

PAPER – 6 : INFORMATION TECHNOLOGY AND STRATEGIC MANAGEMENT

SECTION A : INFORMATION TECHNOLOGY

QUESTIONS

1. Define the following terms briefly:

(i) Volatile Memory	(ii) Network-attached Storage
(iii) Storage Density	(iv) Screen Resolution
(v) Data Transfer Time	(vi) Data Mart
(vii) Port	(viii) Latency
(ix) Alternate Key	(x) Mobile Commerce
(xi) Graph plotter	(xii) Metadata
(xiii) Data warehouse operations	(xiv) Directory
(xv) Syntax of protocol	
2. Convert the following from one number system to another number system along with the working notes:

(i) $(0\ 0\ 1\ 1\ 0\ 1\ 1\ 1)_2$	=	() ₁₀
(ii) $(9231)_{10}$	=	() ₂
(iii) $(1128.345)_{10}$	=	() ₂
(iv) $(10101.1011)_2$	=	() ₁₀
3. Give one or two uses of each of the following:

(i) Bit Mapped Devices	(ii) VGA
(iii) Multiplexer	(iv) Middleware
(v) Power Supply Connectors	(vi) AGP Slot
(vii) Live Backup	(viii) Buffering
(ix) ASCII	(x) Artificial Intelligence
(xi) Encryption	(xii) Memo data type
4. Distinguish between the following:
 - (i) PROM and EPROM
 - (ii) Smart Terminals and Dumb Terminals
 - (iii) Smart Card Systems and Bar Code Readers
 - (iv) CD-ROM Disks and WORM Disks

- (v) Video Cards and Network Cards
- (vi) The Address Bus and The Data Bus
- (vii) Tertiary Storage and Off-line Storage
- (viii) Primary Key and Candidate Key
- (ix) Data and Information
- (x) External View and Conceptual View
- (xi) Drum Plotter and Flat-bed Plotter
- (xii) Client Server Network and Peer-to-Peer Network

PRINTERS AND ITS TYPES

5. What is the difference between impact and non-impact printers? Discuss atleast two examples of impact and non impact printers each.

ELECTRONIC DATA INTERCHANGE

6. (a) Define Electronic Data Interchange (EDI) and mention its advantages.
(b) Explain how does EDI work?

LOCAL AREA NETWORK

7. (a) Discuss the concept of a LAN. Why is it required?
(b) What are the pre-requisites in implementing LAN?
(c) Discuss the components of a LAN.

TYPES OF SERVER

8. Discuss different types of Internet servers in detail.

GENERAL PURPOSE SOFTWARE

9. (a) What do you understand by General Purpose Software?
(b) Discuss few examples of General Purpose Software.

DATABASES

10. (a) Discuss the structure of a DBMS in detail.
(b) Also discuss various types of databases.

DATA MINING

11. (a) What do you understand by the term "Data Mining".
(b) Discuss different stages involved in the process of Data Mining.

COMMUNICATION INTERFACE DEVICES

12. Discuss some of the majorly used communication Devices.

TRANSMISSION TECHNOLOGIES & TECHNIQUES

13. (a) Discuss the various transmission modes on the basis of the data transfer?

(b) Discuss each of the transmission technique in brief.

DECISION TABLE

14. (a) What do you understand by Decision Table? Also, discuss its components.

(b) What are the different types of Decision Table?

(c) What are the advantages and disadvantages of Decision Table?

FLOWCHARTS

15. (a) Define flowchart and discuss various symbols used in flowcharts.

(b) Mention some of the limitations of flowchart.

(c) Given the following set of data:

Account No.	Age of customer	Sex	Unpaid Balance (in Rs.)
13466	28	M	145.23
4156	20	F	49.50
33215	45	F	89.24
44178	19	M	115.23
56723	28	F	75.95
47892	33	F	25.78
24567	19	M	54.75
56783	55	M	24.78
43579	39	F	67.85
56782	30	M	150.97
79134	18	F	39.95
63423	29	F	69.95

Draw the flowchart to compute and print out the following:

Average

Unpaid Balance

Customer Age

Males

Females

Under 20

Rs.

XXX.XX

Rs.

xxx.xx

20 to Under 30

XXX

XXX

30 to Under 40

XXX

XXX

40 and over

XXX

XXX

STORAGE

16. (a) Describe how the bulk of removable storage media is managed and its usage controlled?
- (b) How the reliability of storage media is monitored?

LANGUAGE TRANSLATORS

17. What do you understand by the term “Language Translators”? Discuss some of the most widely used Language Translators.

OPERATING SYSTEMS

18. What do you mean by Operating systems? Discuss some of the basic functions that an operating system can perform.

TAPE DEVICES

19. Discuss Tape Devices in detail.

DESIGNING OF USER INTERFACE & PROGRAM LIBRARY MANAGEMENT SOFTWARE

20. (a) What are the elements that are required to be considered in designing of user interface? How the interface design is developed?
- (b) Discuss the features of Program Library Management Software.

SUGGESTED ANSWERS/HINTS

1. (i) Volatile memory is a type of memory that requires constant power to maintain the stored information and is typically used only for primary storage.
- (ii) Network-attached storage is secondary or tertiary storage attached to a computer which another computer can access over a local-area network, a private wide-area network, or in the case of online file storage, over the Internet.
- (iii) Storage density refers to the compactness of stored information. It is the storage capacity of a medium divided with a unit of length, area or volume (e.g. 1.2 megabytes per square centimeter).
- (iv) Screen Resolution is one of the most important features used to differentiate display. Most display devices form images from tiny dots - called pixels that are arranged in a rectangular pattern. The more dots available to display any image on - screen, the sharper the image (the greater the resolution) is.
- (v) Data Transfer Time is defined as the time taken to activate the read/write head, read the requested data and transmit them to primary memory for processing.
- (vi) Data Mart is defined as a database which contains selective data from a data warehouse meant for a specific function or department.

- (vii) A Port is a hardware device that allows a series of bits to be transferred to a bus for data input or, inversely, the transfer of data from a bus to the port for data output.
- (viii) Latency is the time taken to access a particular location in storage. It is typically measured in nanosecond for primary storage, millisecond for secondary storage, and second for tertiary storage.
- (ix) An Alternate Key of any table is simply that candidate key which is not currently selected as the primary key. An alternate key is a function of all candidate keys minus the primary key.
- (x) Mobile Commerce (M-commerce) is defined as the buying and selling of goods and services through wireless handheld devices such as cellular telephone and Personal Digital Assistants (PDAs). Known as next-generation E-commerce, M-commerce enables users to access the Internet without needing to find a place to plug in.
- (xi) Graph Plotter is a device capable of tracing out graphs, designs and maps into paper and even into plastic or metal plates. Plotters may be driven on-line or off-line wherein a high degree of accuracy can be achieved, even upto one thousandth of an inch.
- (xii) Metadata or “data about data”, is used to inform operators and users of the data warehouse about its status and the information held within the data warehouse. Examples of data warehouse metadata include the most recent data load date, the business meaning of a data item and the number of users that are logged in currently.
- (xiii) Data warehouse operations comprise of the processes of loading, manipulating and extracting data from the data warehouse. Operations also cover user management, security, capacity management and related functions.
- (xiv) A Directory is like a drawer in a filing cabinet containing files. A computer disk usually contains multiple directories, if necessary, a directory can also contain other directories. The purpose of directories is to enable the user to partition the computer’s disk/storage devices in an organized and meaningful manner.
- (xv) Syntax of protocol defines the format of the data being exchanged, character set used, type of error connection used, type of encoding scheme (eg.. signal levels) during data transmission.

2. (i) $(0\ 0\ 1\ 1\ 0\ 1\ 1\ 1)_2 = (\quad)_{10}$

$$= 0 \times 2^7 + 0 \times 2^6 + 1 \times 2^5 + 1 \times 2^4 + 0 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$$

$$= 0 + 0 + 32 + 16 + 0 + 4 + 2 + 1$$

Thus, $(0\ 0\ 1\ 1\ 0\ 1\ 1\ 1)_2 = (55)_{10}$

(ii) $(9231)_{10} = (\quad)_2$

		Remainder
2	9231	
2	4615	1
2	2307	1
2	1153	1
2	576	1
2	288	0
2	144	0
2	72	0
2	36	0
2	18	0
2	9	0
2	4	1
2	2	0
2	1	0
	0	1



Thus, $(9231)_{10} = (10010000001111)_2$

(iii) $(1128.125)_{10} = (\quad)_2$

We have to solve the integral and fractional part separately.

Consider integral part 1128.

		Remainder
2	1128	
2	564	0
2	282	0
2	141	0
2	70	1
2	35	0
2	17	1
2	8	1
2	4	0
2	2	0
2	1	0
	0	1



$(1128)_{10} = (10001101000)_2$

..... (1)

Now consider fractional part 125.

