

PAPER – 6 : INFORMATION TECHNOLOGY AND STRATEGIC MANAGEMENT

SECTION – A : INFORMATION TECHNOLOGY

QUESTIONS

1. Define the following terms.

(i) Microprocessor	(ii) BIOS	(iii) Cache Memory
(iv) Seek Time	(v) Clock Speed	(vi) Directory Program
(vii) Number Systems	(viii) String	(ix) Key
(x) Record	(xi) Schema	(xii) Random Access
(xiii) Data Mart	(xiv) Switch Network	(xv) Asynchronous Transmission
(xvi) Client	(xvii) Network Topology	(xviii) DSL Connection
(xix) Web Page	(xx) URL	(xxi) Surfing
(xxii) Smart Cards	(xxiii) Web Casting	
2. Convert the following from one number system to another number system.

(i) $(11101101)_2$	=	$(\quad)_{10}$
(ii) $(2575)_{10}$	=	$(\quad)_2$
(iii) $(755.50)_{10}$	=	$(\quad)_2$
(iv) $(101101.101)_2$	=	$(\quad)_{10}$
3. Give one or two uses of each of the following :

(i) Server	(ii) CMOS	(iii) SCSI
(iv) Register	(v) SVGA	(vi) COM
(vii) Sound Card	(viii) USB Connector	(ix) Distributed Database
(x) Modem	(xi) Bandwidth	(xii) Wireless LAN
(xiii) ISP	(xiv) Web Browser	(xv) Cyber Cash
4. Distinguish between the following :
 - (i) Workstation and Microcomputer
 - (ii) Dynamic RAM and Static RAM
 - (iii) Semi Conductor Memory and Bubble Memory
 - (iv) Impact printer and Non-Impact printer
 - (v) System Software and Application Software
 - (vi) DDL and DML
 - (vii) Client Server Database and Knowledge Database
 - (viii) Fixed Length Fields and Variable Length Fields

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- (ix) Local Area Network and Wide Area Network
- (x) Database Server and Application Server
- (xi) Two Tier and Three Tier system Architecture
- (xii) NID and HID
- (xiii) B2B and B2C
- (xiv) Intelligent Terminal and Key Board Printer Terminal

Historical Development of Computers

5. Discuss in detail various generations of Computers.

Computer System and its Parts

6. (a) What do you mean by a Computer? Discuss, in brief, advantages and Limitations of Computers.
- (b) Discuss, in brief, various features of the Central Processing Unit.

Secondary Storage Devices

7. (a) What are the factors that determine the number of characters that can be stored in a floppy diskette?
- (b) What care is required for storing the data in a diskette?

Input /Output Devices and its method

8. (a) Describe the various input devices used to input and capture the data.
- (b) What is DDE? Describe OMR in brief.
- (c) Describe the various characteristics of printers.

Operating System

9. (a) Discuss various Types of Operating Systems in brief.
- (b) Discuss the features of the Operating System.

Application Software

10. (a) How a DSS can be helpful in taking the financial decisions ? Discuss in brief.
- (b) "ERP can be useful for an organization to execute certain amount of task in a well structured manner". Discuss in brief.

File Organization

11. (a) Define File Organization. Describe different types of file organizations in brief.
- (b) What are the various factors that determine the best file organization for a particular application?

Backup and Recovery

12. (a) Discuss various types of Database backup and Recovery methods.
- (b) Discuss various steps in the development of a backup and recovery strategy.

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Computer Networks

13. (a) Define Computer Network and its benefits in brief.
(b) In which ways a computer network can help a business?

Client/Sever Technology

14. (a) Discuss the benefits of Client/Server Technology.
(b) Briefly describe the characteristics of Client/Server Technology.

Data Centre

15. (a) What is a Data Centre? Discuss various features of a Data Centre.
(b) Explain value added services being offered by a Data Centre.
(c) What are the challenges faced by the management of a Data Centre?

Internet applications and its uses

16. (a) What are the various business uses of Internet ? Discuss in brief.
(b) Discuss applications of Internet in brief.

E-commerce

17. (a) What is e-Commerce? Discuss working procedure of e-Commerce in brief.
(b) Why Internet has emerged as the foundation for the world's new information infrastructure?

Intranet and Extranet

18. (a) Discuss the benefits of Intranet.
(b) What is Extranet? Discuss five rules defined in Extranet.

Flowcharting

19. (a) What is Program analysis? Discuss the benefits of Flow Chart.
(b) There are total 6,000 students in a university having four different disciplines. Their discipline code and yearly tuition fee per student details are as follows:

Discipline of student	Code	Yearly tuition fee
Medical	M	80,000
Engineering	E	60,000
Science	S	40,000
Arts	A	25,000

Draw a flowchart to read the name, discipline code of the student from the terminal/file. Find the total yearly revenue earned and the number of students discipline wise. Also find the percentage of contribution to the total revenue from each discipline of the students.

Print the total revenue collected and the number of students, the percentage of their

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contribution discipline wise to the total revenue earned by the university.

Decision Table

20. (a) Discuss advantages and disadvantages of a Decision Table.
- (b) A computer file has customer name, type, bill number, bill date, amount and the date of payment. If the customer is a dealer and pays his bills within 30 days, 10% discount is allowed. If it is 30 to 45 days, discount and surcharge is zero. If he pays after 45 days, he has to pay 10% surcharge. The corresponding percentages for a manufacturer are 12½%, 0, 12½%.

Write a decision table for the above problem.

SUGGESTED ANSWERS/ HINTS

1. (i) **Microprocessor:** A microprocessor is a programmable digital electronic component that incorporates the functions of a central processing unit (CPU) on a single semi conducting integrated circuit (IC). The word size of CPU has been reduced from 32 bits to 4 bits, so that the logic circuits of CPU would fit onto a single microprocessor.
- (ii) **BIOS:** BIOS (stands for Basic Input Output System) is a small chip on the motherboard that loads the hardware settings required for functioning of various devices like keyboards, monitors, or disk drives. It is a boot firmware program that controls the computer from the time we start it up until the operating system takes over. The BIOS also manages data flow between the computer's operating system and attached devices such as hard disk, video card, keyboard, mouse and printer.
- (iii) **Cache Memory:** Processors incorporate a special type of internal memory (cache) to boost processing power significantly. Some of the information in the main memory is duplicated in the cache memory which is slightly slower but of much greater capacity than the processor register and faster but much smaller than main memory. It comes in two types: L₁ and L₂ Cache.
- (iv) **Seek Time:** The time required to position a movable read-write head over the recording track to be used is called seek time. If the read-write head is fixed, the seek time will be zero.
- (v) **Clock Speed:** The clock speed is the speed at which the processor executes instructions. Clock speed is measured in megahertz (MHz)—which is a million cycles per second. Therefore, a 450 MHz processor performs 450 million instructions per second. Higher the clock's speed, the faster the processor, the better the system performance.
- (vi) **Directory Program :** This program allows a user to view the names of the data and program files which are stored on a disk/diskette. The Directory Program will not only list the files, but also shows the amount of kilobytes of memory these files occupy, the time and day when files were last revised and the amount of unused storage space available on the floppy.

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- (vii) **Number Systems** : It represents the numbers ranges from 0 to 9 , alphabets like A to Z and the special characters like =, -, *, ?, /, which are converted into 0s and 1s ,so that the computer can understand how to do the task assigned by the user.
- (viii) **String**: It refers to a data type consisting of a sequence of contiguous characters that represent the characters themselves rather than their numeric values. A String can include letters, numbers, spaces, and punctuation. The String data type can store fixed-length strings ranging in length from 0 to approximately 63K characters and dynamic strings ranging in length from 0 to approximately 2 billion characters. The codes for String characters range from 0–255.
- (ix) **Key**: A key is a set of one or more columns whose combined values are *unique* among all occurrences in a given table. A key is the relational means of specifying uniqueness.
- (x) **Record** : It is a collection of related fields that are treated as a single unit. For example, an employee record would be a collection of fields of one employee. These fields would include the employee's code, name, hours-worked, pay-rate, tax-rate-deduction, and so forth. Records are then grouped to form a file.
- (xi) **Schema** : A schema describe the logical structure of a database which separates all data definitions of the database management from ordinary file management into a separate entity. The schema then becomes a component of the overall data base itself. Database systems have several schemas, partitioned according to the levels of abstraction. At the lowest level is the **physical schema**; at the intermediate level is the **logical schema**; and at the highest level is a **subschema**.
- (xii) **Random Access**: Random Access pertains to the method of file organization in a storage device in which the access time of the storage device is not significantly affected by the location of the data to be accessed. It means that any item of data which is stored online can be accessed within a relatively short time (usually in part of a second).
- (xiii) **Data Mart** : A voluminous database which contains integrated data, detailed data, summarized data, historical data and metadata (data about data) is called a **data warehouse**. A database which contains selective data from a data warehouse meant for a specific function or department is called a **data mart**.
- (xiv) **Switched Network** : It is a type of network that provides switched communication system and in which users are connected with each other through the circuits, packets, sometimes message switching and the control devices. Active network elements like switch, router, gateways etc. participate in communication. Example of a switched network is public switch telephone network.
- (xv) **Asynchronous Transmission**: In Asynchronous mode of transmission, each character (1byte) to be transmitted is preceded by a start bit and terminated by one or more stop bits. The function of a start bit is to tell the receiver where the new character starts and that of stop bit is to tell the receiver that the character has

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ended. This mode is inefficient as the extra start and stop bits slow down the process of data transmission when there is huge volume of data to be transmitted.

