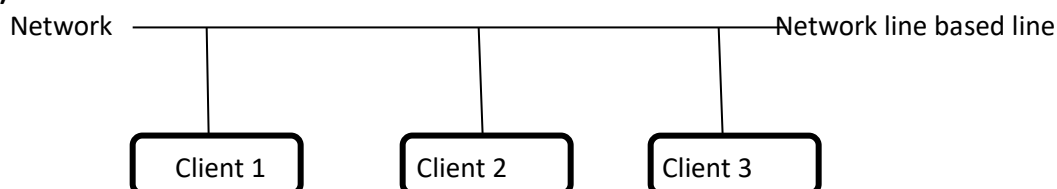
Figure 3

All computer behaves has peer (pair) as well as client, these client communicate with each other for exchange of the resources.

- ❖ **General function of operating system.**
- • **Processor/Process Management**
  CPU executes a large number of program while it may concern each the execution of our program, the CPU is also need for other system activity. These activity/activities are called processors. The operating system is responsible for the following activities.
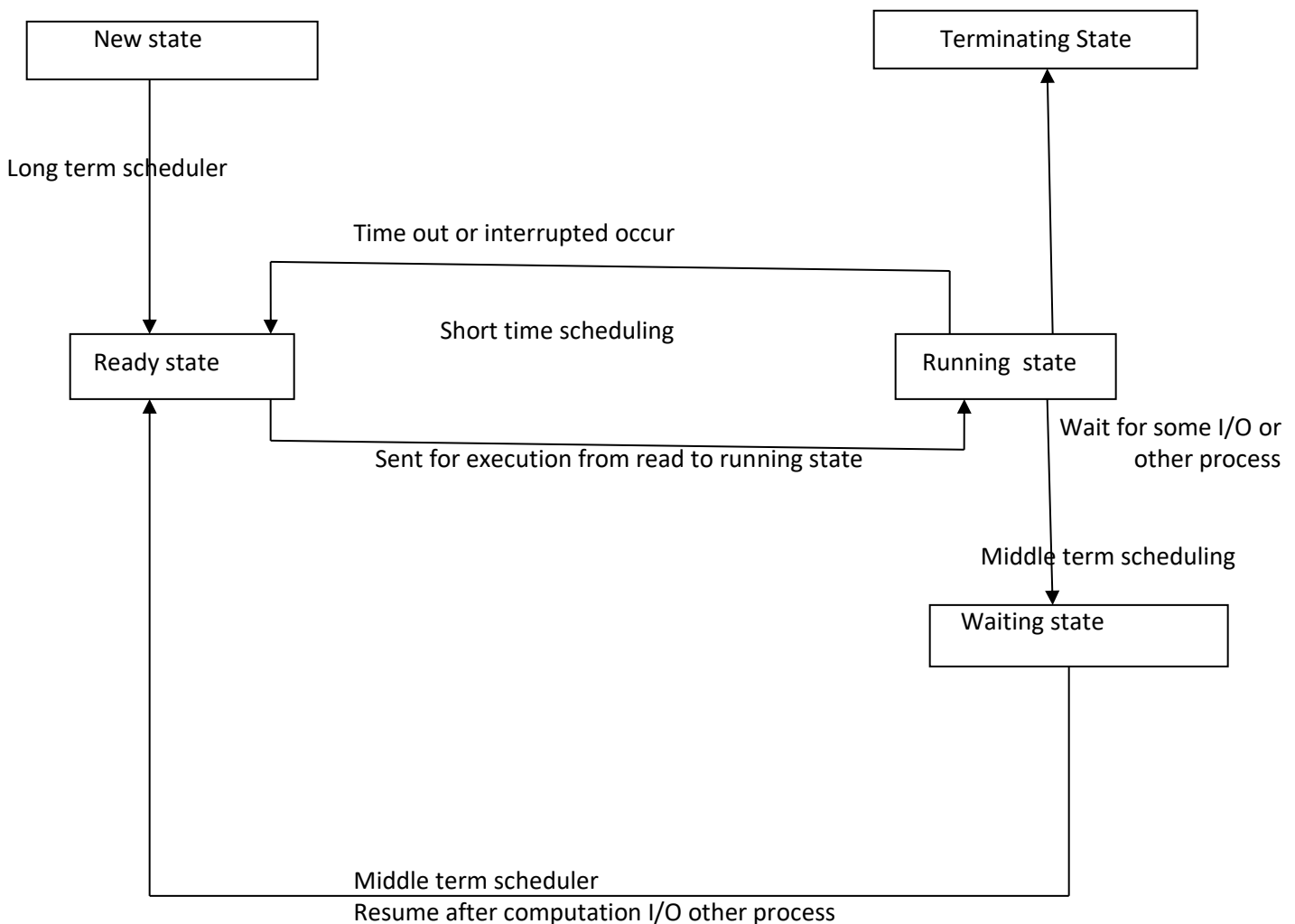 Eg- creation & deletion and both user and system process substance & resumption of processing deadlock handling etc.