Integer part

0.125 x 2	
0.250	0
0.250 x 2	
0.500	0
0.500 x 2	
1.000	1



$$(0.125)_{10} = (0\ 0\ 1)_2 \quad \dots\dots (2)$$

Thus combining (1) and (2), we get,

$$(1128.125)_{10} = (1\ 0\ 0\ 0\ 1\ 1\ 0\ 1\ 0\ 0\ 0\ .\ 0\ 0\ 1)_2$$

$$\begin{aligned} \text{(iv)} \quad (10101.1011)_2 &= (\quad)_{10} \\ &= 1 \times 2^4 + 0 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 + 1 \times 2^{-1} + 0 \times 2^{-2} + 1 \times 2^{-3} + 1 \times 2^{-4} \\ &= 16 + 0 + 4 + 0 + 1 + 1/2 + 0 + 1/8 + 1/16 \\ &= 21 + 11/16 \end{aligned}$$

$$\text{Thus, } (10101.1011)_2 = (21.6875)_{10}$$

3. (i) Bit-mapped devices allow each individual pixel on the screen to be controlled by the computer. Thus, any type of image that can be formed from the rectangular grid of dots on the screen (for example, a 640-by-480 grid) is possible.
- (ii) VGA or Video Graphics Adapter is a high quality graphics adapter which provides upto 256 colors and also a high resolution. The two typical combinations of resolutions and colors that a VGA can provide are :
 - 640 x 480 pixels with 16 colors.
 - 320 x 200 pixels with 256 colors.
- (iii) The Multiplexer is a device that scans each device to collect and transmit data on a single communication line to the CPU. It also communicates transmission from the CPU to the appropriate terminal linked to the Multiplexer. The devices are polled and periodically asked whether there is any data to transmit.
- (iv) Middleware is defined as the network system implemented within the client/server technology. It is all the distributed software needed to allow clients and servers to

interact. General middleware allows for communication, directory services, queuing, distributed file sharing, and printing.

- (v) The Power Supply Connectors allow the user to connect the power supply unit to the motherboard and provide power for the functioning of the various components that fit on the motherboard.
 - (vi) AGP Slot is a dedicated slot meant to provide faster access to GP – based device like graphics accelerator cards, thus enhancing the visual experience for the user.
 - (vii) A Live Backup is carried out by using the BACKUP utility and provides a redundant copy of the transaction log for restart of any system on a secondary machine in the event the primary database server machine becomes unusable.
 - (viii) When processor executes one program at a time, basic I/O peripherals such as floppy disk drive and line printers are slow compared with the electronic speed of the processor and thus causing an imbalance in the system as a whole. In a multi - programming environment, the buffering enables the CPU to execute one program's instructions while a second program waits for its I/O operations to take place, rather than being idle.
 - (ix) ASCII stands for American Standard Code for Information Interchange and is used extensively in small computers, peripherals, instruments and communications devices. Microcomputers using 8-bit word length use 7 bits to represent the basic code and the 8th bit is used for parity either 1 or 0.
 - (x) Artificial intelligence (AI) is a software that tries to emulate aspects of human behavior, such as reasoning, communicating, seeing, and hearing. There are several types of AI, including natural language, voice and visual recognition, robotics, neural networks, and expert systems. Natural language, voice and visual recognition focus on enabling computers to interact more easily and naturally with users. Robotics focuses on teaching machines to replace human labor. Both neural networks and expert systems aim to improve decision-making.
 - (xi) Encryption allows information to transit the Internet while being protected from interception by eavesdroppers.
 - (xii) Memo data type is used when the user needs to store more than 255 characters. A Memo field can store up to 65,536 characters. If a user wants to store formatted text or long documents, user should create a OLE Object field instead of a Memo field.
4. (i) PROM and EPROM
- PROM: PROM (Programmable Read Only Memory) is a non-volatile memory which allows the user to program the chip with a PROM write. The chip can be programmed once, thereafter, it can not be altered.

EPROM: EPROM (Erasable Programmable Read Only Memory) chips can be electrically programmed. Unlike ROM and PROM chips, EPROM chips can be erased and reprogrammed. Erasure is performed by exposing the chip to Ultra-violet light.

(ii) Smart Terminals and Dumb Terminals

Smart Terminals: These are non-programmable by users and contain a microprocessor and some internal storage. They have data editing capability and can consolidate input data before sending it to CPU.

Dumb Terminals: These are input/output (I/O) devices that provide for data entry and information exit when connected to a computer but have no additional capability.

(iii) Smart Card Systems and Bar Code Readers

Smart Card Systems: Smart cards resemble credit cards in size and shape and contain a microprocessor chip and memory, and some include a keypad as well, to provide new or enhanced services for customers. Smart cards are used most frequently to make electronic purchases, to electronically transfer funds between accounts and for security applications.

Bar Code Reader: Commonly found in supermarkets and departmental stores, bar code reader devices convert the bar code, which is a pattern of printed bars on products, into a product number, just as though the number has been typed on a keyboard. Because of improved accuracy of data entry, better customer service through faster checkout at the point of sale, greater control and reliability of inventory records, and are used in retail, medical, libraries, military and other government operations, transportation facilities, and the automobile industry.

(iv) CD-ROM Disks and WORM Disks

CD-ROM Disks: CD-ROM stands for Compact-Disk-Read-Only memory which contains reference material. The master copy is duplicated or "pressed" at the factory and copies are distributed with their pre-recorded contents. Once inserted into the CD-ROM disk drive, the text, video images, and so on can be read into primary storage for processing or display, but can not be altered. The capacity of a single CD-ROM is over 650 MB which is equivalent to 250,000 pages of text, or 1500 floppy disks.

WORM Disks: WORM disks stands for Write-Once-Read-Many optical laser disks and are used by end user companies to store their own proprietary information. Once the data have been written to the medium, they only can be read, not updated or changed. The PC version of a WORM disk cartridge, which looks like a 5¼ inch

version of the 3½ inch diskette, has a capacity of 200 MB. The WORM disks cartridge is a feasible alternative to magnetic tape for archival storage.

(v) Video Cards and Network Cards

Video Card: These allow computers to display video and animation, to display television as well as capture frames from video. A video card with a digital video camera allows computer users to produce live video. A high speed or network connection is needed for effective video transmission.

Network Cards: These allow computers to connect together to communicate with each other by means of cable, thin wire or wireless networks.

(vi) The Address Bus and The Data Bus

The Address Bus: The address bus is a set of wires similar to the data bus that connects the CPU and RAM and carries the memory addresses in every microcomputer. The number of wires in the address bus determines the maximum number of memory addresses. For example, one byte of data is enough to represent 256 different values. If the address bus could carry only eight bits at a time, the CPU could address only 256 bytes of RAM.

The Data Bus: The Data Bus is an electrical path that connects the CPU, memory, and the other hardware devices on the motherboard and enables data transfer. The number of wires in the bus affects the speed at which data can travel between hardware components. Because each wire can transfer one bit at a time, an eight-wire bus can move eight bits at a time, which is a full byte.

(vii) Tertiary Storage and Off-Line Storage

Tertiary Storage: It is a system where a robotic arm will "mount" (connect) or "dismount" off-line mass storage media according to the computer operating system's demands. It is used in the realms of enterprise storage and scientific computing on large computer systems and business computer networks.

Off-line Storage: It is a system where the storage medium can be easily removed from the storage device and is used for data transfer and archival purposes. Floppy disks, optical discs and flash memory devices including "USB drives" are commonly used for off-line mass storage purposes.

(viii) Primary Key and Candidate Key

Primary Key: The primary key of any table is any candidate key of that table which the database designer arbitrarily designates as "primary". It uniquely identifies each row in a table. It may be selected for convenience, comprehension, performance or any other reasons. It is entirely proper to change the selection of primary key to another candidate key.

Candidate Key: A candidate key is any set of one or more columns whose combined values are unique among all occurrences (i.e., tuples or rows). Since a null value is not guaranteed to be unique, no component of a candidate key is allowed to be null. There can be any number of candidate keys in a table.

(ix) Data and Information

Data: Data are a collection of facts - unorganized but able to be organized into useful information. A collection of sales orders, time sheets, and class registration cards are a few examples. Data are manipulated to produce output, such as bills and pay cheques.

Information: When this output can be used to help people make decisions, it is called information.

(x) External View and Global View

External or User View: This view encircles the following –

- It is at the highest level of the database abstraction.
- It includes only those portions of database or application programs which are of concern to the users.
- It is described by users by means of a scheme, called the external schema and is written by the programmers.

For example, an external view in its Logical Record 1 may indicate employee name, employee address and in its Logical Record 2 may indicate employee name, employee address and employee code and employee salary.

Global or Conceptual View: It is viewed by the DBA and encompasses the following –

- All database entities and relationships among them are included.
- Single view represents the entire database and is defined by the conceptual schema.
- It describes all records, relationships and constraints or boundaries.
- Data description to render it independent of the physical representation.

For example, a conceptual view may define employee code as a string of characters, employee address also as a string, employee code as a key and employee salary as an integer.

(xi) Drum Plotter and Flat-bed Plotter

Drum Plotter: A drum plotter plots on paper affixed to a drum. The drum revolves back and forth, and a pen suspended from a bar above moves from side-to-side

taking up new plot positions or plotting as it moves. This device is suitable for routine graph plotting and also for fashion designs.

Flat-bed Plotter: On a flat-bed plotter, the paper lies flat. The bar on which the pen is suspended itself moves on a gantry to provide the necessary two-way movement. Color plotting is usually possible.

(xii) Client-Server Network and Peer-to-Peer Network

Client-Server Network: Client-Server networks consist of servers and clients. Servers are typically powerful computers running advanced network operating systems and user workstations (clients) which access data or run applications located on the servers. Fig. alongside shows one server and 5 client machines connected to it. Servers can host e-mail; store common data files and serve powerful network applications such as Microsoft's SQL Server.

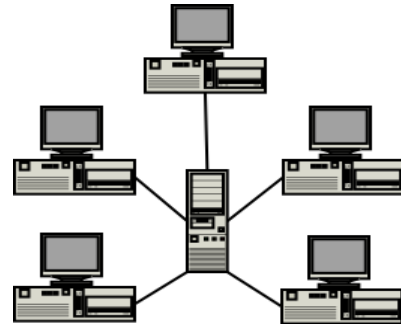


Fig.:Client server Arrangements

As a centerpiece of the network, the server validates logins to the network and can deny access to both networking resources as well as client software. Servers are typically the center of all backup and power protection schemas.