- (xvi) **Client:** It is a software that is used to contact and obtain data from a server software program on another computer, often across a great distance. Each client program is designed to work with one or more specific kinds of server programs. A web browser is a specific kind of client.
- (xvii) **Network Topology :** The geometric arrangement of computer resources, remote devices and communication facilities is known as network structure or network topology. A computer network is comprised of nodes and links. A node is the end point of any branch in a computer whereas a link is a communication path between two nodes. A network structure determines which elements in a computer network can communicate with each other.
- (xviii) **DSL Connection :** Digital Subscriber Line (DSL) is also called an always-on-connection which uses existing 2-wire copper telephone line connected to the premise, not tied up with phone as a dial-up connection does. There is no need to dial-in to Internet Service Provider (ISP) as Digital Subscriber Line (DSL) is always on. The two main categories of Digital Subscriber Line (DSL) for home subscribers are called Asymmetric Digital Subscriber Line (ADSL) and Symmetric Digital Subscriber Line (SDSL).
- (xix) **Web Page :** The Web page is a text document that contains links to other web pages, graphic and audio files, and other Internet services such as file transfer protocol (FTP) and E-mail. Web pages reside on servers that run special software that allow users to access web pages and to activate links to other web pages and to Internet services.
- (xx) **Uniform Resource Locators (URL):** They are used to address and access individual web pages and Internet resources. The format of URL is protocol / internet address /web page address.
- (xxi) **Surfing:** Many of the servers on the Internet provide information, specializing on a topic or subject. When a user is looking for some information, it may be necessary for him to look for such information from more than one server. WWW links the computers on the Internet, like a spider web, facilitating users to go from one computer to another directly. When a user keeps hopping from one computer to another, it is called "surfing".
- (xxii) **Smart Cards:** Smart cards have an embedded microchip instead of magnetic strip. The chip contains all the information a magnetic strip contains but it also offers the possibility of manipulating the data and executing applications on the card. Three types of smart cards are: Contact Cards, Contactless Cards and Combi Cards.
- (xxiii) **Webcasting :** It is also called push technology which is web-based technology. It allows users to passively receive broadcast information rather than actively search the web for information. Push technology allows users to choose from a menu of

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sources, specifying what kind of information they want to receive. Once selected, the information is automatically forwarded to the user. Internet news services, which deliver the day's activities to the user's desktop, are an example of push technology.

$$\begin{aligned}
 2. \quad (i) \quad (11101101)_2 &= (\quad)_{10} \\
 &= 1 \times 2^7 + 1 \times 2^6 + 1 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 \\
 &= 128 + 64 + 32 + 0 + 8 + 4 + 0 + 1
 \end{aligned}$$

$$(11101101)_2 = (237)_{10}$$

$$(ii) \quad (2575)_{10} = (\quad)_2$$

2	2575	
2	1287	1
2	643	1
2	321	1
2	160	1
2	80	0
2	40	0
2	20	0
2	10	0
2	5	0
2	2	1
2	1	0
2	0	1

$$(2575)_{10} = (101000001111)_2$$

$$(iii) \quad (755.50)_{10} = (\quad)_2$$

To convert the given number from Decimal Number System to Binary Number System, first we will convert mantissa part, then the fractional part into Binary Number System.

Step – I

2	755	
2	377	1
2	188	1
2	94	0
2	47	0
2	23	1
2	11	1

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2	5	1
2	2	1
2	1	0
2	0	1

$$(755)_{10} = (1011110011)_2$$

Step – II

$$50 \times 2 = 1.0$$

$$(.50)_{10} = (1.0)_2$$

So,

$$(755.50)_{10} = (1011110011.1)_2$$

$$\begin{aligned} \text{(iv)} \quad (101101.101)_2 &= (\quad)_{10} \\ &= 1 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 + 1 \times 2^{-1} + 0 \times 2^{-2} + 1 \times 2^{-3} \\ &= 32 + 0 + 8 + 4 + 0 + 1 + 1/2 + 0 + 1/8 \\ (101101.101)_2 &= (45.625)_{10} \end{aligned}$$

3. (i) Server:

- a. It provides services to other computing systems called clients over a network and waits for service request from other computers on the network.
- b. It provides better access control and can reduce costs by reducing duplication of hardware/software.

(ii) CMOS: The PC uses the CMOS memory to store the date, time and system set up parameters, which are loaded every time the computer is started. It is powered by lithium ion battery.

(iii) SCSI: Small Interface System Interface (SCSI) is a device interface that is used to solve the problem of a finite and possibly insufficient number of expansion slots. Instead of plugging interface cards into computer's system bus via the expansion slots, SCSI extends the system bus outside the computer by way of a cable. In other words, it is an extension cord for computer bus.

(iv) Register:

- a. It is a high-speed memory location built directly into the CPU that is used to hold the data currently being processed.
- b. Registers contain information that the arithmetic and logic unit needs to carry out the current instruction.

(v) SVGA- It is known as Super Video Graphics adapter which is an improvement on the VGA. VGA provides high quality graphics and resolution using upto 256 colours. The two combinations of resolutions and colours provided by SVGA are (a) 640 x 480 pixels with 256 colours and (b) 1024 x 480 pixels with 16 colours.

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(vi) Computer Output MicroFilm (COM):

- a. It is an output technique that records output from a computer as microscopic images on roll or sheet film.
- b. It reduces characters 24, 42, or 48 times smaller than normal size. The information is then recorded on 16 mm, 35 mm or 105 mm Microfilm.

(vii) Sound Card :

- a. A sound card is a device which translates the electrical signal from the microphone into a digitized form that the computer can store and process. Sound cards can also translate digitized sounds back into analog signals that can then be sent to the speakers.
- b. It allows computers to produce sound such as music and voice.

(viii) USB connectors: USB stands for Universal Serial Bus. These ports provide the user with higher data transfer speed for different USB devices like keyboards, mouse, scanners or digital cameras.

(ix) Distributed Database:

- a. Processing of data is done at more than one site thus, it may save a lot of time and money for an Organization.
- b. Distributed database systems may also provide organizations with faster response times for filling orders, answering customer requests or providing managers with information.

(x) Modem (Modulator/Demodulator): It is an electronic device which is used to convert digital signals to analog telephone signals (modulation) and analog signals to digital data (demodulation) in a data communication system. Modem allows the communication *among* computers through telephone lines. Modems can be categorized on the basis of speed, price and other features. However, most commonly people classify them as internal or external. Speed of a modem can be 28.8Kbps (Kilo bits per second) or 56.6 Kbps.

(xi) Bandwidth : Bandwidth represents the difference between the highest and lowest frequencies that can be used to transmit data. In other words, it refers to a channel's information carrying capacity. It is usually measured in bits per second (bps).

(xii) Wireless LAN (WLAN) :

- a. A flexible data communication system implemented as an extension to a wired LAN using radio frequency (RF) technology, transmits and receives data over the air, minimizing the need for wired connections.
- b. Users can share information without any plug in or without any physical connection with wired infrastructure. Wireless LAN configurations range from simple peer-to-peer topologies to complex networks offering distributed data connectivity and roaming facilities.

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(xiii) **Internet Service Provider (ISP):** An institution that provides access to the Internet subscriber on a charge basis is referred to as Internet Service Provider. For example, in India VSNL (Videsh Sanchar Nigam Limited) is one of the Internet Service Providers.

(xiv) **Web Browser :** It is a special client software package which is used to view web pages on Internet from a server by a user request. This request is a standard HTTP request containing a page address. A page address looks like: <http://www.name.com>. Netscape and Internet Explorer are commonly used web browsers.

(xv) **Cyber Cash :** It is an electronic cheque which has all the features of a paper cheque. It functions as a message to the sender's bank to transfer funds, and, like a paper cheque, the message is given initially to the receiver who, in turn, endorses the cheque and presents it to the bank to obtain funds. The electronic cheque protects customers against fraud by encoding their account number with the bank's public key, thereby not revealing their account number to the merchant. As with the SET protocol, digital certificates can be used to authenticate the payer, the payer's bank, and bank account.

4. (i) **Micro-computer and Workstations :** A microcomputer is a full-fledged computer system that uses a microprocessor as its CPU. These are also called personal computers.

Workstations looks like a personal computer and is typically used by one person. In terms of processing power, workstations are faster than microcomputers but less than minicomputer.

Workstations differ significantly from microcomputers in two areas. Internally, workstations are constructed differently than microcomputers. They are based on different architecture of CPU called Reduced Instruction Set Computing (RISC) which results in faster processing of instructions compared to microprocessor based personal computers. Workstations are generally used by scientists and engineers.

Another difference is that most microcomputers can run on DOS, Windows and Windows NT Operating System whereas workstations generally run on the Unix Operating System or a variation of it.

Although workstations are still more powerful than the average personal computer, the difference in the capabilities of these types of machines are growing smaller.

- (ii) **Dynamic RAM and Static RAM :** **Dynamic RAM** is the most common type of main memory. It is dynamic because each memory cell loses its charge so it must be refreshed hundreds of times each second to prevent data from being lost.

Static RAM, on the other hand, is a lot faster, larger and more expensive. It is static because it need not be continually refreshed. Because of its speed, it is mainly used in cache memory.

The Static RAM retains the stored data as long as power remains on, whereas in Dynamic RAM the stored information is to be recharged before it disappears.

The power consumption of Dynamic RAM is less than Static RAM. In DRAM, the computer does the refreshing process taking time out from other chores every millisecond.

- (iii) **Semi-conductor memory and Bubble memory:** **Semi-conductor memory** is made up of very thin silicon chip which contains a number of small storage cells that can hold data. Instead of being made up of a series of discrete components, these units are constructed as integrated circuits, meaning that a number of transistors are integrated or combined together on a thin silicon wafer to form a complete set of circuits. The faster and more expensive bipolar semi conductor chips are often used in the ALU and high speed buffer storage sections of the CPU, while the slower and less expensive chips that employ metal-oxide semi-conductor technology are used in the main memory section.

On the other hand, **Bubble memory** is composed of small magnetic domains formed on a thin single-crystal film of synthetic garnet. These magnetic bubbles, which are actually magnetically charged cylinders, only a few thousands of a centimeter in size, can be moved across the garnet film by electric charges. The presence or absence of a bubble can be used to indicate whether a bit is 'on' or 'off'. Since data stored in bubble memory is retained when power to the memory is turned off, it can be used for auxiliary storage. Bubble memory has high potential because of its low production costs and its direct access capabilities, thus it may become widely employed as main memory technology. Since it is small, lightweight, and does not use very much power, bubble memory is finding a great deal of use as an auxiliary storage in portable computers.

- (iv) **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.

Non-impact printers: A non-impact printer forms characters by chemical or electronic means. Three types of non-impact printers are *thermal printers*, *ink-jet printers* and *laser printers*. They are fast in operation, printing a page, or even more in a second. The laser printer produces very high quality prints from a wide selection of character fonts.

- (v) **System Software and Application Software:** **System Software** comprises of those programs that direct the computer in performing tasks which are basic to proper functioning of the computer system or commonly needed by system users. The system software of one computer system may differ in many ways from that of another.

Application software directs the computer in performing specific user-related data processing tasks. Application programs fall in two categories viz., cross industry i.e. programs that perform tasks common to many industries or organisations and industry specific i.e. programs that perform tasks unique to a particular industry or organisation. The most popular application programs are used by individuals to

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improve the speed and quality of their work. Examples of such programs are payroll, general accounting, sales statistics, and inventory control etc.

Systems software is traditionally written in low-level languages. A detailed knowledge of system hardware is needed to write such programs. Hence, systems software are generally provided by the computer manufacturers or software development firms that specialize in writing systems program.

Application programs are either written by individual users in high-level language or written and marketed by service companies as generalised applications packages on modular design which can be tailor-made to cater to the needs of different users.

- (vi) **Data Definition Language (DDL)** is used to create a link between logical and physical structure of database file. Logical refers to the way the user views the data and physical refers to the way the data is stored on the storage media. Overall logical view of the data is called Schema and particular application view is called Sub-schema.