Figure 4

- ➢ Process- The Notion of process is centralizes to understanding of operating system. There are quite few definition present in the literature but no "perfect" definition has yet appeared.
- ➢ The term "Process" was first by the designer of MULTICS in 1960, since then the term process use some what interchangeably with "task" or "job".
                    The process has been given may definition.
1. A program is execution(to perform to complete).
2. The process is instance of program.
3. The entity to which processor are assign.

4. A process in the unit of work in a system.
5. The dispatch able unit.
6. A process is a frame work of a setup 1 of sequential steps for performing task.
7. A process is the unit of work in a system.
8. The "animated" spirit of a procedure in a sequence.

❖ Process state-
  ➢ Process state is indicative of the activity.
  ➢ It is currently performed such as
    1. New state
              The process is being created.
    2. Ready state
              The process is waiting for a chance to be allocated to CPU kinds.
    3. Running state
              When the process in being executed.
    4. Waiting date(Block state)
                      When a process waits for termination of on I/O operation or another process.
    5. Terminated state
              The process has finished execution.

❖ Process state transition (change from on place to another)
  ➢ A process goes to various state for performing in the transition of the process from one state to another occurs depending on the follow of the execution of the process.
  ➢ It is not necessary for a process to under goes all the state.
  ➢ Various process state are-
    1. New state
              The process in being created.
    2. Ready state
              The process is waiting for a chance to be allocated the CPU time for execution.
    3. Running state
              The process is being executed.
    4. Waiting or Block state
                  When a process wait for the termination of an I/O operation or another process.
    5. Termination state
              The process has finished execution
  ➢ transition of a process form on e state to another diagram.
  ➢ A new process is admitted into a data structure called that stares all data item in FIFO manner. The process will inserted first into the read queue is sent for execution time/first.
  ➢ Each process is assigned a time slice for (Very short time) execution from ready queue his sent to the running state if the process is not completed in the time slice when a process is interrupted and timeout. The running process send (to the) back to the ready.
                          When execution of a process ends the process state is marked by terminate state (When the process waits for completion of an I/O operation or another process. It send to waiting state. The process state is marked as waiting then often task . it go back to ready state. When execution of a process end the process state it goes to terminated state).

❖ PCB(Process Control Block)

Circuit state
Process Id
Link to parent process
Link to child process
The priority of a process
A process it is running on register

➢ A process in an operating system is represented by data structure is known as a process control.
➢ It process control block a location in the main management. Where various information of process regarding memory process & I/O management is stared.
➢ Each process is a single PCB(Process Control Block).
➢ When a process is terminated the PCB is released from the memory.
➢ The information contains in the process control block about the specific process including.

1. Current state
   The current state of process ie, whether it is waiting, ready, running or what ever.
2. Process ID
   Unique identification of the process in order to track which is which information.
3. Link to parent process
   A new process child can be created from an existing process. The existing process is called child process.
4. Link to child process (If it exit)
5. The priority of a process
   A part of CPU scheduling information on of a process information.
6. A Register save Area-
   The processor it is running on the PCB, is a creation stare that allow to operating system to locate key information about the process. This a PCB is the date structure or descriptor that defines a process of the operating system.