Peer-to-Peer Network: Peer-to-peer networks are also known as Workgroups, wherein there are no dedicated servers. All computers are equal, and therefore, are termed as peer and each of these machines function both as a client and a server. This arrangement is suitable for environments with a limited number of users (usually ten or less). Moreover, the users are located in the same area and security is not an important issue while the network is envisaged to have a limited growth.

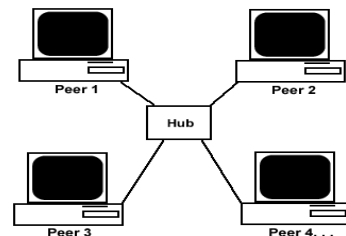


Fig . : Peer-to-Peer Networks

At the same time, users need to freely access data and programs that reside on other computers across the network. The basic advantage of this architecture is simplicity of design and maintenance. Since there is no server, all nodes on the network are fully employed and independent.

5. Impact Printers and Non-Impact Printers

Impact printers: Impact printers can be described as printers which utilize some form of striking device to transfer ink from an inked ribbon onto the paper being printed to form images or characters. The characters printed are formed by one of two methods:

- (i) They are either distinct, whole alphanumeric images produced by a process known as full character or formed character printer or,
- (ii) They are formed by a dot matrix method which arranges a series of dots to assume the shape of each character being printed.

Impact printers fall into two basic categories - Serial or Line printers.

- (a) Serial Printers: These printers print one character at a time, usually from left to right. Dot-matrix printer and Daisy wheel Printers are the most commonly used type of serial printer.
 - Dot-matrix Printers: Dot matrix printers utilize wire needles or pins which strike the ribbon against the paper in the pattern necessary to produce each character image. The printing head is a matrix block which consists of rows and columns of holes through which pins appear. The characters being printed are formed by activating the printing head so that certain pins appear through the holes to form a pattern which resembles each character. The pins are formed into the shape of the character to be printed, then pressed against an inked ribbon and the pattern printed on the paper. The character, whether they are letters, numbers or grammatical symbols are printed as a series of dots which merge together to form the character. Dot matrix printers are fast and cheap but their print quality is relatively poor. They are only really suitable for printing draft copies and documents, which are usually retained within an organization.
 - Daisywheel Printers: Daisywheel printers work in a similar manner to an electronic typewriter. Daisywheel is a molded metal or plastic disc-shaped printing element which looks very much like a daisy which is about 65 mm in diameter and has a number of stalks or petals which radiate from a central core. On the end of each stalk is a type character set in a similar manner to the keys as on a typewriter. This type of printer works by rotating the print element until the required character is positioned in front of the sheet of paper at the point where it will be printed. A small hammer hits the back of the stalk forcing that character against an inked ribbon and through onto the paper.
- (b) Line Printers: A line printer operates at much higher speeds and prints what appears to be a full line at a time. Chain printers and Drum printers are the two common types of line printers.
 - Chain Printers: It has a chain that revolves at a constant speed in a horizontal plane. The complete chain has a complement of 48 numbers, alphabets and

special symbols cast on 5 times over. It is confronted by a set of as many magnetically controlled hammers as the number of print position. The continuous stationery and ribbon are inter posed between a segment of the chain and the set of hammers. When a required character on the chain faces its print position, the corresponding hammer is actuated and character is printed.

- Drum Printers: These printers use a solid cylinder which has as many bands on it as the number of print positions. Each band has cast on it the complement of 48 numerals, alphabets and special characters. The drum rotates at a constant speed confronted by a set of as many hammers as the number of bands with the inked ribbon and continuous stationery interposed. In one rotation of the drum there would be appropriate strikes by the set of the hammers. In the first strike A's are printed in the appropriate print positions, followed by B,C,.....Z,0,1.....9 and special symbols one by one.

Non-impact printers: Non-impact printer form characters by chemical or electronic means. The non-impact printers require special and more expensive paper and can print only one copy at a time. Three types of non-impact printers are - Thermal printers, Ink-jet printers and Laser printers.

- (a) Thermal printers: These printers use thermal printing facility i.e. the printer forms each character on the matrix printing head in the normal way but, instead of the printing head being impacted physically against an inked ribbon to print the character, the pins are heated by the electric element and then pressed against the paper. When the pins touch the paper, the area heated by the pins changes color, usually to black or brown to form the character.
 - (b) Ink-Jet Printers: These type of printers utilize the dot matrix principle but instead of pins to form a character, it uses an array of nozzles which spray jets of ink onto the paper.
 - (c) Laser Printers: These printers use a combined system which utilize laser and Xerographic photocopying technology. In a laser printer, a beam from a small laser scans horizontally across a charged xerographic selenium drum to build up an invisible electrostatic image of a whole page of text. Laser printer produces not only alphanumeric characters but also drawings, graphics and other requirements. Its output can be very close to professional printing quality.
6. (a) Electronic Data Interchange (EDI)

American National Standards Institute (ANSI) defines EDI (Electronic Data Interchange) as:

Electronic Data Interchange (EDI) is the transmission, in a standard syntax, of unambiguous information of business or strategic significance between computers of independent organizations. The users of EDI do not have to change their internal

data bases. However, users must translate this information to or from their own computer system formats, but this translation software has to be prepared only once.

In simple terms, EDI is computer-to-computer communication using a standard data format to exchange business information electronically between independent organizations. The computer-to-computer transfer can be direct, between two companies using an agreed upon data protocol, or it can be performed by a third-party service vendor. Users can transmit business documents such as purchase orders, price quotes, shipping notices, and even payment orders electronically to customers and suppliers. EDI is vastly implemented in the trucking, marine shipping and air cargo industries in developed countries.

Advantages of EDI

- (i) Issue and receive orders faster – Since most purchasing transactions are routine, they can be handled automatically, utilizing the staff for more demanding and less routine tasks.
- (ii) Make sales more easily – Quotes, estimates, order entry and invoicing will proceed more smoothly and efficiently. Orders received electronically ensure that information is available immediately, so that an organization can respond faster and be more competitive.
- (iii) Get paid sooner – Invoices received electronically can be reconciled automatically, which means they are earmarked for payment in one's trading partner's accounting department sooner.
- (iv) Minimize capital tied up in inventory – For manufacturing organizations with a just-in-time strategy, the right balance is crucial but every organization stands to benefit from reducing order lead times.
- (v) Reduce letters and memos – Letters and memos do not follow rigid rules for formatting. They can be handled by an electronic mail system.
- (vi) Decrease enquiries – Customers or suppliers can make direct on-line enquiries on product availability, or other non-sensitive information instead of consuming the staff's precious time.
- (vii) Make bulk updates of catalogues and parts listings – One can provide updates of data files, such as catalogues to customers or part listings to franchisees.

(b) Working of EDI

EDI is an electronic exchange of business documents such as invoices, purchase orders, and shipping notices in a standard, machine-understandable data format.

EDI automates the transfer of data between dissimilar computer systems in 3-step as shown in Fig. below.

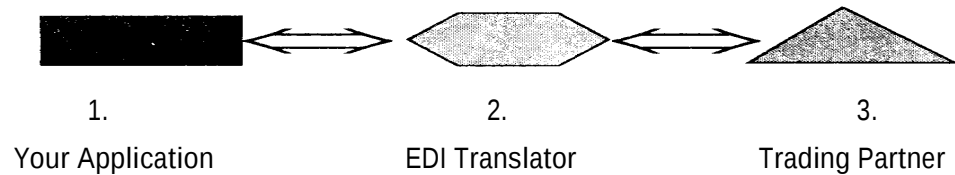


Fig. : General Working of EDI

- Data from an application is translated into a standard format.
 - Then, it is transmitted over communication lines to the trading partner.
 - Finally, it is re-translated by the trading partner's application.
- (i) Communications: To make EDI work, one needs communications software, translation software, and access to standards. Communications software moves data from one point to another, flags the start and end of an EDI transmission, and determines how acknowledgements are transmitted and reconciled. Translation software helps the user to build a map and shows him how the data fields from his application corresponds to the elements of an EDI standard. Later, it uses this map to convert data back and forth between the application format and the EDI format.
- (ii) Mapping: To build a map, the user first selects the EDI standard appropriate for the kind of EDI data to be transmitted, like invoices, purchase orders, advance shipping notices.

An EDI translator displays a selected EDI standard on one side of the screen, and his application file (defining the fields in the applications) on the other and marks the map to show where the data required by the EDI standard is located in his application. Once the map is built, the translator refers to it during EDI processing every time a transaction of that type is sent or received.

- (iii) Profiles: The last step is to write a partner profile that tells the system where to send each transaction and how to handle errors or exceptions. Whereas the user needs a unique map for every kind of document he exchanges with a partner, he should only have to define partner information once.

In summary, to make EDI work, one needs to:

- Select communications software.
- Select a standard for each document user wants to exchange with his trading partner.

- Import an application file that defines the fields and records in user's application.
 - Define a map that shows how the fields in user's application correspond to elements in the standard.
 - Define partner profiles that tell the system how transactions will be addressed, what they will contain, and how to respond to errors.
 - Finally, the system should be tested with sample documents.
7. (a) The concept of Local Area Network (LAN) enables more and more computers to get connected to provide many useful benefits, such as printer and hard disk sharing, especially when budgets became a constraint.