Functions performed by a DDL include the following:

- Describes the Schema and Sub-schema.
- Describes the field name and data type of each field.
- Indicates the keys of record i.e. defines Primary, Secondary and Foreign key.
- Defines data security restrictions i.e. defines the passwords and access rights of various users.
- Provides for Logical and Physical data independence.
- Provides means for associating the related records of different files.

On the other hand, **Data Manipulation Language (DML)** provides the techniques for processing the data stored in database files.

Functions performed by a DML include the following:

- Provides the techniques for data manipulation such as insertion, deletion and updation of records.
- Enables the user and application programmes to process the data on logical basis rather than physical location basis.
- Provides for programming languages independence. A DML must support various high level programming languages like COBOL, PL/1, C++ etc.
- Allows the user and application programmers to be independent of physical data structure and physical data structure maintenance.
- Provides for use of record relationship which is defined using the DDL.

- (vii) **A Client-server database** is designed in a structure whereby one system can connect to another system to ask question or instruct it to a perform job. The system that asks the questions and issues the instructions is the client and the system

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answering the queries and responding to the instructions is the server. The client machine contains the user interface logic, business logic and the database logic and the server machine contains the database. Both are coupled with a network of high bandwidth. The computational functions are shared in such a way that the server does all such higher level functions which it alone can do leaving the client to perform low level functions. A client-server database can be classified into 2-tier, 3-tier and n-tier models. The system is scalable i.e. as much as clients may be added or removed and the shared resources may be relocated to a larger and faster server or to multiple servers. This type of client-server database is a 2-tier model. In 3-tier and n-tier client-server database designs, there is an application server tier between the data server tier and the client tier. Client tier is responsible for data presentation, receiving user events and controlling the user interface. Application tier handles the business logic, protecting the data from direct access by the clients. Data server tier is responsible for data storage.

A knowledge database system provides functions to define, create, modify, delete and read data in a system. The type of data maintained in a database system historically has been declarative data describing the static aspects of the real world objects and their associations. A database system can also be used to maintain procedural data describing the dynamic aspects of the real world objects and their associations, for example, several amended versions of enactments in the field of labour laws to facilitate management decisions in pay negotiations. When both the declarative and procedural data are stored in a database, it constitutes a knowledge database with more powerful data maintenance.

(viii) Fixed Length Fields and Variable Length Fields

Under **Fixed Length Fields** scheme, fields are simply placed in a sequence one after another. Thus, while designing physical records, it conserves storage space. In this scheme, a trailing blank pad character field and leading zero pad numeric field is used. Hence, under fixed length field scheme we know the exact location, within a file for each of the fields of a physical record.

Variable Length Fields scheme makes the location of a particular field and a particular record irregular. That is, depending on which records exist and the precise values for fields, different records and fields will be in different locations. A common way to handle variable length field is to break the relation into a fixed length physical records containing all fixed length fields and one or more variable length physical records. In personal computers, this is how many DBMS handle a memo field which is a variable-length field.

(ix) Local Area Network and Wide Area Network

Following are the salient features of a LAN:

- Multiple user computers are connected together.
- Computers are spread over a small geographic region.
- Communication channels between the computers are usually privately owned.

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- Channels are relatively high capacity and error-free.
- LAN enables multiple users to share software, data, devices and physical media.

On the other hand, the salient features of a **WAN** are as stated below:

- Multiple user computers connected together.
- Computers are spread over a wide geographic region.
- Communication channels such as long distance telephone service, satellite transmission etc. are provided by third party.
- Channels are relatively low capacity and error-prone.
- WAN operates at a lower link speed, usually 1Mbps.
- WAN does not allow sharing of resources.

- (x) **Database Server** allows the user interface software to run on each user's PC (the client), and running the database engine in a separate machine (the database server) shared by all users. This approach can increase database performance as well as overall LAN performance because only selected records are transmitted to the user's PC, not large blocks of files. Database servers offer real potential for remote database access and distributed databases. Because the database server only returns selected database record(s) to the client machine (instead of large blocks of data), remote access over relatively slow telephone lines can provide acceptable performance. In addition, a client computer can make requests of multiple servers regardless of physical location.

Application Server is a server program that resides in the server (computer) and provides the business logic for the application program. The server can be a part of the network, more precisely the part of the distributed network. The server program is a program that provides its services to the client program that resides either in the same computer or on another computer connected through the network. Application servers are mainly used in Web-based applications that have a 3-tier architecture. The application server is a second/middle tier of the three-tier architecture. In other words, application servers are now an integral part of the three-tier architecture.

- (xi) **Two Tier systems:** A two-tier system consists of a client and a server. The database is stored on the server, and the interface used to access the database is installed on the client. Processing management is split between the user system interface environment and the database management server environment. The database management server provides stored procedures and triggers. The two-tier architecture is intended to improve usability by supporting a forms-based, user-friendly interface. It improves scalability by accommodating up to approx 100 users and improves flexibility by allowing data to be shared, usually within a heterogeneous environment. The two-tier architecture requires minimal operator intervention, and is frequently used in non-complex, non-time critical information processing systems. In this type of architecture, the business logic and the

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presentation layer is located on the client machine and the data layer is on the server machine. If the number of clients connecting to the sever are many then the server will be overloaded and this will make processing each client request very slow .The two tier design allocates the user system interface exclusively to the client. It places database management of the server and splits the processing management between client and server, creating two layers. It is extensively used in non-time critical information processing where management and operations of the systems are not complex. This design is used frequently in Decision Support system where the transaction load is light.

In **Three Tier systems**, the application server tier works in between the data server tier and the client tier. The tiers are bound together logically and can run on the same physical machine. This middle tier provides process management where business logic and rules are executed and can accommodate hundreds of users (as compared to only 100 users with the two-tier architecture) by providing functions such as queuing, application execution, and database staging. The third tier provides database management functionality and is dedicated to data and file services that can be optimized without using any proprietary database management.

The three tier architecture is used when an effective distributed client/server design is needed that provides increased performance, flexibility, maintainability, reusability and scalability, while holding the complexity of distributed processing from the user. Client-tier is responsible for the presentation of data, receiving user events and controlling the user interface. Application-server-tier is responsible for all the business logic. This tier protects the data from direct access by the clients. Data-server-tier is responsible for data storage.

- (xii) **Network Intrusion Detection (NID)** deals with information passing on the wire between hosts. NID devices intercept packets traveling along various communication mediums and protocols, usually TCP/IP. Once captured, the packets are analyzed in a number of different ways. Some NID devices will simply compare the packet to a signature database consisting of known attacks and malicious packet "fingerprints", while others will look for anomalous packet activity that might indicate malicious behavior. NID deals with data transmitted from host to host.

Host-based Intrusion Detection (HID) systems are designed to monitor, detect, and respond to user and system activity and attacks on a given host. Some more robust tools also offer audit policy management and centralization, supply data forensics, statistical analysis and evidentiary support, and in certain instances provide some measure of access control. HID is concerned with what occurs on the hosts themselves.

- (xiii) **B2B** stands for business-to-business, the exchange of services, information and/or products from one business to another, as opposed to between a business and a consumer. Business-to-business electronic commerce (B2B) typically takes the form of automated processes between trading partners and is performed in much higher volumes than business-to-consumer (B2C) applications. It can also encompass marketing activities between businesses, and not just the final transactions that

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result from marketing. It is also used to identify sales transactions between businesses.

B2C stands for business-to-consumer, the exchange of services, information and/or products from a business to a consumer, as opposed to between one business and another. Business-to-consumer electronic commerce (B2C) is a form of electronic commerce in which products or services are sold from a firm to a consumer. It minimizes internal costs created by inefficient and ineffective supply chains and creates reduced end prices for the customers. Two Classifications of B2C E-Commerce are –

- **Direct Sellers:** Companies that provide products or services directly to customers are called direct sellers. There are two types of direct sellers: E-tailers and Manufacturers.
- **Online Intermediaries:** Online intermediaries are companies that facilitate transactions between buyers and sellers and receive a percentage. There are two types of online intermediaries: brokers and infomediaries.

(xiv) **Intelligent Terminal** has an in-built processing capability. It is also user-programmable. It contains not only a storage area but also a microprocessor. The terminal can be programmed to communicate with and instruct the user who is entering data. It can also do some processing of the data internally such as sorting, summarizing, checking both input and computed values for reasonableness and so on, rather than relying on the mini-computer or the main-frame CPU. Intelligent terminals cost several times more than non-intelligent terminals but the savings they provide for many companies is much more than their cost. Intelligent terminals also provide a type of back up to the main computer because the terminal can handle some of the processing.

Keyboard printer terminal: Also known as teletypewriter, it consists of a keyboard for sending information to the computer and a printer, for providing a copy of the input and for receiving information from the computer. The output is normally typed on a continuous roll of paper at speeds typically between 20 to 50 characters per second. A paper tape reader/punch is sometimes incorporated in the design of a terminal to enable information to be keyed in and punched on to paper tape for retention of data or for subsequent input to the computer.

5. Generation of Computers are discussed below:

- (i) **First Generation computers :** UNIVAC (Universal Automatic Computer) was the first general purpose electrical computer and marked the beginning of the first generation of electrical computers. The first generation electrical computers employed vacuum tubes. These computers were large in size and required air conditioning. The input and output units were the punched card reader and the card punches. Because of the inherently slow speed of these input/output units, the power of the CPU was subjected to their speed.

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- (ii) **Second Generation computers:** These computers employed transistors and other solid state devices. Their circuits were smaller than the vacuum tubes, and generated less heat. Hence, the second-generation computers required less power, were faster and more reliable. There were two distinct categories of the second generation computers for business and scientific applications. They employed magnetic tape as the input/output media. Second generation computers successfully displaced the unit record equipment on cost benefit grounds in many installations.
- (iii) **Third Generation computers:** These employed integrated circuits in which all the elements of an electronic circuit are contained in a tiny silicon wafer. The third generation computers are much cheaper and more reliable than the second-generation computers. They are much faster with vast capacity to store the data and admit connection of a wide variety of peripherals particularly magnetic disk units. They are based on the principles of standardization and compatibility. The third generation computers can be used for both scientific and business applications. The third generation computers permit multi-programming which is interleaved processing of several programmes to enhance the productivity of the computer, time-sharing which is the use of the computer by several customers at a time, operating systems which optimize the man-machine capabilities and such data communications facilities as remote terminals. They also permit use of such high level languages as FORTRAN and COBOL. Third generation computers however, offered communication capabilities and the use of remote terminals and the trend was reversed to centralization.
- (iv) **Fourth Generation computers :** Fourth generation machines appeared in 1970's utilizing still newer electronic technology which enabled them to be even smaller and faster than those of the third generation. One of the major inventions, which led to the fourth generation, was the large scale Integrated Circuit (LSI). The LSI is a small "chip" which contains thousands of small electronic components that function as a complete system. In fact, the entire computer can be manufactured on a single chip of size less than 1/3 inch square. A single chip may perform the functions of the entire computer, calculator or control device.
- (v) **Fifth Generation computers :** Fifth generation computers perform all of the functions currently envisioned for real-life. The technology used in this era is artificial intelligence, which could reason well enough to hold conversations with its human operators, use visual input, and learn from its own experiences. Using recent engineering advances, computers are able to accept spoken word instructions (voice recognition) and imitate human reasoning. The ability to translate a foreign language is also moderately possible with fifth generation computers. Two such engineering advances are parallel processing, which replaces von Neumann's single central processing unit design with a system harnessing the power of many CPUs to work as one. Another advance is superconductor technology, which allows the flow of electricity with little or no resistance, greatly improving the speed of information flow. Computers today have some attributes of fifth generation computers. For example, expert systems assist doctors in making diagnoses by

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applying the problem-solving steps a doctor might use in assessing a patient's needs.