❖ CPU/Processor scheduling-
   ➢ A multiprogramming operating system the method of procedure for switching the CPU among multiple processing is called CPU scheduling or process or scheduling.
   ➢ The CPU scheduler is a part of operating system which is responsible for CPU scheduling.
   ➢ When ever, CPU becomes idle the CPU scheduler selects a process from a ready queue and sending to the CPU for execution.
     Eg. In the process of CPU scheduling two processer P1 and P2 share cpu time. When the process P1 uses the CPU, the process P2 perform I/O operation and when the CPU is accessed by process P2 the process P1 perform operation.
   ➢ Process A is in running state and needs to perform and I/O related task process a doesn't need the CPU while performing I/O related task.

❖ Process scheduler/CPU scheduler/ scheduler
   ➢ It is a part of operating system which is responsible from entire process scheduling and transition of process.
   ➢ The scheduler change the state process a from running to waiting state and enables process B to use the CPU.

❖ Scheduling criteria
   ➢ Some performance criteria that are frequently use by scheduler to maximize system performance are –

1. CPU utilization- The key idea is that if the CPU is busy all the time. The utilization factor of all the components of the system will be also high.
2. Through put- It refers to the amount of work process completed in a unit of time. One way to measure through put is by means of the number of process that are completed in a unit time. The higher number of processor the more work opration being done by the system.
3. Turn Around Time- The amount of time to accomplish the execution of a process is known as turn around time of the process. It is always minimize.
   Turn Around time= Execution Time (processing time) + Waiting Time(Response time)
4. Waiting Time- The amount of a process waits in thread queue to get a chance for execution is known as waiting time.
5. Response Time/Processing Time/Execution Time- The amount of time a process switch with the CPU.
   Response Time= Turn Around time – Waiting time

❖ Level or types of scheduler
  The different types of scheduler are-
1. Long term scheduler- Long term scheduler works with a new process should be once initiated in the system. The scheduler task newly submitted jobs and converts them into processes which are further put in the ready queue/state for processing.
2. Middle Term scheduler – middle term scheduler divided whether to introduce the process to the waiting state from the running state or to put up back a process from waiting state to ready state.
3. Short term scheduler- The scheduler decision are mode on which process in the ready state should dispatched to the CPU for execution.
                                    This scheduler is the most important and complex among all the scheduling level.
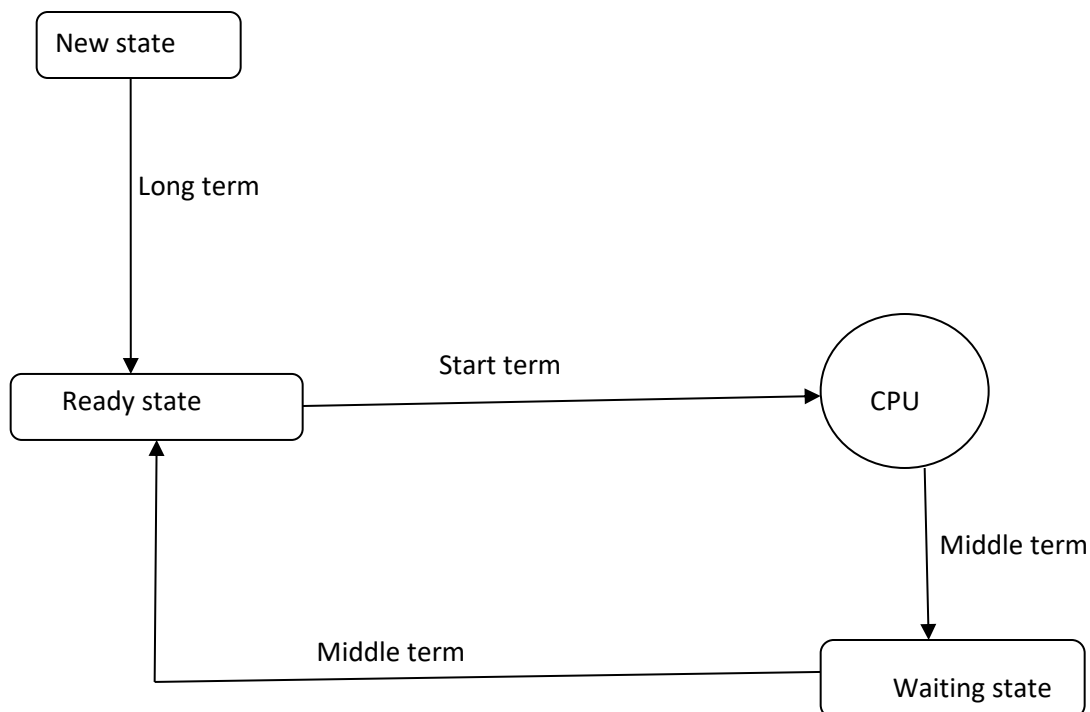