LANs can be used in the manner suited to the organization which owns them, and can be completely independent of the constraints imposed by public telephone authorities, or other public services.

Why LAN is required?

LAN is required because of the following reasons:

- (i) Security - Security for programs and data can be achieved using servers that are locked through both software and by physical means. Diskless nodes also offer security by not allowing users to download important data on floppies or upload unwanted software or virus.
- (ii) Expanded PC usage through inexpensive workstation - Once a LAN has been set up, it actually costs less to automate additional employees through diskless PCs. Existing PCs can be easily converted into nodes by adding network interface cards.
- (iii) Distributed processing - Many companies operate as if they had distributed system in place. If numerous PCs are installed around the office, these machines represent the basic platform for a LAN with inter-user communication and information exchange.
- (iv) Electronic mail and Message Broadcasting - Electronic mail allows users to communicate more easily among themselves. Each user can be assigned a mail-box on the server. Messages to other users can then be dropped into the mail-box and read by them when they log into the network.
- (v) Organizational Benefits - These include reduced costs in computer hardware, software and peripherals, and a drastic reduction in the time and cost of training or re-training manpower to use the systems. It helps managers and executive to communicate with each other more easily and faster, without any logistical constraints. Information flow too becomes a lot smoother with

various departments having the ability to access or request for information and data pertinent to them.

- (vi) Data management benefits - Since data is located centrally on the server, it becomes much easier to manage it, as well as back it up. No file is transferred between users through floppies.
 - (vii) Software cost and up-gradation - If the organization is concerned about using licensed software purchasing a network version can save a lot of money, since there would be no need to buy multiple copies of the same software for every machine in the organization. Therefore, software upgrades are much easier as any given package is stored centrally on the server.
- (b) Pre-requisites in LAN Implementation - There are certain features that every LAN should have and users would do well to keep note of these when they decide to implement their own network. These features essentially invoice hardware and software components. Broadly, these are:
- (i) Compatibility - A LAN operating system must provide a layer of compatibility at the software level so that software can be easily written and widely distributed. A LAN operating system must be flexible, which means that it must support a large variety of hardware. Novell Net Ware is a network operating system that can provide these features, and has today, become an industry standard.
 - (ii) Internetworking - Bridging of different LANs together is one of the most important requirements of any LAN. Users should be able to access resources from all workstations on the bridge network in a transparent way; no special commands should be required to cross the bridge. A network operating system must be hardware independent, providing the same user interface irrespective of the hardware.
 - (iii) Growth Path and Modularity - One of the most important requirements of a LAN is its modularity. A set of PCs should get easily converted into a LAN which can grow in size simply by adding additional workstations. If more storage is required, one should be able to add another hard disk drive, or another server. If one needs to connect with a user on another LAN, he/she should be able to install a bridge.
 - (iv) System Reliability and Maintenance - All computers are prone to system lockups, power failures and other catastrophes. If a centralized processing system goes down, all users connected to it are left without a machine to work on. Such a situation can arise even in a distributed or local area network system. However, a LAN operating system should be powerful enough to withstand accidents.

(c) Components of a LAN - A typical LAN running under Novell NetWare has five basic components that make up the network. These are :

- File Server
- Network operating system
- Personal Computers, Workstations or Nodes
- Network Interface Cards
- Cabling

(i) File Server - A network file server is a computer system used for the purpose of managing the file system, servicing the network printers, handling network communications, and other functions. A server may be dedicated in which case all of its processing power is allocated to network functions, or it may be non-dedicated which means that a part of the server functions may be allocated as a workstation or DOS-based system.

(ii) The network operating system - It is loaded into the server's hard disk along with the system management tools and user utilities. When the system is restarted, NetWare boots and the server comes under its control. All processing is done on the server, and hence it is called a Passive Device. The larger the network, the more important it becomes to have a high performance server

(iii) Workstations - Workstations are intelligent systems attached to the server through the network interface card and the cabling. The dumb terminals used on mainframes and minicomputer systems are not supported on networks because they are not capable of processing on their own. After processing, files are stored back on the server where they can be used by other workstations. The workstation can also be a diskless PC, wherein loading of operating system takes place from the file server.

(iv) Network interface card (NIC) - Every device connected to a LAN needs a Network interface card(NIC) to plug into the LAN. For example, a PC may have an Ethernet card installed in it to connect to an Ethernet LAN.

(v) Network Cabling - Once the server, workstations and network interface cards are in place, network cabling is used to connect everything together. The most popular type of network cable is the shielded twisted-pair, co-axial and fiber optic cables.

8. Some of the different types of Internet Servers are:

- File Server: A file server, one of the simplest server, manages requests from clients for files stored on the server's local disk. A central file server permits groups and

users to share and access data in multiple ways. Central file servers are backed up regularly and administrators may implement disk space quotas for each user or group of users.

- **Mail Server:** A mail server is the most efficient way to receive and store electronic mail messages for a community of users. A central mail server runs 24 hours a day and can also provide a global email directory for all community and school users, as well as email gateway and relay services for all other mail servers in the district.
- **DNS Server:** DNS (Domain Name Service) is an Internet-wide distributed database system that documents and distributes network-specific information, such as the associated IP address for a host name, and vice versa. The host that stores this database is a name server. The library routines that query the name server, interpret the response and return the information to the program that requested it are resolvers.
- **Gopher Server:** Gopher is an Internet application that uses multiple Gopher servers to locate images, applications, and files stored on various servers on the Internet. Gopher offers menu choices to prompt users for information that interests them, and then establishes the necessary network connections to obtain the resource.
- **Web Server:** The World Wide Web (WWW) is a popular Internet source of information. Web browsers present information to the user in hypertext format. When the user selects a word or phrase that a Web page's author has established as a hypertext link, the Web browser queries another Web server or file to move to another Web page related to the link.
- **FTP Server:** File Transfer Protocol (FTP) is an Internet-wide standard for distribution of files from one computer to another. The computer that stores files and makes them available to others is server. Client software is used to retrieve the files from the server.
- **News Server:** Usenet News is a world wide discussion system consisting of thousands of newsgroups organized into hierarchies by subject. Users read and post articles to these newsgroups using client software. The "news" is held for distribution and access on the news server. Because newsgroups tend to generate large amounts of Internet traffic, you may wish to consider the method in which you intend to receive Usenet news.
- **Chat Server:** Some organizations choose to run a server that will allow multiple users to have "real-time discussions, called "chats" on the Internet. Some chat groups are moderated, most however are unmoderated public discussions, allowing the participants to meet for private discussions.
- **Caching Server:** A caching server is employed when user wants to restrict his number of accesses to the Internet. A caching server sits between the client computer and the server that would normally fulfill a client's request. Once the client's request is sent, it is intercepted by the caching server, which maintains a library of files that have been requested in the recent past by users on the network.

If the caching server has the requested information in its cache, the server returns the information without going out to the Internet.

- Proxy Server: A proxy server is designed to restrict access to information on the Internet. A proxy server operates on a list of rules given to it by a System Administrator. Some proxy software uses list of specific forbidden sites, while other proxy software examines the content of a page before it is served to the requester.

9. (a) General Purpose Software

This software provides the framework for a great number of business, scientific, and personal applications like Spreadsheet, data bases, Computer-Aided Design (CAD) and word processing applications. Most general-purpose software is sold as a package and is accompanied by user-oriented documentation such as reference manuals, keyboard templates, and so on. It is then upto the user of the software to create the application. For example, an accountant can use spreadsheet software to create a template for preparing a balance sheet of a company. The three basic types of software are: Commercial, Shareware and Open Source Software. Some software is also released into the public domain without a license.

- Commercial software comes prepackaged and is available from software stores and through the Internet.
- Shareware is a software developed by individual and small companies that cannot afford to market their software world wide or by a company that wants to release a demonstration version of their commercial product. User will have an evaluation period in which the user can decide whether to purchase the product or not.
- Open Source software is created by generous programmers and released into the public domain for public use. There is usually a copyright notice that must remain with the software product. Many popular Open Source applications are being developed and upgraded regularly by individuals and companies that believe in the Open Source concept.

(b) Some of the examples of General Purpose Software are:

- (i) Word Processor: A word processor is a computer application used for the production (including composition, editing, formatting, and possibly printing) of any sort of printable material. Most are powerful systems consisting of one or more programs that can produce any arbitrary combination of images, graphics and text. Microsoft Word is the most widely used computer word processing system with many other commercial word processing applications, such as WordPerfect, Open-source applications such as OpenOffice's Writer and KWord.

- (ii) **Spreadsheet Program:** A spreadsheet is a rectangular table (or grid) of information, often financial information. The spread-sheet is used to present bookkeeping ledgers with columns for categories of expenditures across the top, invoices listed down the left margin, and the amount of each payment in the cell where its row and column intersect.
 - (iii) **Database Management System:** A Database Management System (DBMS) is a system or software designed to manage a database, and run operations on the data requested by numerous clients. Typical examples of DBMS use include accounting, human resources and customer support systems.
 - (iv) **Internet Browser:** An Internet Browser is a software application that enables a user to display and interact with text, images, and other information typically located on a web page on the WWW or a LAN.
 - (v) **Electronic mail:** Electronic mail is a method of composing, sending, storing, and receiving messages over electronic communication systems.
10. (a) **Structure of a DBMS**
- (i) **DDL Compiler –**
 - It converts data definition statements into a set of tables which contain meta-data (data about the data) concerning the database.
 - It gives rise to a format that can be used by other components of database.
 - (ii) **Data Manager –**
 - It is the central software component and is referred as the database control system.
 - It converts operations in users' queries to physical file system.
 - (iii) **File Manager –**
 - It is responsible for file structure and space management.
 - It is responsible for locating block containing required record and for requesting block from disk manager.
 - It is responsible for transmitting required record to data manager.
 - (iv) **Disk Manager –**
 - It is a part of the Operating System and carries out all physical input / output operations.
 - It transfers block / page requested by file manager.
 - (v) **Query Manager –**
 - It interprets user's online query and uses information to modify it.
 - It converts to an efficient series of operations.

