PAPER-6 : INFORMATION TECHNOLOGY

QUESTIONS

1. Define the following terms briefly :

(i)	Parity Bit	(ii)	BIOS
(iii)	Stored Program Concept	(iv)	Flash Memory
(v)	MICR	(vi)	Digitization
(vii)	FAT	(viii)	Rotational Delay Time
(ix)	Artificial Intelligence	(x)	Topology
(xi)	Bandwidth	(xii)	Multiplexer
(xiii)	Gateways	(xiv)	Domain Name
(xv)	Secure System	(xvi)	PPP (Point to Point Protocol)
(xvii)	Internet Service Provider(ISP)	(xviii)	Asymmetric Crypto System
(xix)	Intermediary	(xx)	Test Pack

2. Covert the following from one number system to another number system along with the working notes :

(i)	$(423.25)_{10}$	=	(	$)_2$
(ii)	$(101101.1011)_2$	=	(	$)_{10}$
(iii)	$(426.40)_8$	=	(	$)_{10}$
(iv)	$(15AE)_{16}$	=	(	$)_{10}$
(v)	$(B2C)_{16}$	=	(	$)_{10}$
(vi)	$(9876)_{10}$	=	(	$)_8$
(vii)	$(1100100110)_2$	=	(	$)_8$
(viii)	$(6437)_8$	=	(	$)_{16}$
(ix)	$(2E7)_{16}$	=	(	$)_8$
(x)	$(1111101111.11)_2$	=	(	$)_{16}$

3. Give one or two reasons for the following:

(i)	Use of Serial Interface	(ii)	Use of USB Connector
(iii)	Use of drivers	(iv)	Use of concurrent processing
(v)	Use of Graph Plotter	(vi)	Use of Firmware
(vii)	Use of subroutine	(viii)	Use of Dynamic Processing
(ix)	Use of Security Software	(x)	Use of Protocol Translator

(xi) Use of Router (xii) Use of Web Browser

(xiii) Use of Macro (xiv) Use of Flowchart

(xv) Use of File Management Software (xvi) Use of File Pointer

4. Distinguish between the following.

(i) Fixed Length Field and Variable Length Field

(ii) Hardware and Software

(iii) Analog and Digital Computers

(iv) Main memory and Virtual memory

(v) Microcomputers and Workstations

(vi) Semi-conductor Memory and Bubble Memory

(vii) Voice Synthesizer and Voice Recognition Systems

(viii) Compiler and Interpreter

(ix) DDL and DML

(x) Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM)

(xi) Synchronous and Asynchronous Data Transmission

(xii) Centralized Processing and Distributed Processing

(xiii) Ring Network and Mesh Network

(xiv) Logical Record and Physical Record

(xv) Key to Disk and Key-to-Diskette

Data Processing

5. (a) Describe various generations of Computers in brief .

(b) Describe the different ways in which data files can be classified.

Anatomy of Computer

6. (a) Discuss various types of expansion slot used in Computer System.

(b) What do you understand by the term 'Bus'? discuss various types or buses in brief.

(c) Explain the concept of RAM and also discuss its various type.

Computer Input Media and Devices

7. (a) What are the various ways in which computer systems are configured in organization. Discuss in brief.

(b) What do you understand by Image processing? Discuss distinct steps in documenting a image.

Computer Output

8. (a) Explain the concept of impact printer.

   (b) Discuss the working procedure of Computer Output Microfilm.

Auxiliary Storage Devices

9. (a) Discuss the various uses of video disks in brief.

   (b) What care is required for using and storage of a diskette?

Software

10 (a) What do you understand by the term "Software" Discuss various types of Software in brief.

   (b) What are the various types of Operating Systems used in Microcomputer? Discuss in brief.

Data Storage and Retrieval

11. (a) What are the various issues related to data management?

   (b) Discuss Indexed sequential file organization (ISAM) with suitable example.

Database management System

12. (a) What is a Data base? Discuss various types of Database in brief.

   (b) What are the advantage and disadvantages of using DBMS?

Advanced System

13. (a) What is real time System? Discuss various real time applications in brief.

   (b) Discuss various components of a decision support system in brief.

Telecommunication and Networking

14. (a) What do you mean by Data Communication? What are the various transmission techniques used in Data Communication?

   (b) Briefly describe the various storage techniques used in network based system.

   (c) What is Communication Protocol. Discuss the various aspect of communication protocols.