6. (a) A Computer is a Electronic Data Processing device capable of receiving input, storing sets of instructions for solving problems and generating output with high speed and accuracy.

Advantages of Computer Systems are :

- (i) **Speed:** The smallest unit of time in the human experience is, realistically, the second. Computer operations are measured in milliseconds, microseconds, nanoseconds, and picoseconds.
- (ii) **Accuracy:** Errors do occur in computer-based information systems, but precious few can be directly attributed to the computer system itself. The vast majority can be traced to a program logic error, a procedural error, or erroneous data. These are human errors.
- (iii) **Reliability:** Computer systems are particularly adept at repetitive tasks. They don't take sick leaves and coffee breaks, and they seldom complain. Anything below 99.9% uptime, the time when the computer system is in operation, is usually unacceptable.
- (iv) **Memory Capability:** Computer systems have total and instant recall of data and an almost unlimited capacity to store these data.
- (v) **Versatility:** The computer can be used for a variety of jobs-calculations, data retrieval, controlling machines, entertainment etc.

Limitations of Computer Systems are:

- (i) **Program must be reliable:** By using the program's branching ability, the computer may be able to modify its behavior according to the success or failure of past decisions. But a program that has operated flawlessly for months can suddenly produce nonsense.
 - (ii) **Application logic must be understood:** The computer can only process jobs which can be expressed in a finite number of steps leading to a specified goal. Each step must be clearly defined. If the steps in the solution cannot be precisely stated, the job cannot be done. This is why the computer may not be helpful to people in areas where subjective evaluations are important.
- (b) The heart of any computer is the central processing unit (CPU). It is this central processor that makes comparisons, performs calculations, reads, interprets and controls the execution of the instructions.

Various features of the Central Processing Unit are discussed below:

- (i) **Clock Speed:** The clock speed is the speed at which the processor executes instructions. Clock speed is measured in megahertz (MHz)—which is a million cycles per second. Higher the clock's speed, the faster the processor, the better the system performance.

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- (ii) **Cache:** Processors incorporate their own internal cache memory. The cache acts as temporary memory and boosts processing power significantly. The cache that comes with the processor is called Level One (L1) cache. This cache runs at the processor's clock speeds, and therefore is very fast. The L1 cache is divided into 2 sections—one for data, the other for instructions. Generally, more the L1 cache, faster the processor.
- (iii) **Architecture:** The CPUs architecture determines the manner in which it processes data. CPUs employ multi-staged pipelines for transmitting data. To ensure proper data flow through these lines, the CPU includes a kind of prediction and error correction mechanism.
- (iv) **Slot:** Different processors use different sockets or slots to fit onto the motherboard. Based on the type of processors, there are two main types of slots for connecting to the motherboard—Socket 7 and Slot 1.
- (v) **Density:** A CPU is made up of millions of small transistors. A CPU performs all the calculation and manipulation operations by synchronising between the transistors. Therefore, the shorter the distance between two transistors on a CPU, the faster the performance.
- (vi) **MMX:** MMX stands for Multimedia Extensions—a set of instructions built in to the CPU, specifically intended for improving the performance of multimedia or graphic applications—mainly games. However, one needs to have applications specifically designed to take advantage of MMX.

7. (a) **Diskette Storage capacity depends upon the following factors:**

- (i) **Number of sides of the diskette used:** Earlier disks and drives were designed so that data could be recorded only on one side of the diskette. Now a days disk drives are manufactured so that data can be read/written on both sides of the diskette. Such drives are called 'Double Sided Drives'. The use of double sided drives and diskette approximately doubles the number of characters that can be stored on the diskette.
- (ii) **The recording density of the bits in the track:** Recording density refers to the number of bits that can be recorded on a disk in one inch circumference of the innermost track on the diskette. This measurement is referred to as bits per inch (bpi). For the user, the diskette is identified as being either single density or double density. A single density drive can store 2768 bits per inch.
- (iii) **The number of tracks on the diskette:** Number of tracks depends upon the drive being used. Many drives record 40 tracks on the surface of the diskette. Other drives, however, can record 80 tracks on the diskette.

In case of hard disk the storage capacity depends on the number of platters that are stacked on the top of one another, the number of tracks per platter and the number of sectors per track. Hard disks generally have 6 platters, i.e. 12 faces out of which eleven faces can be used. Each side may have 200 or

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more tracks, each track having 54, 63 or even more sectors per track and hard disk generally store 512 bytes of data in a sector. Data on magnetic disc is stored in cylinders where the nth track of each face vertically above and below each other constitutes cylinder n.

Thus, the storage capacity of hard disk is calculated as

$$= \text{No. of cylinders} \times \text{No. of usable sides} \times \text{No. of sectors / track} \times \text{No. of bytes / sector.}$$

(b) Care required in using and storing a diskette :

- (i) On receiving a new diskette, it should be inspected for sign of obvious damage. The surface of the diskette should not be touched with hand or some sharp object.
- (ii) Write-protect precaution should be observed by peeling off or sticking on (as applicable) the aluminum square on the notch.
- (iii) Correct insertion of disk in the disk drive is essential, otherwise some data stored on the disk is likely to be destroyed or the disk itself may get damaged. The diskette should be inserted slowly in the disk drive only when power to the entire computer system is on. It should be removed prior to turning the system off.
- (iv) As a defensive measure, it is advisable that a back-up copy of the information stored on each diskette be prepared and stored separately at a safe location. The diskette should be properly labeled for right identification.
- (v) While storing a diskette, both physical and environmental factors should be considered. Diskette should not be stored in such a way that may sag, slump or compress it.
- (vi) Diskette should be protected from main enemies like temperature and direct sunlight, dust, liquids and vapors and electromagnetic interference. Care should be taken to clean the disk drive head to remove dust regularly.

8. (a) The various input devices are:

- (i) **Keyboard:** A microcomputer's keyboard is normally its primary input and control device. One can enter data and issue commands via the keyboard. Besides the standard typewriter keyboard, most micro keyboards have function keys, also called soft keys of a document or worksheet that extend past the bottom, top, or sides of the screen. This is known as scrolling. The user can use the up and down arrow keys ($\uparrow \downarrow$) to scroll vertically and the left and right keys ($\leftarrow \rightarrow$) to scroll horizontally.
- (ii) **Mouse:** The Mouse is a small box, from the bottom of which protrudes a small ball bearing. The ball bearing rotates when the user moves the mouse across his desk and, as it is linked by cable to the microcomputer, this moves the cursor on the display screen. When the cursor alights on the facility required, the user presses a button on the top of the mouse and it is activated. A mouse

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may have one, two or three buttons. A mouse may be classified as a mechanical mouse or an optical mouse, depending on the technology it uses.

- (iii) **Touch Screen:** An invisible microwave beam 'matrix' criss crosses the screen, emanating from holes along the bottom and sides of the display unit. By pressing the finger against a function or program displayed on the screen, the infrared beam is broken at that intersection and the system is activated. Touch screens are used in information providing systems.
 - (iv) **Light Pen:** A light pen is a pointing device which can be used to select an option by simply pointing at it, or to draw figures directly on the screen and move the figures around. A light pen has a photo-detector at its tip. This detector can detect changes in brightness of the screen. When the pen is pointed at a particular point on the screen, it records the instant change in brightness that occurs and informs the computer about this. Light-pens are useful for menu-based applications. Instead of moving the mouse around or using a keyboard, the user can select an option by pointing at it. A light pen is also useful for drawing graphics in CAD.
 - (v) **The Track Ball:** A track ball is a pointing device that works like an upside-down mouse. The user rests his thumb on the exposed ball and his fingers on the buttons. To move the cursor around the screen, the ball is rolled with the thumb. Since the whole device is not moved, a track ball requires less space than a mouse. When space is limited, a track ball can be a boom. Track balls are particularly popular among users of notebook computers.
 - (vi) **Joystick:** It is a screen pointing input device. It is a vertical lever usually placed in a ball socket, which can be fitted in any direction to control cursor movements for computer games and for some professional applications.
- (b) **Direct Data Entry (DDE):** Direct Data Entry refers to entry of data directly into the computers through machine-readable source documents. DDE does not require manual transcription of data from original paper documents. These devices can scan source documents magnetically or optically to capture data for direct entry into the computer.

OMR are commonly used for scoring tests. It is marked by the person taking the test, and can be read by the optical mark page reader. The optical mark reader when on-line to the computer systems, can read up to 2,000 documents per hour. Seemingly this rate is slow but the fact that transcription has been eliminated, the overall time is less than those of the conventional file media. OMR can also be used for such applications as order writing, payroll, inventory control, insurance, questionnaires, etc. In all optical readers, the printed marks and/or characters must be scanned by some type of photo-electric device, which recognizes characters by the absorption or reflectance of light on the document (characters to be read are non-reflective). Reflected light patterns are converted into electric impulses, which are transmitted to the recognition logic circuit — there they are compared with the characters the machine has been programmed to recognize, and, if valid, are then

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recorded for input to the CPU. If no suitable comparison is possible, the document may be rejected.

(c) Various characteristics of printers are:

(i) **Speed:** The speed of a printer is measured in terms of cps (characters per second), lps (lines per second) or ppm (pages per minute). The speed of a dot-matrix printer is measured in cps. While the speed can vary widely, it is generally 200 cps. A line printer prints a line at a time. Its speed can be anywhere from 5 to 50 lps.

(ii) **Quality of output:** Depending on the type of characters formed, printers can be classified as draft, near letter quality (NLQ) or letter quality printers.