- In a form it is capable of being sent to data manager.
- It uses data dictionary to find structure of relevant portion of database.
- It prepares an optimal plan to access database for efficient data retrieval.

(vi) Data Dictionary –

- It maintains information pertaining to structure and usage of data and meta data.
- It is consulted by the database users to learn what each piece of data and various synonyms of data field means.

(b) Types of Databases

The growth of distributed processing, end user computing, decision support and executive information systems has caused the development of several types of databases. Fig. below illustrates six of the main databases that may be found in computer using organizations.

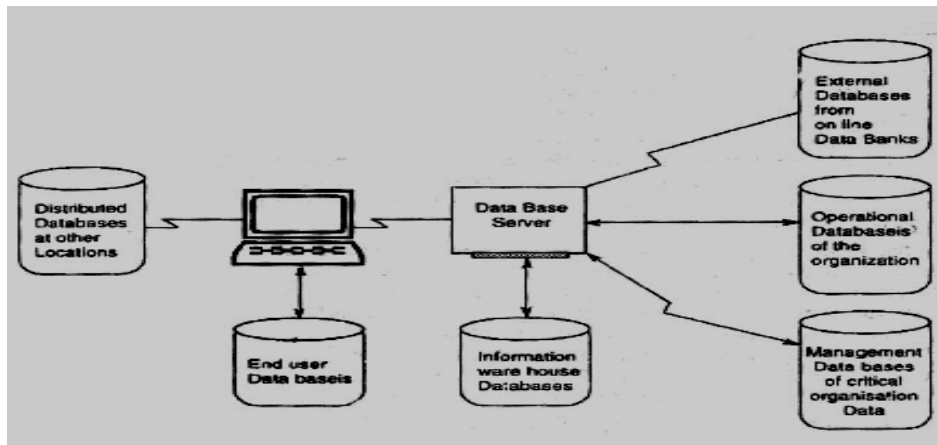


Fig. : Types of Servers

- Operational databases:** These databases store detailed data needed to support the operations of the entire organization. They are also called subject area databases (SADB), transaction databases, and production databases. Examples are a customer database, personnel database, inventory database, and other databases containing data generated by business operations.
- Management Databases:** These databases are also called “Information Databases” and store data and information extracted from selected operational and external database. They consist of summarized data and information most needed by the organization’s managers and other end users and are accessed by executive end-users as part of decision support systems and executive information systems to support managerial decision making.

- (iii) **Information Warehouse Databases:** An information warehouse stores data from current and previous years which usually are extracted from the various operational and management databases of an organization. It is a standardized, integrated & central source of data and is used by managers and other end-user professionals throughout an organization. For example, an important use of information warehouse databases is pattern processing, where operational data is processed to identify key factors and trends in historical patterns of the business activity.
 - (iv) **End User Databases:** These databases consist of a variety of data files developed by end users at their workstations. For example, users may have their own electronic copies of documents they generated with word processing packages may have their own data files generated from spreadsheet and DBMS packages.
 - (v) **External Databases:** Access to external, privately owned online databases or data banks is available, for a fee, to end users and organizations from commercial information services. Data is available in the form of statistics on economic and demographic activity from statistical data banks. One can receive abstracts from hundreds of newspapers, magazines, and other periodicals from bibliographic data banks.
 - (vi) **Text Databases:** Text databases are natural outgrowth of the use of computers to create and store documents electronically. These are also available on CD-ROM optical disks for use with microcomputer systems. Big corporations and government agencies have developed large text databases containing documents of all kinds. They use text database management systems software to help create, store, search, retrieve, modify, and assemble documents and other information stored as text data in such databases.
 - (vii) **Image Databases:** A wide variety of images can also be stored electronically in image databases. For example, electronic encyclopedia are available on CD-ROM disks which store thousands of photographs and many animated video sequences as digitized images, along with thousands of pages of text. Thousands of pages of business documents, such as customer correspondence, purchase orders and invoices, as well as sales catalogues and service manuals, can be optically scanned and stored as document images on a single optical disk.
11. (a) **Data Mining:** Data mining is concerned with the analysis of data and picking out relevant information. It is responsible for finding the patterns by identifying the underlying rules and features in the data. The data mining analysis process starts with a set of data, uses a methodology to develop an optimal representation of the structure of the data during which time knowledge is acquired. Once knowledge has

been acquired, this can be extended to larger sets of data working on the assumption that the larger data set has a structure similar to the sample data. Examples of Data mining Software's are SPSS, SAS, Think Analytics and G-Stat etc.

(b) Stages involved in Data Mining

The following Fig. summaries the common stages or processes identified in data mining and knowledge discovery by Usama Fayyad & Evangelos Simoudis, two of leading exponents of this area.

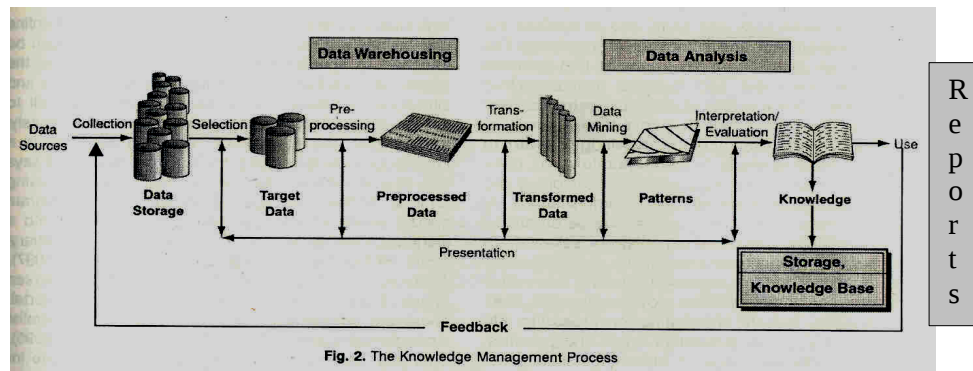


Fig. : Components of Data mining

The phases depicted start with the raw data and finish with the extracted knowledge which was acquired as a result of the following stages:

- (i) Selection - Selecting or segmenting the data according to some criteria e.g. all those people who own a car, in this way subsets of the data can be determined.
- (ii) Preprocessing - This is the data cleansing stage where certain information is removed which is deemed unnecessary and may slow down queries for e.g.: gender of the patient. The data is reconfigured to ensure a consistent format as there is a possibility of inconsistent formats because the data is drawn from several sources e.g. gender may be recorded as F or M and also as 1 or 0.
- (iii) Transformation - The data is not merely transferred, but transformed. E.g.: demographic overlays commonly used in market research. The data is made useable and navigable.
- (iv) Data mining - This stage is concerned with the extraction of patterns from the data. A pattern can be defined as given a set of facts(data) F , a language L , and some measure of certainty C a pattern is a statement S in L that describes

relationships among a subset F_s of F with a certainty c such that S is simpler in some sense than the enumeration of all the facts in F_s .

- (vi) Interpretation and Evaluation - The patterns identified by the system are interpreted into knowledge which can then be used to support human decision-making e.g. prediction and classification tasks, summarizing the contents of a database or explaining observed phenomena.

12. Some of the commonly used communication devices are:

- (i) Network Interface Card: Every computer in a network has a special card called a Network Interface Card (NIC) which provides the connector to attach the network cable to a server or a workstation. The on-board circuitry then provides the protocols and commands required to support of network card which has additional memory for buffering incoming and outgoing data packets, thus improving the network throughput. Each NIC has a 8 bytes permanent and unique MAC(media access control) address provided by the manufacturer, also known as physical address, and construct, transmits, receives, and processes data to and from a host to network.
- (ii) Switch: A switch is a kind of multi port connecting device which makes intelligent routing decisions on the basis of hardware (physical) addresses. Switches create temporary point to point links between two nodes on a network and send all data along that link, regenerate incoming signals and forwards them.
- (iii) Router: A router is a kind of connecting device which interconnects different types of networks and makes forwarding decisions of data packet on the basis of network addresses. The primary purpose of a router is to examine the source and destination IP addresses of data packets it receives and to direct those packets out the appropriate port and over the best path available at the time using routing protocols and routing algorithms.
- (iv) Hub: A hub is a multi port connecting device used to interconnect LAN devices by means of simple twisted pair wires. A hub can be used to extend the physical length of a network and can be active and passive. Passive hub sends an incoming signal as it is as an output, whereas Active hub regenerates incoming signal before sending it and supports homogeneous network only.
- (v) Bridge: The main task of a bridge computer is to receive and pass data from one LAN to another. In order to transmit this data successfully, the bridge magnifies the data transmission signal and act as a repeater as well as a link.
- (vi) Repeater: The main task of repeater is to solve the snag of signal degradation which results as data is transmitted along the various cables. The repeater boosts or amplifies the signal before passing it through to the next section of cable.