Internet and Emerging Technologies

15. (a) What is EDI? Discuss the advantages of EDI.

   (b) What do you understand by the term 'Data Centre'? Discuss Various Services provided by the Data Center.

Database Performance Monitoring

16. (a) Discuss various integrity controls that a DBMS must support.

    (b) Which areas of DBMS should be addressed while maintaining a database?

Information Technology Act 2000

17 (a) Explain the power of Central Government to make rules as defined in section 87 of IT Act 2000.

    (b) Discuss the power of adjudicating officer under 'Cyber Regulation Appellate Tribunal' of chapter X.

Flowcharting

18. (a) Discuss various phases of computer programming process in brief.

    (b) Draw a flow chart to compute and print Income-tax, Surcharge and Education cess on the income of a person, where income is to be read from terminal and tax is to be calculated as per the following rates:

	Slab (Rs.)	Rate
(i)	1 to 1,00,000	No tax
(ii)	1,00,001 to 1,50,000	@ 10% of amount above 1,00,000
(iii)	1,50,001 to 2,50,000	Rs. 5,000 + 20% of amount above 1,50,000
(iv)	2,50,001 onwards	Rs. 25,000 + 30% of amount above 2,50,000
	Surcharge	@ 10% on the amount of total tax, if the income of a person exceeds Rs. 10,00,000
	Education cess	2% on the total tax

Decision table

19 (a) What is "Decision Table"? Discuss the various parts of a decision table ?

    (b) The details of procedure for dealing with delivery charges for goods bought from ABC Company is given below:

    For calculating the delivery charges, customers are divided into two categories, those whose sales region code is 10 or above and those with the code of less than 10.

    If the code is less than 10 and the invoice amount is less than Rs. 10,000, the delivery charge to be added to the invoice total is Rs. 200. But if the invoice value is for Rs. 10,000 or more, the delivery charge is Rs. 100.

    If the code is equal to or greater than 10, the corresponding delivery charge are Rs. 250 and Rs.150 respectively.

    Prepare a decision table of the above procedure.

Word Processing

20 (a) Describe any five formatting text and Paragraph features in MS-Word.

(b) Write short notes on the following (MS-Word)

(i) Clip Gallery (ii) Auto Text

(iii) Spelling & Grammar (iv) Document Editing

Spread Sheet

21 (a) Describe various types of charts available in MS-Excel.

(b) Define the following functions used in MS-Excel.

(i) MOD(x/y) (ii) DCOUNT( ) (iii) LOG( )

(iv) TRUNC( ) (v) DMIN( ) (vi) VAR( )

(vii) STDEV( ) (viii) PPMT( ) (ix) DB( )

(x) NPV( )

Business Project management and Presentation Tools

22. (a) Discuss in brief, the enhanced features or MS-Power Point 2000.

(b) Explain the following terms with reference to MS-Power Point 2000.

(i) Slide timings (ii) Transition

(iii) Tri-pane view (iv) Handouts

(v) Notes

Computer Aided Audit Techniques

23. (a) What major steps are required to be undertaken by the auditor prior to implementation of a CAAT? Explain in brief.

(b) What is CAAT? Discuss White Box and Black Box auditing approach in performing audit in computerized environment.

Accounting Package

24. (a) Explain the process of voucher entry in tally 5.4 for the following.

(i) Receipt entry

(ii) Payment entry

(b) Discuss the Key features of EX.NGN accounting packages .

25. Write short notes on the following.(Compilation)

(i) Bar Code Reader (ii) Data Dictionary (iii) Neural Network

(iv) Digital Signature (v) Web Casting

SUGGESTED ANSWERS/HINTS

1. (i) Parity Bit : It is an additional redundant bit that is used to provide a check on the integrity of a data representation. It helps in detecting any errors that may occur while transmitting a binary data.

   (ii) BIOS stands for Basic Input Output system. It is a small chip on the motherboard that includes start up code, the set up program and also loads the hardware settings required to operate various devices like keyboard, monitor, disk drives, etc.

   (iii) Stored Program Concept :Computers can perform variety of mathematical calculations millions of times without error. They can sort data, merge lists, search files, make logical decisions and comparisons. However, computer is devoid of any original thinking. Hence, computer is provided with set of instructions. These instructions are stored in primary memory and executed under the command of the control unit of CPU. This is known as 'Stored Program Concept'.

   (iv) Flash Memory: Flash Memory is a memory in which the data is recorded permanently and is not wiped out when the power is turned off. Flash memory devices are very fast because they do not have any moving part.