Figure 5

- ❖ Scheduling Algorithm
  - ➢ The CPU scheduling deals with the problem of dicision deciding which of the process in the ready queue to be allocated a CPU. There are several scheduling algorithm which will be in this topic.
  - ➢ A major division among scheduling algorithm is that whether they support
    1. Preemptive   2. Non Preemptive
1. Preemptive algorithm-
   - ➢ A scheduling discipline is preemptive, if the CPU can be taken away.
   - ➢ The control of the CPU it is the hand of operating system.
     Example- win'98 up to is preemptive.
   - ➢ Preemptive scheduling more useful in high priority process which requires immediate response.
     Several type of CPU scheduling police are use such as
     1. FCFS- First Comes First Serve.
     2. SJF-Shortest job first.
     3. PS- Priority Scheduling
     4. SRTN
     5. RRS-Round Robin Scheduling
1. First comes first serve(FCFS)-
   - ➢ FCFS algorithm is the simplest and most straight forward of all the CPU scheduling algorithm.
   - ➢ A process is allocated CPU time according to the arrival time of a process. The process that comes first is allocated the CPU first.
   - ➢ An FCFS algorithm is non-preemptive which usually results in poor performance because a process requiring waits for completion of the another process for the long time/more wait for switching the execution.
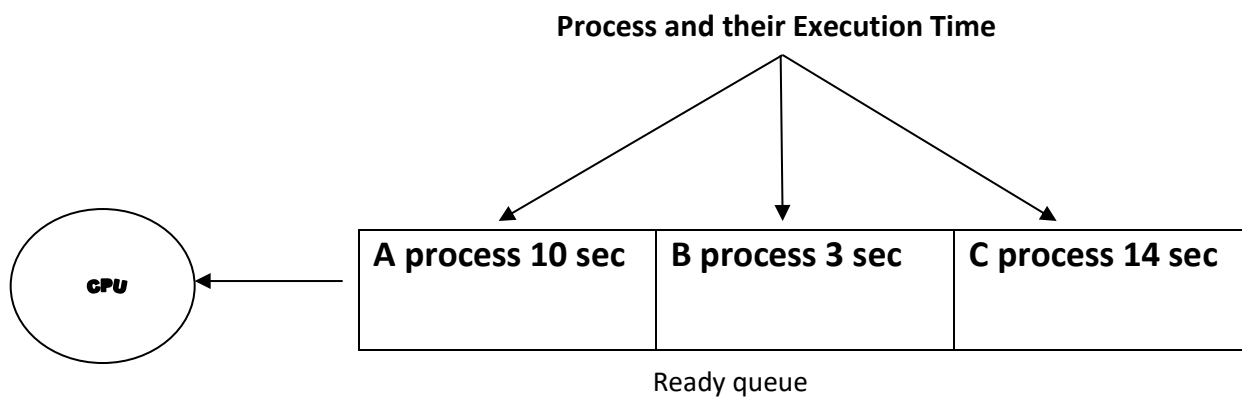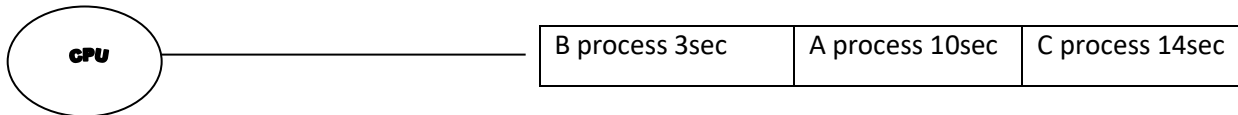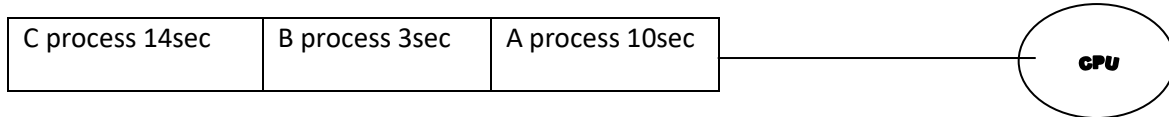   - ➢ FCFS algorithm is executed-