- (vii) Gateways: Gateway is similar to bridge in that it relays data from network to network. It does not possess the management facilities of router but like router, they it translates data from one protocol to another. It is usually used to link LANs of different topologies, e.g., Ethernet and Token Ring, so enabling the exchange of data.
 - (viii) MODEM: MODEM stands for Modulator/Demodulator which is an encoding as well as decoding device used in data transmission. It is a device that converts a digital computer signal into an analog telephone signal (i.e. it modulates the signal) and converts an analog telephone signal into a digital computer signal (i.e. it demodulates the signal) in a data communication system. Modem is used for handling data streams from a peripheral device to the CPU and vice versa through the common carrier network. These communication channels include telephone lines, microwave links or satellite transmission.
 - (ix) Multiplexer: The multiplexer scans each device to collect and transmit data on a single line to the CPU, thus enabling several devices to share one communication line. It also communicates transmission from the CPU to the appropriate terminal linked to the Multiplexer.
 - (x) Front-end communication processor: It is a programmable device which controls the functions of communication system and support the operations of a mainframe computer by performing functions like code conversions, editing and verification of data, terminal recognition and control of transmission lines. The mainframe computer is then able to devote its time to data processing rather than data transmission.
 - (xi) Protocol converters: A protocol is a set of rules required to initiate and maintain communication between a sender and receiver device. Dissimilar devices cannot communicate with each other unless a strict set of communication standards is followed. Because an organization's network typically evolved over numerous years, it is often composed of a mixture of many types of computers, transmission channels, transmission modes, and data codes. To enable diverse systems components to communicate with one another and to operate as a functional unit, protocol conversion may be needed like conversion from ASCII to EBCDIC. Protocol conversion can be done via hardware, software, or a combination of hardware and software.
 - (xii) Remote Access Device: Remote access device is a modem bank that serves as gateways to the Internet by properly routing all incoming and outgoing connections.
13. (a) There are 3 different transmission modes characterized according to the direction of the exchanges: Simplex, Half-duplex and Full-duplex connections:

- **Simplex Connection:** A simplex connection is a connection in which the data flows in only one direction, from the transmitter to the receiver. Simplex mode is seldom used because a return path is generally needed to send acknowledgements, control or error signals. This type of connection is useful if the data do not need to flow in both directions. For example, a print command from a computer to the printer.
 - **Half-duplex Connection:** A half-duplex connection (or semi-duplex) is a connection in which the data flows in one direction or the other, but not both at the same time. With this type of connection, each end of the connection transmits in turn, making it possible to have bidirectional communications using the full capacity of the line. For example: Walkie Talkie.
 - **Full-Duplex Connection:** A full-duplex connection is a connection in which the data flow in both the directions simultaneously. Each end of the line can thus transmit and receive at the same time, which means that the bandwidth is divided in two for each direction of data transmission if the same transmission medium is used for both directions of transmission.
- (b) **Transmission Techniques:** Various transmission Techniques are briefly discussed below:-
- **Circuit Switching:** A Circuit Switched network is the one that establishes a fixed bandwidth circuit (or channel) between nodes and terminals before the users may communicate, as if the nodes were physically connected with an electrical circuit. In circuit-switching, this path is decided upon before the data transmission starts. The system decides on which route to follow, based on a resource-optimizing algorithm, and transmission goes according to the path. For the whole length of the communication session between the two communicating bodies, the route is dedicated and exclusive, and released only when the session terminates. For example –Telephone systems use the concept of Circuit Switching.
 - **Packet switching:** It is a sophisticated means of maximizing transmission capacity of networks. Packet switching refers to protocols in which messages are broken up into small transmission units called packets, before they are sent. Each packet is transmitted individually across the net, wherein each packet may follow different routes to the destination. Thus, each packet has header information which enables to route the packet to its destination. At the destination the packets are reassembled into the original message. Passwords and all types of data can be included within the packet and the transmission cost is by packet and not by message, routes or distance. Sophisticated error and flow control procedures are applied on each link by the network.
 - **Message Switching:** Some organizations with a heavy volume of data to transmit use a special computer for the purpose of data message switching. The computer receives all transmitted data, stores it, and when an outgoing communication line is available, forwards it to the receiving point.

14. (a) A Decision Table is a table which may accompany a flowchart, defining the possible contingencies that may be considered within the program and the appropriate course of action for each contingency. Decision tables are necessitated by the fact that branches of the flowchart multiply at each diamond (comparison symbol) and may easily run into scores and even hundreds. If, therefore, the programmer attempts to draw a flowchart directly, he is liable to miss some of the branches.

The components of the decision table are following:

- (i) Condition Stub - Statement which introduce one or more conditions (i.e., factors to consider in making a decision) or comparisons.
- (ii) Condition Entries - Which list in its various columns the possible permutations of answer to the questions in the conditions stub ie.. the entries that complete condition statements.
- (iii) Action Stub - Which comprehensively lists one or more actions to be taken along the various program branches.
- (iv) Action Entries - Which lists, in its columns corresponding to the condition entries the actions contingent upon the set of answers to questions of that column.
- (v) Rules - Unique combinations of conditions and actions to be taken under those conditions.
- (vi) Header - Title identifying the table.
- (vii) Rule Identifiers - Code (R1, R2, R3,) uniquely identifying each rule within a table.
- (viii) Condition Identifiers - Codes (C1, C2, C3,...) uniquely identifying each condition statements/entry.
- (ix) Action Identifiers - Codes (A1, A2, & A3...) uniquely identifying each action statement/entry

A decision table is given below as an example :—

		Granting Credit Facility	R1	R2	R3	
Part 1	C1	Credit limit Okay	Y	N	N	Part 3
	C2	Pay experience Favorable	-	Y	N	
Part 2	A1	Allow Credit Facility	X	X		Part 4
	A2	Reject Order			X	

There are two conditions: C1 and C2 in this table and two actions: A1 and A2.

According to R1 (a set of rules), if there is a “Y” (Yes) to C1 and C2 is to be bypassed, action A1 will be taken, that is, “Allow credit facility”. Under R3, “N”(No) to both C1 and C2 requires action A2 to be taken.

(b) Following are the types of Decision Table:

- ◆ **Limited Entry Tables:** In a limited entry table, the condition and action statements are complete and merely define whether or not a condition exists or an action should be taken. The symbols used in the condition entries are :

Y : Yes, the condition exists

N : No, the condition does not exist.

— : Irrelevant, the condition does not apply, or it (or blank) makes no difference whether the condition exists or not.

The symbols used in the action entries are:

X : Execute the action specified by the (or blank) action statement.

— : Do not execute the action specified by the (or blank) action statement.

- ◆ **Extended Entry Table:** The condition and action statements in an extended entry table are not complete, but are completed by the condition and action entries.

Example :

	Granting Credit Facility	R1	R2	R3
C1	Credit Limit	OK	Not OK	Not OK
C2	Pay Experience	-	Favorable	Unfavorable
A1	Credit Facility	Allow	Allow	-
A2	Credit Action	-	-	Reject Order

- ◆ **Mixed Entry Table:** The third type of decision table is the mixed entry form which combines both the limited and extended entry forms. While the limited and extended entry forms can be mixed within a table, only one form may be used within a condition statement/entry or an action statement/entry.

Example:

	Granting Credit Facility	R1	R2	R3
C1	Credit Limit Okay	Y	N	N
C2	Pay Experience	-	Favorable	Unfavorable
A1	Credit	Allow	Allow	-
A2	Reject Order			X

(c) Advantages and Disadvantages of Decision Table are:

Advantages are:

- (i) A decision table provides a framework for a complete and accurate statement of processing or decision logic. It forces a discipline on the programmer to think through all possible conditions.
- (ii) A decision table may be easier to construct than a flow chart.
- (iii) A decision table is compact and easily understood making it very effective for communication between analysts or programmers and non-technical users. Better documentation is provided by it.
- (iv) Direct conversion of decision table into a computer program is possible. Software packages are available which take the statement specifying a decision table and compile it into a program.
- (v) It is possible to check that all test combinations have been considered.
- (vi) Alternatives are shown side by side to facilitate analysis of combinations.
- (vii) The tables show cause and effect relationships and use standardized format.
- (viii) Typists can copy tables with virtually no question or problems.
- (ix) Complex tables can easily be split into simpler tables.
- (x) Table users are not required to possess Computer knowledge.

Disadvantages are:

- (i) Total sequence - The total sequence is not clearly shown i.e., no overall picture is given by decision tables as presented by flow charts.
- (ii) Logic - Where the logic of a system is simple, flowcharts nearly always serve the purpose better than a decision table.

15. (a) Flowchart is defined as a diagram, prepared by the programmer, of the sequence of steps, involved in solving a problem. It is like a blueprint, which shows the general plan, architecture, and essential details of the proposed structure. It is an essential tool for programming and illustrates the strategy and thread of logic followed in the program. It allows the programmer to compare different approaches and alternatives on paper and often shows interrelationships that are not immediately apparent. A flowchart helps the programmer avoid fuzzy thinking and accidental omissions of intermediate steps.

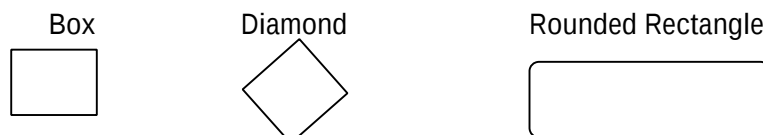


Fig. : Flowchart symbols

The box in above Fig. is an action symbol. Such actions as “dress” etc. would be written within the box. The diamond shown in figure is the symbol for posing a question.