   (v) MICR: MICR stands for Magnetic Ink Character Recognition. It allows the computer to recognize characters printed using magnetic ink. This technology is used to read electronic numbers printed on the bottom of the cheque.

   (vi) Digitization: The process of converting the graphical information such as lines, pictures and graphs etc. to digital form with the help of Image Scanner is called digitizing.

   (vii) FAT :It is a log that records the location of each file and the status of each sector. When a file is written to a disk, the operating system checks the FAT for an open area, stores the file and then identifies the file and its location in the FAT. The FAT solves common filing problems with respect to updation of the files on the disk.

   (viii) Rotational delay Time: After adjusting the Read/Write head of the disk on the desired track, it is the time taken by Read/Write head to find the desired sector. It is considered as half of the time required in one revolution of the platter.

   (ix) Artificial Intelligence : AI is a software that tries to emulate aspects of human behavior, such as, reasoning, communicating, seeing and hearing. AI software can use its accumulated knowledge to reason and, in some instances, learn from experience and thereby modify its subsequent reasoning.

   (x) 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.

   (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) Multiplexer : This device enables several devices to share one communication line. It scans each device to collect and transmit data on a single line to the CPU. It also communicates transmission from the CPU to the appropriate terminal linked to the multiplexer.

(xiii) Gateways: It is used to connect two dissimilar networks but do not possess network management facilities.They are used to connect LANs of different topologies e.g. Bus and Ring Network.

(xiv) Domain Name: It refers to the unique name that identifies an internet site. Domain name always have two or more parts, separated by dots. The part on the left is the most specific and the part on the right is most general. A given machine may have more than one domain name but a given domain name points to only one machine. E.g. icai.org; exam.icai.org.

(xv) Secure System: It refers to a system in which the computer hardware, software and procedures are:

- reasonably secure from unauthorized access and misuse.
- provide a reasonable level of reliability and correct operation.
- reasonably suited to perform the intended functions.
- adhere to generally accepted security procedures.

(xvi) PPP (Point-to-Point Protocol) – It is most well known protocol that allows a computer to use a regular telephone line and a modem to make TCP/IP Internet connection and thus be really on the Internet.

(xvii) 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.

(xviii) Asymmetric Crypto System: It refers to a system of a secure key pair consisting of a private key for creating a digital signature and a public key to verify the digital signature.

(xix) Intermediary : It is in respect to any particular electronic message means any person who on behalf of another person receives, stores or transmits that message or provides any service with respect to that message.

(xx) Test packs: The test packs is the application of auditors test data (live or dummy) to clients application programs. A small sample of data is processed through the computer and output is compared with manually generated output using the same data.

2. (i) $(423.25)_{10}$ = ($)_2$

2	423	Remainder	.25
2	211	1	×2
2	105	1	0.50
2	52	1	×2
2	26	0	1.00
2	13	0	
2	6	1	
2	3	0	
2	1	1	
	0	1	

Hence, $(423.25)_{10}$ = $(110100111.01)_2$

(ii) $(101101.1011)_2$ = ($)_{10}$

= $1\times2^5+1\times2^3+1\times2^2+1\times2^0+1\times2^{-1}+1\times2^{-3}+1\times2^{-4}$

= 32+8+4+1+.5+.125+0.0625

= 45.6875

Hence,$(101101.1011)_2$ = $(45.6875)_{10}$

(iii) $(426.40)_8$ = ($)_{10}$

8	426	Remainder	0.40
8	53	2	× 8
8	6	5	5.00
	0	6	

Hence, $(426.40)_8$ = $(652.5)_{10}$

(iv) $(15AE)_{16}$ = ($)_{10}$

$(15AE)_{16}$ = $1 \times 16^3 + 5 \times 16^2 + 10 \times 16^1 + 14 \times 16^0$

= 4096 + 1280 + 160 +14

= $(5550)_{10}$

(v) $(B2C)_{16}$ = ( )$_{10}$

$(B2C)_{16} = 11 \times 16^2 + 2 \times 16^1 + 12 \times 16^0$

$= 11 \times 256 + 2 \times 16 + 12 \times 1$

$= 2860$

Hence, $(B2C)_{16} = (2860)_{10}$

(vi) $(9876)_{10}$ = ( )$_8$

	9876	Remainder
8	1234	4
8	154	2
8	19	2
	2	3

Thus, $(9876)_{10} = (23224)_8$

(vii) $(1100100110)_2$ = ( )$_8$

To convert the given number from binary to octal, we will combine the digits in groups of three, adding leading zeros if required.