In a **draft quality printer**, a character is formed by arranging dots to resemble it. Although the characters can be distinguished, the output is not as good as that of near letter quality printouts. A dot-matrix printer is an example of a draft printer.

Near letter quality (NLQ) printers use a special character which resembles that of a typewriter. A daisy wheel printer is an example of a NLQ printer. Most dot-matrix printers can also be set to produce near letter quality printouts.

Letter quality printers use a character set in which each letter or character is fully formed. The quality of output is the best in such printers. A laser printer is an example of a letter quality printer.

(iii) **Direction:** Printers can be unidirectional or bi-directional. In a unidirectional printer, printing takes place in one direction only. After printing a line from left to right, the print head returns to the left without printing. A bi-directional printer prints both ways.

9. (a) Various types of operating systems are discussed below:

(i) **MS/ PC-DOS :** The origin of Microsoft's Disk Operating System (MS-DOS) lies in the pre-launch era of the IBM PC. It is a single user single tasking Operating System that provides Command User Interface(CUI) to the PC users.

(ii) **OS/2:** In 1987 IBM and Microsoft announced a new PC OS called OS/2 (Operating System Two). Unfortunately, the original OS/2 was not very successful. One of the reasons for the slow uptake of OS/2 was the then considerable hardware demand of this particular application. Another more serious problem with the original OS/2 that was regarding its inability to support many existing PC applications. So users faced problems due to lack of compatibility between their original applications and OS/2.

(iii) **Microsoft Windows:** The first version of the Microsoft Windows OS was launched in 1983. Microsoft allowed developers to produce software applications to run on their Windows OS without the need to notify them and hence encouraged the whole industry to work with their product. Though the

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original version of Windows was not very successful, MS-Windows-3 became the world's best selling 16-bit GUI operating systems.

Windows 95/98 and Windows NT are the most popular Microsoft Windows operating systems.

Windows 95: It is a 32 bit OS which was released in August, 1995. It was designed to have certain critical features. These included:

- A 32-bit architecture which provides for a multi tasking environment.
- A friendly interface fitted with 'one click' access.
- Windows 95 is network ready i.e. it is designed for easy access to network resources.
- It is backwardly compatible with most Windows 3.1 / DOS applications.

Window NT: Window NT represents an industry standard mission critical operating system. It is 32 bit operating system and represents the preferred platform for the Intel's more powerful Pentium range of processors. Although not exactly the same, Windows NT 4.0 is very similar in appearance to Windows 95. Critical features that allow the program to context the commercial OS market include:

- Stable multitasking environment
- Enhanced security features
- Increased memory
- Network utilities
- Portability

Windows NT is more expensive than other Windows OS and makes greater processing demands, but due to its features it is recognized as a competent and useful OS.

Later Microsoft brought various versions, **Windows Vista** being the latest one. This OS has various features:

- It has a 32/64 bit architecture which provides an environment for multitasking; allowing the user to run multiple programs or execute multiple tasks concurrently. This architecture also enables faster data/file access as well as an improvement in printing delivery.
- A friendlier interface fitted with 'one click' access. One click access refers to the fact that user did not have to double click on the mouse every time they want to activate an application. Other congenial attributes include the ability to employ long file names, easy navigation routes, and plug and play technology enabling user to connect various peripheral devices or add-ons with minimum effort.

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- It is designed for easy access to network resources.
- The OS also facilitates gateways to e-mail, voice recognition, fax facilities and access to the internet via Microsoft network.
- The OS is backwardly compatible to migrate from previous system.
- It has enhanced security features.

(b) The various features of Operating Systems are:

- (i) **Multiprogramming:** It is defined as execution of two or more programs that all reside in primary storage. Since CPU can execute only one instruction at a time, it cannot simultaneously execute instructions from two or more programs. However, it can execute instruction from one program then from second program and so on. This type of processing is referred to as concurrent execution. It is very useful as most of the time, CPU remains idle waiting for Input/ Output devices to complete their job, as Input / output devices are very slow. When Input / Output devices are working for one program, CPU executes instructions of second program. Thus, multiprogramming is a technique which helps in utilizing a computer system more effectively.
- (ii) **Foreground/background processing:** Partitioning allows separate "job streams" to be set up for high-priority tasks (called a foreground partition) and one for low-priority tasks (called a background partition). With foreground/background processing, foreground jobs are usually handled first. When no foreground task awaits processing, the computer goes to the background partition and starts processing tasks there. As other foreground tasks come into the job queue, the computer leaves the background partition and resumes working in the foreground.
- (iii) **Multi-tasking :** It refers to the operating system's ability to execute two or more of a single user's tasks concurrently. Multitasking operating systems are often contrasted with single-user operating systems. *Single-user operating systems* have traditionally been the most common type of operating system for microcomputers. These only allow the user to work on one task at a time. For microcomputers, multi-tasking operating systems provide single users with multiprogramming capabilities. This is often accomplished through foreground/background processing.
- (iv) **Virtual Memory :** It is a technique that allows the execution of a process, even though the logical address space requirement of the process is greater than the physical available main memory. The technique works by dividing a program on disk into fixed length pages or into logical, variable length segments. Virtual memory thus extends primary memory by treating disk storage as a logical extension of the main memory.

Programs stored on disk are broken up into fixed-length pages. When a program needs to be processed, the first few pages of it are brought into primary memory. Then, the computer system starts processing the program.

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If the computer needs a page it does not have, it brings that page in from secondary storage and overwrites it onto the memory locations occupied by a page it no longer needs. Processing continues in this manner until the program finishes. This is known as *overlaying*.

By allowing programs to be broken up into smaller parts, and by allowing only certain parts to be in main memory at any one time, virtual memory enables computers to get by with less main memory than usual.

Virtual memory helps in efficient main memory utilization. Virtual memory makes the task of programming much easier, because the programmer no longer needs to worry about the amount of physical or main memory available.

- (v) **Multiprocessing (or parallel processing)** : It refers to the use of two or more central processing units, linked together, to perform coordinated work simultaneously. Instructions are executed simultaneously because the available CPUs can execute different instructions of the same program or of different programs at any given time. Multiprocessing offers data-processing capabilities that are not present when only one CPU is used. Many complex operations can be performed at the same time. CPU can function on complementary units to provide data and control for one another. Multiprocessing is used for nation's major control applications such as rail road control, traffic control, or airways etc.

- 10. (a) Decision support systems are widely used as part of an organization's AIS. The complexity and nature of decision support systems vary. Many organizations have developed accounts and finance related software systems in-house using either a general type of decision support program or a spreadsheet program to solve specific problems. Below are several illustrations of these systems:

- (i) **Cost Accounting system**: Cost accounting applications help the organizations to calculate product costs for individual procedures or services. Decision Support Systems can accumulate these product costs to calculate total costs per entity. For example, health care industry manages the costs, which require controlling the costs of supplies, expensive machinery, technology, and a variety of personnel. Many organizations combines cost accounting decision support systems with other applications, such as productivity systems. Combining these applications allows managers to measure the effectiveness of specific operating processes. The organization can combines a variety of decision support system applications in productivity to improve its management decision making process.
- (ii) **Capital Budgeting System**: Companies require new tools to evaluate high-technology investment decisions. Decision makers need to supplement analytical techniques, such as net present value and internal rate of return, with decision support tools that consider some benefits of new technology not captured in strict financial analysis. One decision support system designed to support decisions about investments in automated manufacturing technology is

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AutoMan, which allows decision makers to consider financial, non-financial, quantitative, and qualitative factors in their decision-making processes. Using this decision support system, accountants, managers, and engineers identify and prioritize these factors. They can then evaluate up to seven investment alternatives at once.

- (iii) **Budget Variance Analysis System:** Financial institutions rely heavily on their budgeting systems for controlling costs and evaluating managerial performance. One institution uses a computerized decision support system to generate monthly variance reports for division comptrollers. The system allows these comptrollers to graph, view, analyze, and annotate budget variances, as well as create additional one-and five-year budget projections using the forecasting tools provided in the system. The decision support system thus helps the comptrollers to create and control budgets for the cost-center managers reporting to them.
 - (iv) **General Decision Support System:** Some planning languages used in decision support systems are general purpose and therefore have the ability to analyze many different types of problems. In a sense, these types of decision support systems are a decision maker's tools. The user needs to input data and answer questions about a specific problem domain to make use of this type of decision support system. An example is a program called **Expert Choice**. This program supports a variety of problems requiring decisions. The user works interactively with the computer to develop a hierarchical model of the decision problem. The decision support system then asks the user to compare decision variables with each other. For instance, the system might ask the user how important cash inflows are versus initial investment amount to a capital budgeting decision. The decision maker also makes judgments about which investment is best with respect to these cash flows and which requires the smallest initial investment. Expert Choice analyzes these judgments and presents the decision maker with the best alternative.
- (b) **Enterprise Resource Systems (ERPs)** integrate (or attempt to integrate) all data and processes of an organization into a single unified system. A typical ERP system will use multiple components of computer software and hardware to achieve the integration. A key ingredient of most ERP systems is the use of a single, unified database to store data for the various system modules.
- The term ERP originally implied systems designed to plan the utilization of enterprise-wide resources. ERP systems typically attempt to cover all basic functions of an organization, regardless of the organization's business or charter. Business, non-profit organizations, governments, and other large entities utilize ERP systems. Benefits of an ERP system are:
- (i) A totally integrated system;
 - (ii) Ability to streamline different processes and workflows;
 - (iii) Ability to easily share data across various departments in an organization;

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- (iv) Easy access and workflow;
- (v) Reduce complexity between processes and increase productivity and efficiency;
- (vi) Better tracking and forecasting;
- (vii) Lower costs;
- (viii) Improved customer service.

In this way, ERP performs various tasks of an organization in well-structured manner. The introduction of an ERP system to replace two or more independent applications eliminates the need for interfaces previously required between systems, and provides additional benefits that range from standardization and lower maintenance (one system instead of two or more) to easier and/or greater reporting capabilities (as all data is typically kept in one database).

11. (a) System designers choose to organize, access, and process records and files in different ways depending on the type of application and the needs of users. The manner in which files are organized on the storage device is called file organization. The three commonly used file organizations used in business data processing applications are – sequential, direct and indexed sequential file organizations. The selection of a particular file organization depends upon the type of application.

- (i) **Serial:** With serial organization, records are arranged one after another, in no particular order- other than the chronological order in which records are added to the file. Serial organization is commonly found with transaction data, where records are created in a file in the order in which transactions take place. Records in a serially organized file are sometimes processed in the order in which they occur.

- (ii) **Sequential files:** In a sequential file, records are stored one after another in an ascending or descending order determined by the key field of the records. To access these records, the computer must read the file in sequence from the beginning. To locate a particular record, the computer program must read in each record in sequence and compare its key field to the one that is needed. The retrieval search ends only when the desired key matches with the key field of the currently read record.