COMPUTER FLOWCHARTING SYMBOLS

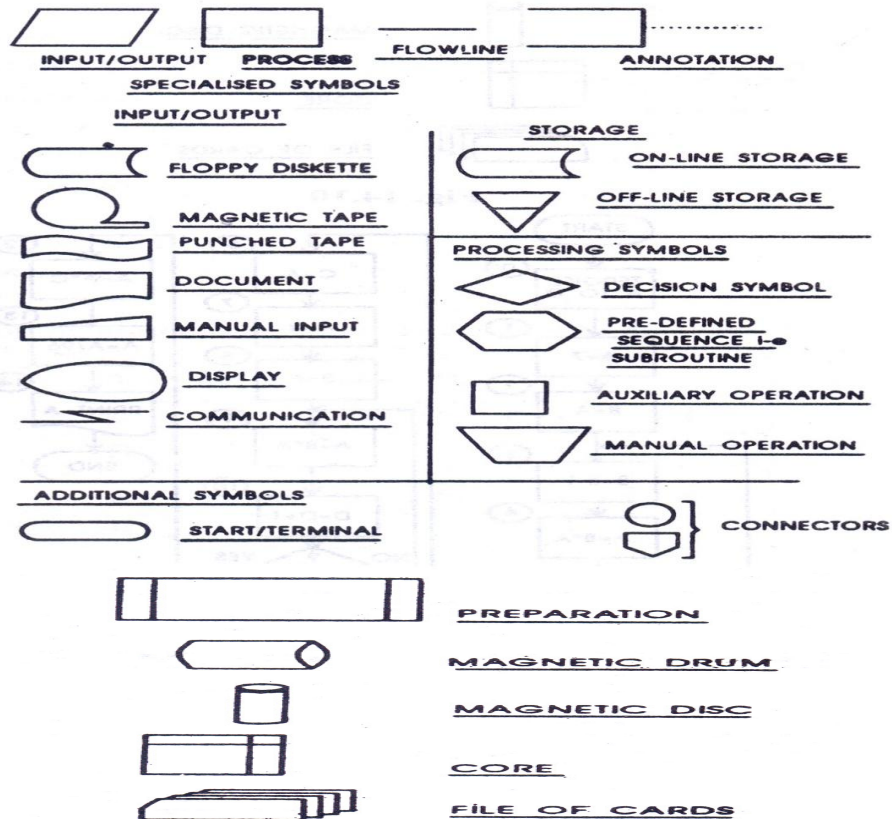


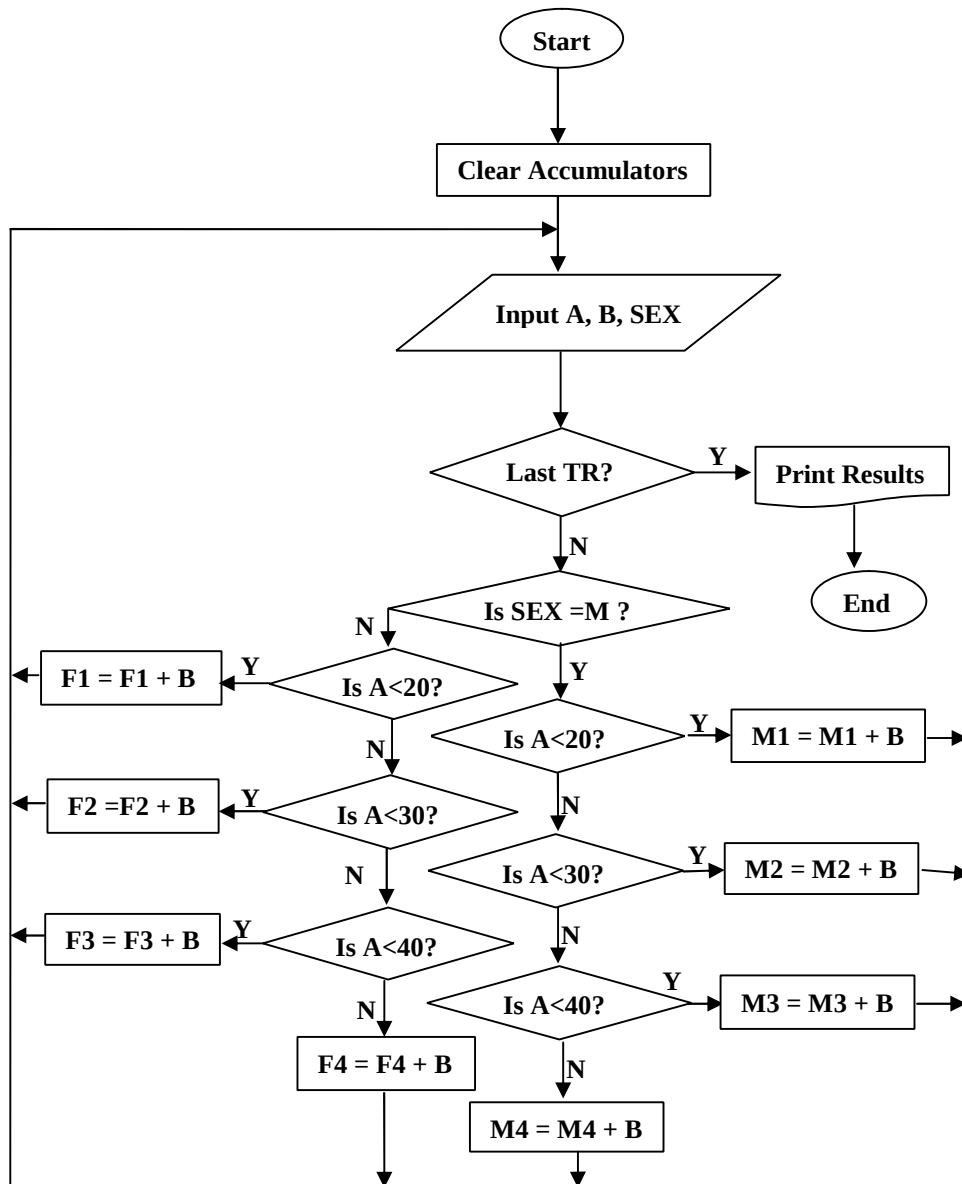
Fig. : Some more Flowchart symbols

More flowcharting symbols are explained in above Fig. with their description.

(b) Limitations of flowcharts are given below:

- (i) Complex logic - Flowchart becomes clumsy when the problem logic is complex.
- (ii) Modification - If modifications are required, it may require complete re-drawing.
- (iii) Reproduction - Reproduction of flowcharts is often a problem because the symbols used in flowcharts cannot be typed.
- (iv) Link between conditions and actions - Sometimes it becomes difficult to establish the linkage between various conditions and the actions to be taken there upon for a particular condition.
- (v) Standardization - Program flowcharts, although easy to follow, are not such a natural way of expressing procedures as writing in English, nor are they easily translated into Programming language.
- (vi) The essentials of what is done can easily be lost in the technical details of how it is done.

- (vii) There are no obvious mechanisms for progressing from one level of design to the next e.g., from system flowchart to run flowcharts, program flowchart etc.
- (c) The program flowchart is given in Fig. below.



M1 to M4 accumulate balances for the 4 age groups of male customers and likewise F1 to F4 for the female customers. Age is symbolized by A, balance by B and Sex is codified as M or F. The last record is dummy.

16. (a) The storage structure design entails the decisions, which must be made on how to make it linear and to partition the data structure so that it can be stored on some device.

To manage storage media, four functions must be undertaken:

- (i) To ensure that removable storage media are stored in a secure and clean environment.
- (ii) To ensure that storage media are used for authorized purposes only.
- (iii) To ensure maintenance of storage media in good working condition, and
- (iv) To ensure location of storage media at on-site / off-site facilities.

A storage media can contain critical files and hence should be housed securely in a constant temperature, dust free environment. In case of mainframe operations, a separate room may be required just adjacent to computer room to house storage media required during daily operations, restricting access to the room and fixing the responsibility in the hands of a file librarian. For managing a bulk of removable storage media effectively an automated library system is needed which records the following –

- (i) An identifier of each storage medium,
- (ii) Location where each storage medium is at present placed,
- (iii) Identity of the person responsible for storage medium,
- (iv) Identity of the present custodian of the storage medium,
- (v) List of files stored on each medium,
- (vi) List of authorized persons to access,
- (vii) Date of purchase and history of use with history of difficulties in using the storage medium,
- (viii) Date of expiry when contents of the storage medium can be deleted,
- (ix) Date of last release from and date last return to the file library,

In mainframe environments, file librarians issue removable storage media as per authorized production schedule by transporting the required media themselves to computer room and collecting it after the production runs. In micro computer environments, the extent of control over its use is dependent on the criticality of the data maintained on it. Care should also be taken when multiple files are assigned to a single medium, for an application system reading one file may also read another file containing sensitive data. To reduce the chance of exposure of sensitive data at some point of time, file should be expunged out of storage media as soon as their

retention dates expire. Such media can then be reused to store other files, thereby reducing the inventory requirement.