(1100100110) = 001 100 100 110

= 1 4 4 6

Hence, $(1100100110)_2 = (1446)_8$

(viii) $(6437)_8$ = ( )$_{16}$

To convert the given number from octal to hexadecimal, we will represent each digit of the number by three bit binary number. These binary bits will then be combined in group of four bits adding leading zeros, if required.

$(6437)_8$ = (110 100 011 111)

= (1101 0001 1111)

= (D 1 F)

Hence, $(6437)_8 = (D1F)_{16}$

(ix) $(2E7)_{16}$ = ( )$_8$

$(2E7)_{16}$ = 2 E 7

= 0010 1110 0111

Rearrange in group of three, adding leading zeros, if required

= 001 011 100 111

= 1 3 4 7

Hence, $(2E7)_{16} = (1347)_8$

(x) $(111110\ 1111\ .\ 1100)_2 = (\quad)_{16}$

To convert the given number from Binary number system to Hexadecimal number system, each digit of the number will be represented in binary form using a group of 4 digits.

= 0011 1110 1111 . 1100

= 3 E F . C

$(1111101111\ .\ 1100)_2 = (3EF.C)_{16}$

3. (i) Use of Serial Interface: A serial interface is used to connect a printer to the input device, either a computer or word processor. It allows the printer to accept transmission of data, which is sent serially, or one character at a time.

(ii) Use of USB connectors: USB standards for universal serial Bus. These ports provide the user with higher data transfer speeds for different USB devices like keyboards, mouse, scanners or digital cameras.

(iii) Use of drivers: Drivers are small programs that translate the program's generic instructions into instructions for a specific piece of hardware. When a new hardware is introduced, the programmer of an operating system just writes a driver for it. Operating System has a library of device drivers, one for each specific hardware item.

(iv) Use of Concurrent Processing : Through this processing, the system shares memory among several programs and to execute the instructions provides by each during the same time frame.

(vi) Use of Graph Plotters: It is an output device which is used to print graphs, designs, drawings and maps on the paper. It is used particularly in applications like computer-aided design (CAD).

(vii) Use of Firmware: The firmware refers to a series of special programs which deal with very low-level machine operations and thus essentially substitutes for additional hardware requirement.

(viii) Use of subroutine: It is a small independent program which is included in the main program to perform a specific function again and again with different values of data.

(ix) Use of Dynamic Processing: This technique is used for swapping jobs in and out of computer memory according to their priorities and the number of time slices allocated to each task. It helps in increasing the processing speed of various tasks.

(x) Use of Security Software: DBMS contains a security software package which provides a variety of tools to shield the database from unauthorized access. Security consideration should include means of controlling physical access to hardware and software while ensuring that authorized person can add, delete and update the database.

(xi) Use of Protocol translator: It is a peripheral device which converts the communication protocol of one system into the protocol of another system so that the two systems are compatible enabling data to be transferred between them.

(xii) Use of Router: Router is a special purpose computer or software package that handles the connection between two or more networks. Routers spend all their time looking at the destination addresses of the packets passing through them and deciding on which route the packets should be sent.

(xiii) Use of Web Browser: It is a client program (software) that is used to look at various kinds of Internet resources. Mosaic, Netscape Navigator and Internet Explorer are some of the commonly used web Browsers

(xiv) Use of Macro : A macro is a small program that carries out pre-defined and pre-recorded series of steps by giving a few keyboard shortcuts. It is just a way of doing the work in a series of steps which is carries out automatically once it is triggered. A macro saves lot of time by automates processing task in advance.

(xv) Use of Flowchart : A flowchart is a diagram , which is created in a sequence of steps to solve a problem. It is an essential tool for programming . It helps the programmer avoid fuzzy thinking and accidental omissions of intermediate steps.

(xvi) Use File Management Software: It is a software package that let users and programmers organize data into files and process those files. It perform important processing task such as information retrieval and report preparation. The file manager permits users to sort records and create filter environments for managing data.

(xvii) Use of File Pointer: File pointers establish linkage between records and are a basic part of the file organization of all the database models except the relational model. A pointer is the address of another related record that is "pointed to". The pointer directs the computer to that related record. It is placed in the last field of a record, if more than one pointer is used, then in the last fields.