Process and their Execution Time

Ready queue

Figure 6

   - ➢ In FCFS scheduling various process are schedule for execution regardless of their expected execution time.
   - ➢ The process 'A' comes first come the ready queue followed by process 'B' and 'C'.
   - ➢ The process are executed in sequence A,B,C.
     For eg:- A needs 10 sec to compete B needs 3sec, c needs 14sec, to complete the turn around time 'A'.
     Turn Around Time of 'A'= 10+0= 10sec.
     Turn Around Time of 'B'= 3+10= 13sec.
     Turn Around Time of 'C'= 14+B = 27sec

2. Shortest job first (SJF)/Next-
   - ➢ It is faster than FCFS.
   - ➢ In SJF the process with the list estimated execution time is selected from the ready queue for execution.
   - ➢ In SJF scheduling various process are schedule for execution according to their estimated execution time.
   - ➢ The algorithm is Non-preemptive in nature.
     For example-

C process 14sec	B process 3sec	A process 10sec	CPU

CPU	B process 3sec	A process 10sec	C process 14sec

- ➢ In SJF scheduling various process are scheduling for execution according to their estimated execution time.
                              The process A,B,C required 10,13,14sec
  respectively the process B with minimum estimated execution time as schedule for execution first followed
 by A&C.

                    Turn Around Time of B= 3+0= 3sec
                    Turn Around Time of A= 10+3= 13sec
                    Turn Around Time of C=13+14=27sec

3. Priority Scheduling (P.S)
   - ➢ In priority scheduling a priority is associated with all process.
   - ➢ Process are executed in a sequence according to their priority(the CPU time is allocated to the process with the highest priority).
   - ➢ The CPU time is allocated to the process with the highest priority.
   - ➢ In the priority of two or more processes are equal than the process that has been process inserted first into the ready queue is selected for execution. In other word FCFS scheduling in performed.

Processing Time for Execution

CPU	Process C 7priority	Process A 4priority	Process B 2priority
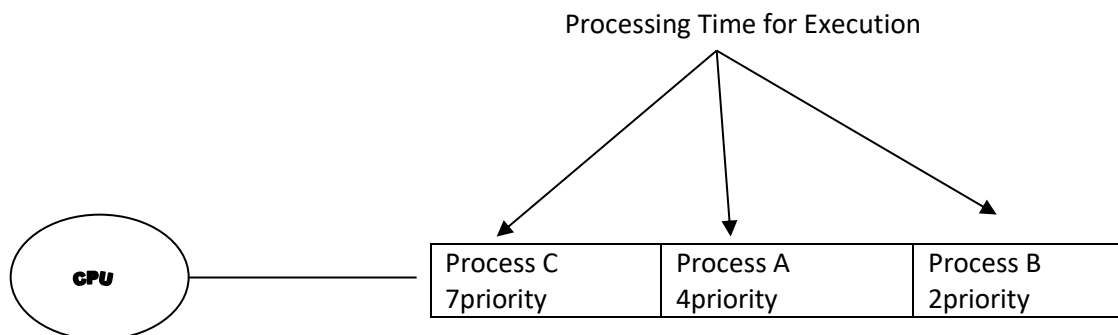
In priority scheduling algorithm, various process are schedule for execution according to their priority, such
as AA,B,C. The process C with highest priority is selected for execution first followed by process A and B.

                    Turn Around Time C= 14sec +0sec = 14sec

Turn Around Time A= 10sec +14sec = 24sec

Turn Around Time B=3sec+27sec = 30sec

4. SRTN Scheduling-
   ➢ It is a scheduling discipline in which the next scheduling entity. A job of process on the basis of shortest renaming execution time.
   ➢ SRTN scheduling preemptive feature of SJF scheduling without preemptive.
   ➢ The SRTN control in the hand of process.
   ➢ In the preemption version, whenever an event accrues that makes a new. Process ready accure and control directly to the operating system.