- (iii) **Direct Access File Organization:** Direct file organization allows immediate direct access to individual records on the file. The most widely used direct access techniques are:

- (a) Direct Sequential Access
- (b) Random Access

Direct sequential access can be further classified into

- (i) Self (Direct) Addressing Method
- (ii) Indexed-Sequential File Organization

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Self (Direct) Addressing Method: Under self direct addressing, a record key is used as its relative address. Therefore, the record's address can be computed directly from the record key and the physical address of the first record in the file. The advantage of Self-addressing is that there is no need to store an index. The disadvantage is that the records must be of fixed length and if some records are deleted, their storage space remains empty.

Indexed-Sequential File Organization: The indexed sequential file organization or indexed sequential access method (ISAM) is a hybrid between sequential and direct access file organizations. The records within the file are stored sequentially but direct access to individual records is possible through an index.

Random Access Organization: In this method, transactions can be processed in any order and written at any location through the stored file. To access a record, prior records need not be examined first. The CPU can go directly to the desired record using randomizing procedure without searching all the others in the file. The technique provides for converting the record key number to a physical location represented by a disk address through a computational procedure.

(b) Factors to be considered for best file organization are briefly discussed below:

- (i) **File Volatility:** It refers to the number of additions and deletions to the file in a given period of time. A file that constantly keeps changing is a highly volatile file. An Indexed-sequential file organization will not be suitable for such files, because additions have to be placed in the overflow area and constant reorganization of the file would have to occur. Other direct access methods would be a better choice. Even the sequential file organization could be appropriate if there are no interrogation requirements.
- (ii) **File Activity:** It is the proportion of master file records that are actually used or accessed in a given processing run. At one extreme is the real-time file where each transaction is processed immediately and hence at a time, only one master record is accessed. This situation obviously requires a direct access method. At the other extreme is a file, such as a payroll master file, where almost every record is accessed when the weekly payroll is processed. In such case, a sequentially ordered file would be more efficient.
- (iii) **File Interrogation:** It refers to the retrieval of information from a file. When the retrieval of individual record needs to be fast to support a real-time operation such as airline reservation, then some direct organization would be required. But if requirements of data can be delayed, then all the individual requests or information can be batched and run in a single processing run with a sequential file organization.
- (iv) **File Size:** Large files that require many individual references to records with immediate response, must be organized for certain direct access method.

However, with small files, it may be more efficient to search sequentially or with more efficient binary search, to find an individual record.

12. (a) 'Backup' is a utility program used to make a copy of the contents of database files and log files. The database files consist of a database root file, log file, mirror log file, and other database files called dbspaces.

'Recovery' is a sequence of tasks performed to restore a database to some point-in-time. Recovery is performed when either a hardware or media failure occurs. Hardware failure is a physical component failure in the machine, such as, a disk drive, controller card, or power supply. Media failure is the result of unexpected database error when processing data.

Certain issues related with Database Backup and Recovery

- (i) A **Transaction Log** is a file that records database modifications. Database modification consists of inserts, updates, deletes, commits, rollbacks, and database schema changes.
 - (ii) A **Mirror Log** is an optional file and has a file extension of **.mlg**. It is a copy of a transaction log and provides additional protection against the loss of data in the event the transaction log becomes unusable.
 - (iii) An **Online Backup** is performed by executing the command-line or from the 'Backup Database' utility. When an online backup process begins, the database engine externalizes all cached data pages kept in memory to the database file(s) on disk. This process is called a checkpoint. The database engine records the activity in the transaction log file while the database is being backed up. The log file is backed up after the backup utility finishes backing up the database. The log file contains all of the transactions recorded since the last database backup. For this reason the log file from an online full backup must be 'applied' to the database during recovery.
 - (iv) An **Offline Backup** does not have to participate in recovery but it may be used in recovery if a prior database backup is used.
 - (v) A **Live Backup** is carried out by using the BACKUP utility with the command-line option. A live backup provides a redundant copy of the transaction log for restart of the system on a secondary machine in the event the primary database server machine becomes unusable.
 - (vi) A **Full Backup** uses the database backup utility to copy the database and log files.
 - (vii) An **Incremental Backup** uses the DBBACKUP utility to copy the transaction log file since the most recent full backup.
- (b) **Developing a backup and recovery strategy:** The steps suggested in the development of a backup and recovery strategy consist of the following:

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- (i) **Understand what backup and recovery means to business:** How long a business can survive without access to the corporate data?

If recovery time is in minutes then database backup and recovery is critical to the business needs and it is paramount that some kind of backup and recovery strategy is implemented. If recovery can take hours then one has more time to perform the tasks. If recovery can be expressed in terms of days then the urgency to recover the database still exists, but time appears to be less of a factor.

- (ii) **Management commits time and resources for the project:** Management must decide to commit financial resources towards the development and implementation of a backup and recovery strategy. The strategy can be basic or quite extensive depending upon the business needs of the company. After developing a backup and recovery strategy, management should be informed of the expected backup and recovery times.

- (iii) **Develop, test, time, document, health check, deploy, and monitor:** These phases are the core in developing a backup and recovery strategy:

- Create backup and recovery commands. The command should be verified with the actual results produced to ensure that desired results are produced.
- Time estimates from executing backup and recovery commands help to get a feel for how long will these tasks take.
- Document the backup commands and create procedures outlining backups which are kept in a file. Also identify the naming convention used as well as the kind of backups performed.
- Incorporate health checks into the backup procedures to ensure that the database is not corrupt.
- Deployment of backup and recovery consists of setting up backup procedures on the production server. Verification of the necessary hardware in place and any other supporting software is required to perform these tasks. Modify procedures to reflect the change in environment.
- Monitor backup procedures to avoid unexpected errors. Make sure that any changes in the process reflect in the documentation.

- (iv) **Beware of external factors that affect recovery:** External factors that effect database recovery are time, hardware, and software. Allow additional recovery time for entering miscellaneous tasks that must be performed. These tasks could be as simple as entering recovery commands or retrieving and loading tapes. Factors that influence time are the size of database files, recovery medium, disk space, and unexpected errors. As the backup and recovery

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strategy develops, it may be necessary to check the performance of the equipment and software ensuring it meets the expectations.

- (v) **Protect database backups by performing health checks:** Database health checks are run against the database and log files to ensure they are not corrupt. The database validity utility is used to scan every record in every table and looks up each record in each index on the table. If the database file is corrupt, this needs to recover from previous database backups. A database can be validated before being backed up or against a copy of the database from the backup.

- 13. (a) A computer network is a collection of computers and terminal devices connected together by a communication system. The set of computers may include large-scale computers, medium scale computers, mini computers and microprocessors. The set of terminal devices may include intelligent terminals, dumb terminals, workstations of various kinds and miscellaneous devices such as the commonly used telephone instruments.

Benefits of Using Networks:

- (i) Organizations can **improve communication** by connecting their computers and working on standardized systems, so that:
 - Staff, suppliers and customers are able to share information and get in touch more easily.
 - More information sharing can make the business more efficient e.g. networked access to a common database can avoid the same data being keyed multiple times, which would waste time and could result in errors.
 - As staff are better equipped to deal with queries and deliver a better standard of service since they can share information about customers.
- (ii) Organization can **reduce costs and improve efficiency** - by storing information in one centralized database and streamlining working practices, so that:
 - Staff can deal with more customers at the same time by accessing customer and product databases.
 - Network administration can be centralized, less IT support is required.
 - Costs are cut through sharing of peripherals such as printers, scanners, external discs, tape drives and Internet access.
- (iii) Organizations can **reduce errors** and improve consistency - by having all staff work from a single source of information, so that standard versions of manuals and directories can be made available, and data can be backed up from a single point on a scheduled basis, ensuring consistency.

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(b) A computer network can help the business in following ways:

- (i) **File Sharing:** File sharing is the most common function provided by networks and consists of grouping all data files together on a server or servers. When all data files in an organization are concentrated in one place, it is much easier for staff to share documents and other data.
- (ii) **Print Sharing:** When printers are made available over the network, multiple users can print to the same printer. This facility can reduce the number of printers the organization must purchase, maintain and supply.
- (iii) **E-Mail:** Internal or "group" email enables the staff of an office to communicate with each other quickly and effectively. Group email applications also provide capabilities for contact management, scheduling and task assignment.
- (iv) **Fax Sharing:** Through the use of a shared modem(s) connected directly to the network server, fax sharing permits users to fax documents directly from their computers without ever having to print them out on paper.
- (v) **Remote Access:** Staff often requires access to their email, documents or other data from locations outside the office. A highly desirable network function, remote access allows users to dial in to an organization's network via telephone and access all the network resources that they can access when they're in the office.
- (vi) **Shared Databases:** Shared databases are an important subset of file sharing. If the organization maintains an extensive database, a network is the only effective way to make the database available to multiple users at the same time.
- (vii) **Fault Tolerance:** This is the process of making sure that there are several lines of defense against accidental data loss. Tape backups, servers attached to an uninterruptible power supply and redundant hardware are examples of such defense lines.
- (viii) **Internet Access and Security:** When computers are connected via a network, they can share a common, network connection to the Internet. This facilitates email, document transfer and access to the resources available on the World Wide Web.
- (ix) **Communication and collaboration:** A network allows employees to share files, view other people's work, and exchange ideas more efficiently.
- (x) **Organization:** A variety of network scheduling software is available that makes it possible to arrange meetings without constantly checking everyone's schedules.

14. (a) Benefits of the Client /Server Technology

- (i) It is easy to work in client/server environment.
- (ii) It reduces the total cost of ownership.

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- (iii) It increases End User and Developer Productivity.
- (iv) It takes less people to maintain a client/server application than a mainframe.
- (v) The expenses of hardware and network in the client/server environment are less than those in the mainframe environment.
- (vi) Users are more productive today because they have easy access to data. Applications can be divided among many different users so efficiency is at its highest.
- (vii) Client/server applications make organizations more effective by allowing them to port applications simply and efficiently.
- (viii) It reduces the cost of the client's computer; the server stores data for the clients rather than clients needing large amounts of disk space. Therefore, the less expensive network computers can be used instead.
- (ix) It reduces the cost of purchasing, installing, and upgrading software programs and applications on each client's machine: delivery and maintenance would be from one central point, the server.
- (x) The management control over the organization would be increased.
- (xi) Many times easier to implement client/server than change a legacy application.
- (xii) It leads to new technology and the move to rapid application development such as object oriented technology.
- (xiii) It offers long term cost benefits for development and support.
- (xiv) It is easy to add new hardware to support new systems such as document imaging and video teleconferencing which would not be feasible or cost efficient in a mainframe environment.
- (xv) It can implement multiple vendor software tools for each application.