4. (i) Fixed Length Fields and Variable Length Fields

Fixed Length Fields scheme, fields are simply placed in 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 DBMS, memo field is used to store data of varied length..

(ii) Hardware and Software

S.No.	Hardware	Software
1.	Physical components of a computer system are called hardware.	Collection of programs designed for specific needs is called software.
2.	Input devices, processing unit, output devices and auxiliary storage devices are different categories of hardware.	Software can be divided into three types-application software, system software and general-purpose software.
3.	Keyboard, mouse, printer, CPU, RAM are example of hardware	Financial Accounting software, operating system, MS-WORD etc. are examples of software.
4.	Hardware is manufactured / assembled by hardware manufacturing companies/ hardware vendors.	Software is developed by software development firms.
5.	Hardware is independent of software.	Software cannot be developed/used without hardware i.e. software is dependent on hardware.
6.	Hardware repair requires hardware engineer.	Software development/modification requires software professionals like application programmer and system programmer.
7.	It is bulky and requires more storage space.	Software can be copied on CD/DVD, which is lightweight and transportable.
8.	Hardware is supported by uninterrupted power supply (UPS).	Software operation requires requisite hardware.
9.	Hardware can be assembled, Indian branded or of MNC brand.	Software can be licensed or pirated.

(iii) Analog computers and Digital computers

Analog computers It process data input in a continuous form. Data such as voltage, resistance or temperature and pressure etc. are represented in a computer as a continuous, unbroken flow of information. In engineering and scientific applications where quantities to be processed exist in wave forms or continually rising and falling voltages, pressure and so on, analog computers are very useful.

Digital computers, on the other hand, count and accept letters or numbers through various input devices that convert the data into electric pulses, and perform arithmetic operations on numbers in discrete form. In addition to performing

arithmetic operations, they are also capable of storing data for processing, performing logical operations, editing or deleting the input data and printing out the result of its processed routine at high speed.

(iv) Main Memory and Virtual Memory

Main memory is a part of the computer hardware, which stores programs, and data that are in active use. Storage locations in main memory are addressed directly by CPU's load and store instructions. Access is slower from main memory than from CPU registers because of large capacity and the fact that it is physically separated from the CPU.

Virtual memory, on the other hand, 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.

Virtual memory helps in efficient main memory utilization. The programs can be loaded partially in the main memory, so more programs can be run at the same time. Hence, efficient CPU utilization and better throughput is possible by using the concept of virtual memory. 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) Microcomputer and Workstations

Microcomputer is a full-fledged computer system that uses a microprocessor as its CPU. These are also called personal computers. Between minicomputer and microcomputer, in terms of processing power, there is a class of computers known as workstation. It looks like a personal computer and is typically used by one person.

Workstations is 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.

(vi) Semi-conductor and Bubble Memory

Semi-conductor 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 thousandths 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.

(vii) Voice Synthesizer System and Voice Recognition System

S.No.	Voice Synthesizer System	Voice Recognition System
1.	It is hardware device which is attached to the parallel port of the Computer.	It is software based approach of data entry into the computer by speaking using microphone attached with the computer.
2.	It is used to convert text to voice.	It is used to convert voice to text
3.	It is an output device.	It is an input technique of data entry.
4.	It is much helpful for blind persons who can not see the text on VDU.	It is helpful for those persons who find it difficult to use conventional devices like Keyboard, Mouse etc. for entry of data into the computer.
5.	It is a costly device.	The problem in the implementation of this system is that the persons are not uniform in their speech modulation which leads to error in data entry.

(viii) Compiler and Interpreter

An interpreter is a language processor and is similar to the compiler in the sense that like compiler it also translates the source program written in a high level

language to machine level language. However, there are certain basic differences between an interpreter and a compiler:

The compilation process consists of first loading the computer with the compiler and then inputting the source program via floppy disk or magnetic tape/disk. As output, the compiler produces an object program on a floppy disk or magnetic tape/disk, and also a print out of the program instructions along with the syntax errors indicated in the aforesaid print out. However, the object program is generated by the compiler only when the entire program is error free. On the other hand, in case of interpreter, when the command "run" is keyed in, each statement in the program is interpreted and if any statement does not conform to the rules of grammar of the language, then a syntax error is displayed. If the statement is error free, then the interpreter executes it before translating the next statement. This process slows down the execution of the program until the errors are removed.