Processing Time for execution

| B process 3sec | A process 10sec | C process 14sec |

CPU
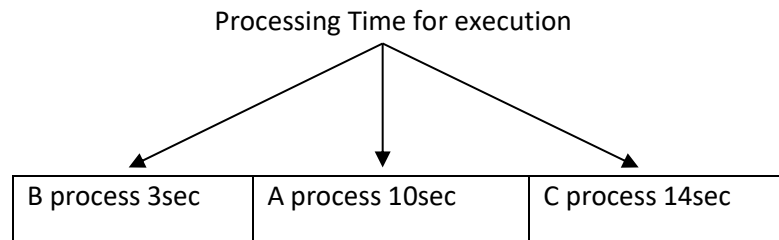
The process A,B,C required 10,3,14sec respectively the process B with minimum estimated execution time   as scheduler for execution first followed by A&C.

Turn Around Time B= 0+3 = 3sec

Turn Around Time A =3+10=13sec

Turn Around Time C=13+14=27sec

5. Round Robin Scheduling (R.R. Scheduling)
   ➢ The Round Robin Scheduling algorithm implements the time sharing/solving concept.
   ➢ Each process is allowed to use CPU for a predefine unit of time known as time slice or internal time with the help of internal timer hardware.
   ➢ In the running process is completed with in the time slice, the next process in the ready queue is allocated to the CPU.
   ➢ In case the running process remain incomplete. It is stared back to the and next process in the ready queue selected for execution.
   ➢ In R.R Scheduling algorithm the ready queue is FCFS scheduling.
                              When the time out accrues the pertly done process are inserted in the end of the ready queue.
   ➢ It is similar to FCFS but preemptive in nature. A timer is used to mark the end of the time slice called interval time.

Processing Time for Execution

| A process 10sec | Process B 3sec | Process C 14sec |

CPU
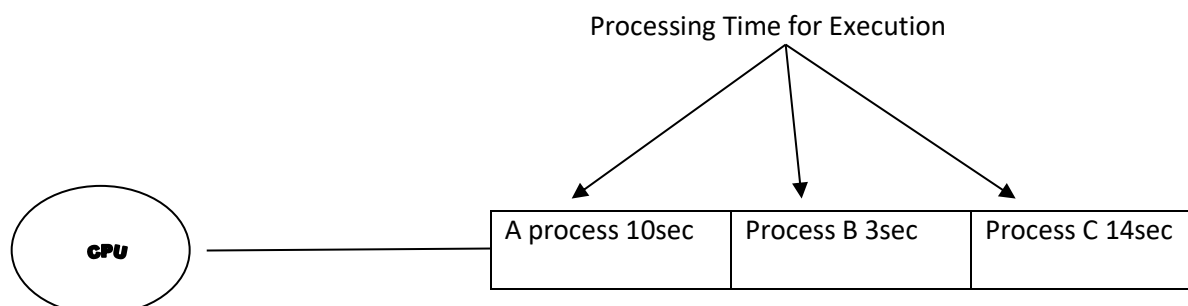
➢ In figure there are three process A,B,C. Each process have a time slice 5sec to the operating system transferred to control of CPU to next process offer 5sec automatically.

Time Around Time of A = Processing Time + Waiting Time
= 5sec (processing time of A) + 3sec(waiting time of A for process of B) + 5sec(Waiting time or the process C) + 5Sec(Processing time of A)=18sec.

Similarly, Turn Around Time of B= 5sec +3sec = 8sec
Turn Around Time of C= 5sec + 3sec +5sec +5sec +9sec = 27sec.

❖ Input Output Management
  ➢ It is the function of operating system.
  ➢ From this function all the input output devices are control.
  ➢ Computer perform to input output and processing data.
  ➢ By input unit same kinds of data such as numeric or character entered into the computer to a program in order to processed for specific result.
  ➢ The processes input data then produce to the outside known as the output.
  ➢ The input output sub system is a part of operating system that control and managers all type of input & output operation perform by input output devices and other devices rut through system software called device driver.
  ➢ Controlling input output command is the aspects of the operating system.

❖ File Management
  ➢ A file is a smallest unit of containing the information on a topic in a PC (Personal computer).
  ➢ A file is a collection of related information.
  ➢ The file managements is the function of the operating system that takes care of file related activities such as accessing, naming, sharing and protection of files.
  ➢ In case of file management operating system works as a file management to perform various file manager/operations such as create, delete, read, write, open, close, rename, copy, update, edit, insert, etc.