(b) Characteristics of C/S Technology

- (i) It consists of client process and a server process that can be distinguished from each other.
- (ii) The client portion and the server portion can operate on separate platforms.
- (iii) Either the client or the server platform can be upgraded without having to upgrade the other platform.
- (iv) The server is able to service multiple clients concurrently.
- (v) The system includes some sort of networking capability.
- (vi) A significant portion of application logic resides at the client end.
- (vii) Action is usually initiated at the client end and not from the server end.
- (viii) User friendly GUI resides at the client end.

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- (ix) A SQL capability is available in C/S system.
 - (x) Database server provides data protection and security.
15. (a) Data Center is a centralized repository for the storage, management and dissemination of data and information. Data centers can be defined as highly secure with fault-resistant facilities and hosting computer equipments that connect to telecommunication networks.

Features of a data centre are discussed below :

- (i) **Size:** Data centers are characterized foremost by the size of their operations and require a minimum area of around 5,000 to 30,000 square meters. A financially viable data center could comprise of a hundred to several thousand servers.
 - (ii) **Data Security:** It should ensure maximum data security and 100 per cent availability. Data centers have to be protected against intruders by controlling access to the facility and by video surveillance. They should be able to withstand natural disasters and calamities, like fire and power failures. Recovery sites must be well maintained.
 - (iii) **Availability of Data:** The goal of a data center is to maximize the availability of data, and to minimize potential downtime. To do this, redundancy has to be built into all the mission critical infrastructure of the data center, such as connectivity, electrical supply, security and surveillance, air conditioning and fire suppression.
 - (iv) **Electrical and power systems:** A data center should provide the highest power availability with uninterrupted power systems (UPS).
 - (v) **Security:** Physical security and systems security are critical to operations. Thus, it should provide both types of security measures to ensure the security of equipments and data placed at the data center.
- (b) **The following value added services are offered by a data centre :**
- (i) **Data monitoring:** This is done via a database agent, which enables the high availability of the database through comprehensive automated management.
 - (ii) **Web monitoring:** It assesses and monitors website performance, availability, integrity and responsiveness from a site visitor's perspective. It also reports on HTTP and FTP service status.
 - (iii) **Backup and Restore:** It provides centralized integrated management solution for enterprise data storage using specialized backup agents for data base, operating system, open files and application.
 - (iv) **Intrusion detection system:** It helps in detecting inappropriate, incorrect or anomalous activity. It provides automated network based security assessment and policy compliance evaluation.

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- (v) **Storage on demand:** It provides the backend infrastructure so as to give a robust and cost effective storage strategy. It provides infrastructure to access information at any time with security, reliability and availability needed to meet the requirements of a company.

(c) **Challenges faced by the management of a Data centre are:**

- (i) **Maintaining a skilled staff and the high infrastructure needed for daily data centre operations:** A company needs to have staff which is expert at network management and has Software / OS skills and hardware skills. The company has to employ a large number of such people, as they have to work on rotational shifts. The company would also use additional cover in case a person leaves.
- (ii) **Maximizing uptime and performance:** While establishing sufficient redundancy and maintaining watertight security, data centres have to maintain maximum uptime and system performance.
- (iii) **Technology selection:** The other challenges that enterprise data centres face is technology selection, which is crucial to the operations of the facility, keeping business objectives in mind. Another problem is compensating for obsolescence.
- (iv) **Resource balancing:** The enterprise chief technical officer today needs to strike a working balance between reduced operational budgets, increased demands on existing infrastructure, maximizing availability, ensuring round-the-clock monitoring and management, and the periodic upgrades that today's technology demands.

16. (a) **The Following are the business uses of Internet:**

- (i) **Reach a worldwide audience:** The Internet is a worldwide network allowing people to reach to even very expensive advertising which people could not reach easily.
- (ii) **Provide product information :** It gives customer direct access to information about the products. The Internet has an unsurpassed ability to make information about company's products or services available to potential customers. It also provides the information when the customer wants it .
- (iii) **Save on literature costs :** Providing the information online reduces the need to print and mail product literature, thereby resulting in significant cost reductions.
- (iv) **Replaced phone based operations:** Often people do transactions over phone using phone banking facility which is time consuming process. Also it does not give proper response to the query asked by the users. Thus, simple graphical interfaces can be designed to allow customers to find the information they want quickly and inexpensively.

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- (v) **Provide easy access to customer service representatives:** The customers can e-mail directly to a customer service representative, requesting that they be contacted.
- (vi) **Level the customer's service load :** There can be lot of problems when customer service lines are busy, and as a result it makes the customers turned away unsatisfied .The solution of this kind of problem is E-mail, which provides "asynchronous communication". Customers with problems that do not require immediate attention can send an e-mail message through web site which can be handled when support people are not busy.
- (vii) **Inexpensively create/augment corporate image :** It is easy and inexpensive to define image on the Internet, whether it is a one-person-company or a large corporation. If company information changes rapidly due to market forces, there is no easier way to change image than electronically.
- (viii) **Recruit new employees :** Many companies provide current information about job openings and attract talented people from places they could not reach otherwise.
- (ix) **Provide useful information to attract customers :** Providing useful information to potential customers is a good way to attract them to the site and return again and again (a property now called "stickiness"). Search sites like " yahoo " and " Lycos " provide useful search services on to the Web.
- (x) **Provide customer service on-line :** Many products and services can be delivered over the Internet. Online services will become an even brighter option for many businesses. Since the transaction is electronic, billing and inventory control can be automated, thereby increasing accuracy and reducing accounting and product storage costs.
- (xi) **Give customers access to searchable information:** Computers on the Internet allow companies to post information in the form of static web pages. With some of the latest software (or some clever programming) , these computers can also help the customers to find the information quickly.
- (xii) **Help customers to understand the need of Internet:** The Internet allows customers to download useful information in the form of custom software applications. These software packages are useful in analyzing and managing business operations in smooth way.
- (xiii) **Let customers try a sample of the product or service:** Many new web tools are becoming available that will allow consumers to try out a sample of company's products and services before they actually buy those products. These web tools provide the consumers a competitive advantage by offering a "test drive" of company's product or service.

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- (xiv) **Eliminate the middleman** : Middlemen exist in some industries where there are barriers to direct contact between producers and consumers. The Internet is a vehicle for removing these barriers. This lowers prices for consumers and increases profits for producers.
 - (xv) **On-line commerce** : Some products and services are well suited for online sales. Rapid growth of online commerce will occur secure credit card transactions which need to be standardized. Efficiency of shipping and delivery methods for hard goods is important for typically impatient internet shoppers.
 - (xvi) **Consider an Intranet**: Using the same Internet technology within company help workers to do communication in better way and work more productively. Many companies are finding an Intranet to be a much more cost effective solution to their network information.
- (b) **Applications of Internet** - The common applications of the Internet can be classified into three primary types namely: Communication, Data retrieval and Data publishing.
- (i) **Communication**: Communication on the Internet can be online or offline. When some users connect to a single server or an on-line service at the same time, they can communicate in an “online chat”. This can be truly “many to many” as in a room full of people talking to each other on peer to peer basis. Alternatively, the users send e-mail to each other which can be read by the receiver whenever he/she finds the time. This is off-line communication, but “one to one” or “one to many”. Similarly, it is possible for users to get together electronically with those sharing common interests in “**usenet**” groups. The users post messages to be read and answered by others at their convenience, in turn all of which can be read and replied to by others and so on.
 - (ii) **Data Retrieval** : For meaningful data retrieval, availability of data that has been compiled from various sources and put together in a usable form is an essential prerequisite. On the Internet, a large number of databases exist. These have been put together by commercially run data providers as well as individuals or groups with special interest in particular areas. To retrieve such data, any user needs to know the address/s of such Internet servers.
 - (iii) **Data Publishing** : Data publishing is a new opportunity that Internet has made possible. Information that needs to be made available to others can either be forwarded to specific addresses, posted in a Usenet site or kept on display in a special site. Internet discourages by social pressure, sending of unsolicited E-mail.
17. (a) Electronic commerce is the process of doing business electronically It involves the automation of a variety of business to business and business to consumer transactions through reliable and secure connections. It is a composite of technologies, processes and business strategy that foster the instant exchange of information within and between organizations. It strengthens relationship with

buyers, makes it easier to attract new customers, improves customer responsiveness and opens new markets on global scale.

Working of E-Commerce: Following is a step by step online transaction processing in an e-commerce environment:

HOW ONLINE PROCESSING WORKS

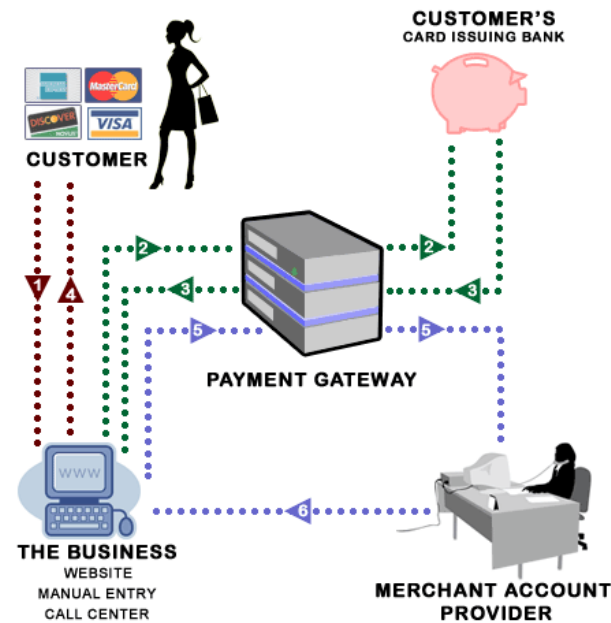


Fig : E-Commerce Transaction

- (i) **Order Placed:** Customer places order through secure connection on website, or merchant manually keys in transaction.
- (ii) **Authorization Request :** Payment Gateway receives the transaction through the secure internet connection, encrypts it, and submits an authorization to the credit card issuing bank.
- (iii) **Authorization Response :** Credit card issuing bank either approves or declines the request and sends a response back through the payment gateway to the website.
- (iv) **Order Fulfilled :** Once approved the merchant processes and ships the customer's order.
- (v) **Settlement Request :** The Payment Gateway sends a settlement request to the merchant account provider each day that transactions are processed.
- (vi) **Settlement Deposited :** The merchant account provider deposits the amount for each settlement into the merchant's bank account. Usually it takes 24 - 48 hours.