- (b) Reliability of storage media should be monitored, especially which are used to store critical files, since the reliability decreases with age. For example, an increasing number of read / write errors are crept in the magnetic tapes and diskettes as these become older and used more. Some of the following measures to monitor the reliability of storage media are:
 - (i) Storage media should not be kept unused for longs, otherwise the possibility of read / writes error occurring with the media increases. With a magnetic tape for example, pressure builds up towards its center on its hub as it grows older. The pressure causes bonding and compacting of the ferromagnetic material from which the magnetic tape is made resulting in unread ability of the tape. Thus a backup storage media need to be managed and should be retrieved at regular intervals and backup files re-written to another fresh medium.
 - (ii) When storage media becomes unreliable, it is best to discard it; after ensuring that all sensitive data is removed from the discarded media. Simply deleting the files on the media does not serve the purpose. It may be necessary to carry out bulk erasure followed by writing random bits to the media followed by carrying out of bulk erasure once again.
 - (iii) If storage media is required to be sent out side the organization for cleaning or repair, care should be taken to erase any sensitive data contained. The data on magnetic tapes for example, can be erased by degaussing or demagnetization.
 - (iv) Removable storage media should be located on-site when these are needed to support production running of application systems and should be located off-site when intended for backup and recovery. The file librarian manages transport of removable storage media to and from off-site locations with a compliance with the backup schedules. Backup schedules are prepared by a team comprised of security administrator, data administrator, application project manager, system development manager, operations manager and the file librarian.
17. Language translator is a general term used for any assembler, compiler or other routine that accepts statements in one language and produces equivalent statements in another language. The language processor reads the source language statements one at a time and prepares a number of machine instructions to perform the operations specified or implied by each source statement. Most computer installations have several language processors available, one for each programming language the computer can accept. The three most widely used types of language translators are Compilers, Interpreters and Assemblers.

- ◆ **Compilers:** A compiler translates the entire program written in high-level languages such as COBOL, FORTRAN, and Pascal into machine language before the program is executed.

Program is entered into the computer system and submitted to the appropriate compiler. For instance, A COBOL program is input to a COBOL compiler; a Pascal program, to a Pascal compiler. The program submitted for compilation called as a source program (or source module) is translated into machine language by the compiler, producing an object program (or object module). Then, another software program called a linkage editor binds the object module of this program to object modules of any subprograms that must be used to complete processing. The resultant program, which is ready for computer execution, is called a load program (or load module). This entire process is sometimes referred to as “Compile/Link-Edit/Go” corresponding to the compilation, link-editing, and execution stages that the user must go through to get a program processed.

- ◆ **Interpreters:** Whereas compilers translate programs into machine language all at once before programs are run, interpreters translate programs a line at a time as they are being run. For instance, if a user has a program in which a single statement is executed a thousand times during the course of the program’s run, an interpreter would translate that statement a thousand different times into machine language. With an interpreter, each statement is translated into machine language just before it is executed. No object module or storable load module is ever produced.

Although interpreters have the glaring weakness of inefficiency because they translate statements over and over, they do have some advantages over compilers.

- These are usually easier and faster to use, since the user is not bothered with distinct and time-consuming compile, link-edit, and execution stages.
 - These typically provide users with superior error messages. When a program contains an error and “blows up,” an interpreter knows exactly which statement triggered the error – the one it last translated. Because interpreters stop when errors are encountered, they help programmers debug their programs. This boosts programmer productivity and reduces program development time.
 - These require less storage space in primary memory than a compiler for that language, and thus are ideal for programming environments in which main memory is limited, such as on low-end microcomputers.
 - These are usually less expensive than compilers.
- ◆ **Assemblers:** Assemblers are used exclusively with assembly languages. They work similarly to compilers, translating an assembly language program into object code. Because assembly language programs are usually more machine efficient than those written in high-level languages, a two-step translation process may take

place. First, the high-level language is translated to assembly language; then, using an assembler, it is converted to machine language.

18. Operating system is a system software which act as an interface between hardware and user. It has two goals:

- Resource allocator
- Control Program

The resources like Processor, Hard Disk, Memory etc. are allocated by the Operating system. As control program it provides the environment for the execution of the program and prevents improper use of computer.

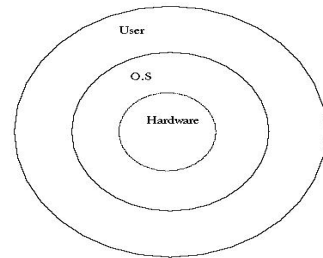


Fig.: Operating System as an Interface

There are six basic functions that an operating system can perform

- (i) **Schedule Jobs:** They can determine the sequence in which jobs are executed, using priorities established.
- (ii) **Manage Hardware and Software Resources:** They can first cause the user's application program to be executed by loading it into primary storage and then cause the various hardware units to perform as specified by the application.
- (iii) **Maintain System Security:** They may require users to enter a password - a group of characters that identifies users as being authorized to have access to the system.
- (iv) **Enable Multiple User Resource Sharing:** They can handle the scheduling and execution of the application programs for many users at the same time, a feature called multiprogramming.
- (v) **Handle Interrupts:** An interrupt is a technique used by the operating system to temporarily suspend the processing of one program in order to allow another program to be executed. Interrupts are issued when a program requests an operation that does not require the CPU, such as input or output, or when the program exceeds some predetermined time limit.
- (vi) **Maintain Usage Records:** They can keep track of the amount of time used by each user for each system unit - the CPU, secondary storage, and input and output devices. Such information is usually maintained for the purpose of charging users' departments for their use of the organization's computing resources.

Operating System functions at two different levels-the hardware level and the user level. The interaction of the OS with the computer's hardware level is, for the most part, hidden from the user. For example, signals relayed from the keyboard to the computer's microprocessor are done automatically, under the control of the OS, and without further recourse to instructions from the user. The user has to access and

operate an appropriate user interface to install programs/ applications, copy files, perform search routines or execute any one of a wide and ever-increasing range of tasks.

MS /PC-DOS, Microsoft Windows having flavors like Windows 95, Windows NT are some of the examples of operating system.

19. Magnetic tape is the oldest secondary storage technology still in wide use in which data is accessed sequentially only. Two most popular forms of magnetic tape for large system MIS applications are: Detachable Reel Magnetic Tapes and Tape Cartridges.

- **Detachable Reel Magnetic Tapes:** Many of the tapes used with mainframes and minicomputers are stored on detachable reels. These plastic tapes, like disks are coated with a magnetizable surface (often iron oxide) that can be encoded with 0 and 1 bits. Tapes come in various widths, lengths, and data densities. A common specification is a 2400 feet reel of $\frac{1}{2}$ inch diameter tape that packs data at 6250 bytes per inch. Recording densities of tapes are often cited as bytes per inch (bpi) because in most instances, a character (byte) is represented as a vertical slice of bits across the tracks of tape surfaces.

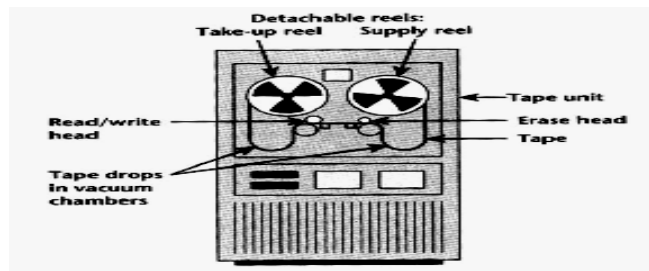


Fig. : Detachable Reel Magnetic Tape

Tapes are read on a hardware device called a tape unit as shown in Fig. above. An empty take-up reel, running at the same speed as the supply reel on which the tape is initially wound, accepts the tape as it is being processed. The tape is processed by passing it under read/write heads located between the two reels. Depending on the instructions given to the computer system, data can then either be read from the tape or written to it.

- **Tape Cartridge Systems:** Tape Cartridge systems represent the leading edge of tape technology and are available for both large and small computer systems to back up hard disks. These tapes, which are not designed for processing purposes, are sometimes called Streaming Tapes. The capacities of these tapes vary, and can usually back up the contents of a hard disk in a few minutes.

Unlike conventional detachable-reel tapes, which uses 9 parallel tracks, these $\frac{1}{2}$ inch tapes store data in 18 tracks. In 1992, IBM released 36 track tape cartridges for use in its mainframes and AS/400 family of midrange computers.

20. (a) Elements which have to be considered in designing of user interface are as follows –

- (i) Source documents to capture data.
- (ii) Hard copy output reports.
- (iii) Screen layout for source document input.
- (iv) Inquiry screens for database queries.
- (v) Command languages for decision support systems.
- (vi) Query languages for the database.
- (vii) Graphic display and color or non-monochromatic display.
- (viii) Voice output to answer users or answer queries.
- (ix) Screen layout manipulation by mouse or light pen.
- (x) Icons for representation of the output.

The interface design is developed as follows –

- (a) Identifying system users and classifying them into homogeneous groups.
- (b) The user group characteristics are understood like whether the system will be handled by novices or experts.
- (c) Eliciting the tasks which the users wish to perform using the system.
- (d) Commencing a preliminary design of the form of interaction that will support these tasks. Prototyping tools are usually employed to refine the design aspect with the users.

(b) Features of Program Library Management System Software are as follows:

- 1. It provides several functional capabilities to effectively and efficiently manage data center software inventory which includes –
 - Application Program Code.
 - System Software Code.
 - Job Control Statements.
- 2. It possesses integrity capabilities such that –
 - Each source program is assigned.
 - A modification number and a version number are assigned.
 - It is associated with a creation date.
- 3. It uses – Password, Encryption, Data Compression, and Automatic backup.

4. It possesses update capabilities with the facilities of Addition, Modification, Deletion and Re-sequencing library numbers.
5. It possesses reporting capabilities for being reviewed by the management and the end users by preparing lists of Additions, Deletions, Modifications, Library catalogue, and Library members attributes.
6. It possesses interface capabilities with the Operating System, Job scheduling System, Access control System and Online program management.
7. It controls movement program from test to production status.
8. At last, it changes controls to application programs.