In case of interpreter, each statement is interpreted whenever the program is executed, whereas with compiler, it is necessary to translate the program once during the compilation run, and the compiled program or the executable codes are stored on the storage medium. Thereafter, only these executable codes are loaded whenever there is a need to run the program. As each statement is not required to be translated at "run time", the program runs faster than an interpreted program.

Interpreters are usually used by personal or small business computers, whereas compilers are basically utilized by mainframes.

An interpreter is more "firmware" than "software" as it is stored on a ROM chip which is a part of the electronics of the computer, whereas a compiler forms a part of the system software which is stored on backing storage.

(ix) DDL and DML

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 Subschema.

Functions performed by DDL include the following:

- Describes the Schema and Subschema.
- Describes the field name and data type of each field.
- Indicates the keys of record i.e. defines Primary, Secondary and Foreign key.
- Defines for 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 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 DDL.

(x) Computer Aided Design (CAD)/Computer Aided Manufacturing (CAM)

Computer-Aided Design (CAD) refers to use of a wide range of computer-based tools that assist engineers, architects and other design professionals in their design activities. It involves both software and sometime special-purpose hardware. CAD is sometimes translated as "computer-assisted" or "computer-aided drafting". First commercial applications of CAD were in large companies in automotive and aerospace industry, as well as in electronics. As computers became more affordable, the application area gradually expanded.

When the field was initially established it was typically limited to producing drawings similar to hand-drafted drawings. Advances in computer technology have allowed more skillful application of computers in design activities. Today CAD is not limited to drafting, it ventures into more "intellectual" areas of designer's expertise.

On the other hand, CAM stands for Computer-Aided Manufacturing. CAM with computer-aided design systems produces quicker and more efficient manufacturing processes. This methodology is applied in different manufacturing areas. CAM can be used for following applications:

- Verification of the data
- Panelization of the design to fit the raw material.
- Ability to edit
- Ability to add manufacturing information

CAM has great usage in mechanical engineering. In electronic design automation, CAM tools prepare printed circuit board (PCB) and integrated circuit design data for manufacturing.

(xi) Synchronous and Asynchronous Data Transmission

Under Synchronous Transmission bits are transmitted at fixed rate. The transmitter and receiver both use the same clock signals for synchronization. Synchronous transmission allows characters to be sent down the line without start-stop bits. It allows data to be send as a multi-word blocks. It uses a group of synchronization bits, which is placed at the beginning and at the end of each block to maintain synchronization. Timing is determined by a modem.

It is faster way of data transmission and many data words can be transmitted per second. However, the synchronous device is more expensive as it must be smart enough to differentiate between the actual data and the special synchronous characters.

On the other hand, in asynchronous transmission, each data is accompanied by stop (1) and start (0) bits that identify the beginning and ending of the word. When no information is being transmitted i.e. sender device is idle, the communication line is usually high i.e. there is continuous stream of 1. Asynchronous transmission is a reliable transmission system as the extra start and stop bits ensure that the sender and receiver remain in step with one another.

It does not require smart device to differentiate between actual data and start/stop bit.

However, it is inefficient as the transmission speed is slowed down when there is huge volume of information to be transmitted.

(xii) Centralized Processing and Distributed Processing

S.No.	Centralized Processing	Distributed Processing
1.	Complete data is processed by central host computer.	Data is processed locally at the user workstation but stored in the central host computer for sharing of data among various users.
2.	All the database files are stored on the central host computer, hence security of data is of major consideration which requires regular backup.	Database files are physically distributed among various users as Partitioned database or Replicated database. Backup of data is taken by individual user.
3.	Dumb Terminals / Intelligent Terminals are used.	Intelligent Terminals are used.
4.	Central host computer is required to be of high speed, usually mini or mainframe computer, as entire workload is on the main CPU.	Central host computer known as Server can be even a microcomputer since data is processed by user workstations.

5.	Waiting time of a user can be high, as main CPU may be busy in processing the data of other users.	Data is processed immediately; hence waiting time of users is less.
6.	Terminals are connected with central host computer using high-speed communication link, which communicate with host computer frequently to access/process the data. Hence, communication expenditure is more.	Communication expenditure is less, as terminals called nodes communicate with server occasionally for data access.
7.	Failure of Central host computer will paralyze the entire network.	Failure of server will not completely breakdown the entire network.

(4) Ring network and mesh network

In a ring network, the network cable passes from one node to another until all nodes are connected in the form of a loop or ring. There is a direct point-to-point link between two neighboring nodes. These links are unidirectional which ensures that transmission by a node traverses the whole ring and comes back to the node, which made the transmission.