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(b) The following reasons exist to explain the Internet's emergence as the foundation for the world's new information infrastructure:

- (i) **Universality** - Any business using the Internet can interact with any other business using the Internet, whereas, earlier networking technologies allowed businesses to ship goods to only those companies that were connected to the same network.
- (ii) **Reach** - The Internet is everywhere, in the large cities and small towns throughout the modern and developing world.
- (iii) **Performance** - Internet can handle visual images, audio clips, and other large electronic objects. It provides its users with a high-function window to the world, in addition to handling everyday networking tasks such as electronic mail.
- (iv) **Reliability** - The design concepts for the Internet came out of U.S. Department of Defense. Hence, Internet technology is highly robust and reliable, in spite of significant differences in the extent to which various Internet service providers actually implement and ensure this reliability.
- (v) **Cost** - Compared with alternative networking technologies, Internet costs are surprisingly low.
- (vi) **Momentum** - Many individuals are already connected to the Internet, and business use is increasing at a dramatic rate.

18. (a) Key benefits of using Intranet are:

- (i) **Workforce Productivity** : Intranets can help users to locate and view information faster and use applications relevant to their roles and responsibilities. With the help of a web browser interface, users can access data held in any database the organization wants to make available, anytime and subject to security provisions from anywhere within the company workstations, increasing employees' ability to perform their jobs faster, more accurately, and with confidence that they have the right information. It also helps to improve the services provided to the users.
- (ii) **Time** : With intranets, organizations can make more information available to employees on a "pull" basis (i.e., employees can link to relevant information at a time which suits them) rather than being deluged indiscriminately by emails.
- (iii) **Communication** : Intranets can serve as powerful tools for communication within an organization, vertically and horizontally. From communication standpoint, intranets are useful to communicate strategic initiatives that have a global reach throughout the organization. The type of information that can easily be conveyed is the purpose of the initiative and what the initiative is aiming to achieve, who is driving the initiative, results achieved to date, and who to speak to for more information.

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- (iv) **Web publishing** : It allows 'cumbersome' corporate knowledge to be maintained and easily accessed throughout the company using hypermedia and web technologies.
 - (v) **Business Operations and Management** : Intranets are also being used as a platform for developing and deploying applications to support business operations and decisions across the internetworked enterprise.
 - (vi) **Cost-effective** : Users can view information and data via web browser rather than maintaining physical documents such as procedure manuals, internal phone list and requisition forms.
 - (vii) **Promote Common Corporate Culture** : Every user is viewing the same information within the Intranet.
 - (viii) **Enhance Collaboration** : With information easily accessible by all authorised users, teamwork is enabled.
 - (ix) **Cross-platform Capability** : Standards compliant web browsers are available for Windows, MAC, and UNIX.
 - (x) **Planning and Creating an Intranet** : Most organizations devote considerable resources into the planning and implementation of their intranet as it is of strategic importance to the organization's success.
- (b) An **Extranet** is an extension of an Intranet that makes the latter accessible to outside companies or individuals with or without an Intranet. It is also defined as a collaborative Internet connection with other companies and business partners. Parts of an Intranet are made available to customers or business partners for specific applications. The Extranet is thus an extended Intranet, which isolates business communication from the Internet through secure solutions. Extranets provide the privacy and security of an Intranet while retaining the global reach of the Internet. An Extranet extends the Intranet from one location to another across the Internet by securing data flows using cryptography and authorization procedures, to another Intranet of a business partner.

Five Rules of the Extranet are as follows:

- (i) **Be as flexible as the business** : An extranet must be driven by the demands of the market, not the limitations of technology. It must be extremely flexible and allow companies to immediately deploy extranet services that best fit the business need, be it intimate supply chain partners using a wide range of applications or mass e-commerce extranets driven by web based applications.
- (ii) **Deploy in "Internet time"** : To deploy an extranet, companies shouldn't have to roll out a new infrastructure or go through a major re-architecting of their applications. To remain market-driven, enterprises must be able to deploy their extranet quickly, and leverage their existing infrastructure to do so.
- (iii) **Protect the interests of the data owner**: Extranet services need to be deployed in a fast and flexible way, but with the complete assurance that only

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the correct users can access the right services. An extranet must ensure that what's supposed to be private stays private.

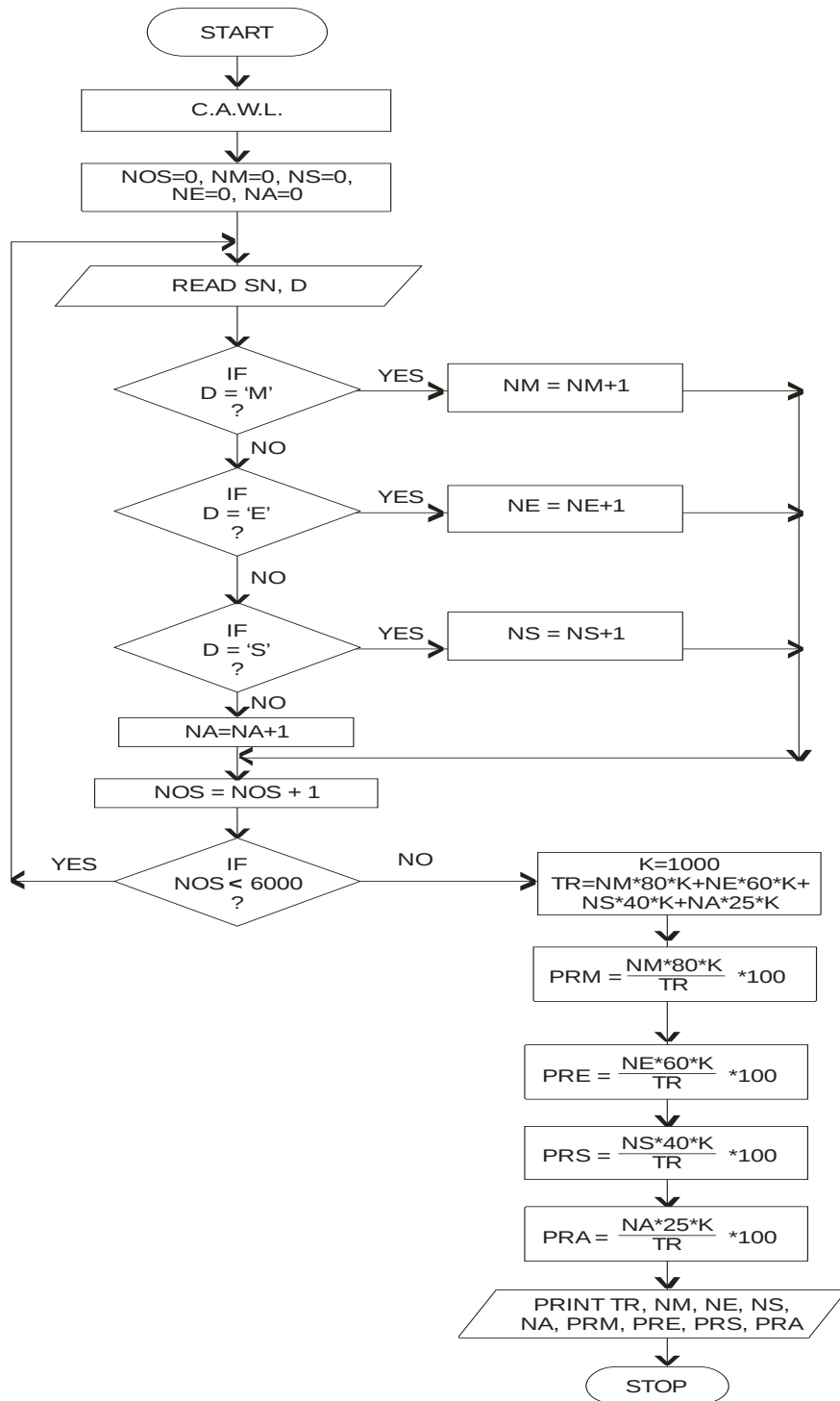
- (iv) **Serve the partner as a customer:** An extranet presents a very important and delicate balance by providing customer service to key partners (who might also be customers) in a competitive environment with mission-critical resources at risk. The final solution must be an extranet without compromise. Partners should never be required to change their security policies, networks, applications, and firewalls for the "good" of the extranet community.
 - (v) **Drive information to the decision-maker :** An extranet must provide a central means to measure progress, performance, and popularity. Business units deploying applications need to understand which extranet content and applications are most successful.
19. (a) Program analysis is an important step in computer programming that determines the Input, Output and Processing of data. In this process, first the programmer has to define the problem. The problem needs to be defined and set for the computer in such a way that every possible alternative is taken care of. The computer procedure must be sufficiently detailed at each stage of a computation to permit the required calculations to be performed.

The benefits of flowcharts are discussed below:

- (i) **Quicker grasp of relationships:** Before any application can be solved, it must be understood, the relationship between various elements of the application must be identified. The programmer can chart a lengthy procedure more easily with the help of a flowchart than by describing it by means of written notes.
- (ii) **Effective Analysis:** The flowchart becomes a blue print of a system that can be broken down into detailed parts for study. Problems may be identified and new approaches may be suggested by flowcharts.
- (iii) **Communication:** Flowcharts aid in communicating the facts of a business problem to those whose skills are needed for arriving at the solution.
- (iv) **Documentation:** Flowcharts serve as a good documentation which aid greatly in future program conversions. In the event of staff changes, they serve as training function by helping new employees in understanding the existing programs.
- (v) **Efficient coding:** Flowcharts act as a guide during the system analysis and program preparation phase. Instructions coded in a programming language may be checked against the flowchart to ensure that no steps are omitted.
- (vi) **Orderly check out of problem:** Flowcharts serve as an important tool during program debugging. They help in detecting, locating and removing mistakes.
- (vii) **Efficient program maintenance:** The maintenance of operating programs is facilitated by flowcharts. The charts help the programmer to concentrate attention on that part of the information flow which is to be modified.

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(b) The flowchart is given below.



20. (a) **Advantages of Using a Decision Table**

- (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 table shows cause and effect relationships.
- (viii) They use standardized format.
- (ix) Typists can copy tables with virtually no question or problems.
- (x) Complex tables can easily be split into simpler tables.
- (xi) Table users are not required to possess computer knowledge.

Disadvantages of using a decision tables

- (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.

(b)

Decision Table

RULES	R1	R2	R3	R4	R5	R6	R7	R8
C ₁ Customer Dealer	Y	Y	Y	N	N	N	Y	-
C ₂ Payment Days >30 Days	Y	N	-	Y	N	N	Y	N
C ₃ ≥30 & ≤45 days	-	Y	N	-	Y	N	Y	Y
C ₄ > 45 days	N	-	Y	-	-	Y	Y	N
Actions								
A ₁ Discount 10%	X							
A ₂ Discount & Surcharge 0		X						
A ₃ Surcharge 10%			X		X			
A ₄ Discount 12½%				X				
A ₅ Surcharge 12½%						X	X	X