Mesh network is a random connection of nodes using communication links. Network lines are expensive to install and maintain. The links are planned to minimize cost and maintain reliable and efficient traffic movement. A mesh network may be fully connected or connected with only partial links. Each node is connected with a dedicated point-to-point link to every node. The reliability is very high as there are always alternate paths available if direct link between two nodes is down or dysfunctional.

(4) Logical Record and Physical Record

No.	Logical Record	Physical Record
1.	The record defined by user is called Logical Record.	Storage of Logical Record in the computer is called Physical Record.
2.	It is the collection of those fields which are accessed by a single primary key.	It is the collection of those fields which are stored in adjacent memory location.
3.	Logical records are linked together with the help of File pointers.	Physical records are linked together with the help of Address Pointers.
4.	It may consist of Fixed length fields and Variable length fields.	All fixed length fields of Logical record are stored in one Physical record and each variable length field of Logical record is considered as separate physical record.

5.	Field Names, their data type and width are defined by user according to the requirements.	Physical record size is defined by Database Administrator (DBA) in such a way that it results in faster accessing of data.
6.	User is concerned with Logical record for insertion, deletion and updation of data.	Computer performs the required manipulation in the physical record.
7.	Sequence of fields in Logical record may be according to the convenience of user.	Sequence of fields in Physical record may not be same as Logical record.

(xv) Key to disk and Key-to-diskette

Key to-disk system consists of a mini processor, number of keying stations, supervisor console and a magnetic disk. Keying station consists of a keyboard and VDU. Supervisor's console is used to monitor the functioning of different operators working on different keying stations, usage of magnetic disk and status of Input data.

Each keying station is connected to the mini processor and for each keying station, fixed area of main memory in the mini processor is allocated. When the data is entered from a keying station, it is stored in its allocated area. When the allocated area in the mini processor is filled with data, then the data from that area is shifted on the magnetic disk as a record. Key-to-disk system provides accuracy of input, security and monitoring of progress. However, since all the keying stations are connected with a single mini processor and in case mini processor fails, then all keying stations stop working.

Key-to-diskette stand-alone computers are provided to the different operators for data entry. Data entered by them is stored on the floppy disks. The data recorded on the floppy disks are later transferred to magnetic tapes with the help of data converter. The data converter can handle upto 20 diskettes at a time.

Since all the computers used are stand-alone computers, therefore, if one computer fails, it will not stop the working of others. In addition to this, stand-alone computers can be installed close to the source of data. Key-to-diskette system allows decentralized.

5. (a) Generation of Computers

First Generation computers : UNIVAC (Universal Automatic Computer) was the first general purpose electrical computer to be available and marks 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 subjugated to their speed. IBM-650 was however, the most popular first generation computer and was introduced in 1950 with magnetic drum

memory and punched cards for input and output. It was intended for both business and scientific applications.

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. IBM 1401 was the most popular second-generation computer. 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.

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 speedier with much vaster capacity 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 optimise 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. The mini computers are also one of the developments in the third generation computers.

Fourth Generation Information Systems : 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. Many new types of terminals and means of computer access were also developed at this time.

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 which function as a complete system. The computer networks came of age and are one of the most popular ways of interacting with computer chains of millions of users. The computers are being applied in various areas like simulation, visualization, Parallel computing, virtual reality, Multimedia etc.

Fifth Generation : The most famous example of a fifth generation computer is the fictional HAL9000 from Arthur C. Clarke's novel, 2001: A Space Odyssey. HAL performed all of the functions currently envisioned for real-life fifth generation computers. With artificial intelligence, HAL could reason well enough to hold conversations with its human operators, use visual input, and learn from its own experiences. 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.Parallel processing and superconductor technology are coming up greatly, improving the speed of information Computers today have some attributes of fifth generation computers. For example, expert systems assist doctors in making diagnoses by applying the problem-solving steps a doctor might use in assessing a patient's needs.

(b) Data Files can be classified into seven types, such as

Master files : A master file contains relatively permanent records for identification and summarising statistical information. A product file, customer file and employee file are examples of master files. The descriptive information in a master file may include such items as product code, descriptions, specifications, etc.

Transaction files : Transaction files are created from source documents used for recording events or transactions. These are detail files, and the information is used for updating the master files. If the processing is of the batch type, the transactions are accumulated for a period and a transaction file is created at the end of the period. The typical source documents, from which transaction files are created are purchase orders, job-cards, invoices etc.

Reference files : These files contain keys of records in other files. In order to retrieve a record from a file, the reference file is first searched to find out in which file a record can be located.

Table files : These are in the nature of catalogues or price lists.

Report files : A report file is created from records in other files in a meaningful and concise form. A sales performance report and a report on materials rejected are examples of report files.

Historical files : These contain statistical information of past periods. These files are used to analyze trends or make comparisons of one period with another and so on.

Back-up-files : These are copies of currently used master files kept in the computer library (i.e., collection of all computer files) as a measure of security.

6. (a) PC motherboards have two or more expansion slots, which are extensions of the computer's bus that provide a way to add new components to the computer. The slots accept circuit board, also called cards, adapters, or sometimes-just boards. The expansion slots on the motherboard are used for various purposes such as

1. To give built –in devices such as hard disks and diskette drives access to the computer's bus via controller cards.
2. To provide I/O (input/output) ports on the back of the computer for external devices such as monitors, external modems, printers, and the mouse (for computers that do not have a built-in mouse port).

3. To give special-purpose devices access to the computer. For example, a computer can be enhanced with an accelerator card, a self contained device that enhances processing speed through access to the computer'' CPU and memory by way of the bus.

Some of the slots and connectors are briefly discussed below:

SIMM/DIMM slots: SIMM stands for Single Inline Memory Modules, while DIMM stands for Dual Inline Memory Module. SIMM/DIMM slots are used to house RAM modules.

PCI slots: The PCI (Peripheral Component Interface) slots are used for connecting PCI-based devices like graphics accelerator cards, sound cards, internal modems or SCSI cards.

AGP slot: All Celeron and Pentium-III motherboards come with an AGP (Accelerated Graphics Port) slot. AGP is a dedicated slot meant to provide faster access to AGP-based graphic accelerator cards, thus enhancing the visual experience for the user.

SCSI : It is a device interface that is used to solve the problem of a finite and possibly insufficient number of expansion slots. It is called small computer system interface (SCSI pronounced "scuzzy"). Instead of plugging interface cards into the computer's bus via the expansion slots, SCSI extends the bus outside the computer by way of a cable.

(b) A Bus acts as the system's expressway that transmits data between the various components on the motherboard. A bus is a collection of wires through which data is transmitted between the various components of a PC. A bus connects the various components of the PC with the CPU and the main memory (RAM). Logically, a bus consists of two parts.

Data Bus : is an electric path or group of parallel wires that connects CPU, memory and other hardware devices on the motherboard for the purpose of transmission of data. The bus is a group of parallel wires. The number of wires in the bus affects the speed at which data can travel between hardware components. Each wire can transfer one bit at a time, an eight-wire bus can move eight bits at a time, which is a full byte.Presently 64-bit data bus is being used for transfer of data from 64-bit CPU.

Address bus, is a set of wires that connects CPU and RAM and carries the addresses of the memory locations from where data can be retrieved or stored. Number of wires in the bus affects the speed at which data can travel between hardware components.Number of parallel wires in the address bus determines the maximum number of memory locations the CPU can address. For example, with an eight-bit address bus, CPU can address maximum 256 memory locations. Today CPUs have 32-bit address bus that can address $4*10^9$ memory locations.

(c) The memory system constructed with metal-oxide semi conductor storage elements that can be changed is called a random access memory (RAM). The purpose of

RAM is to hold programs and data while they are in use. It is called random access memory since access time in RAM is independents of the address of the word, that is, each storage location (address) inside the memory is as easy to reach as any other location and takes the same amount of time. A random access memory is extremely fast but can also be quite expensive.

RAMs can be further divided into two types.

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. The most popular DRAM used in desktop systems are Extended Data Out DRAM, Synchronous DRAM and Rambus DRAM. RDRAM sends data down at high-band width channel.

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. Dynamic RAM is the most common type of main memory whereas static RAM is faster, larger and more expensive than DRAM. Static RAM is used mainly in a special area of memory called a cache.

7. (a) In general, the computer systems found in organizations should be designed to support user work practices. If people work independently and rarely need to share their work with others, the focus should be on providing systems that effectively support their individual endeavors. However, if individual work as part of a group or team, the systems that they use should make it easy for them to share their work, data, and information.

The computer systems are configured in an organization in 3 ways.

(i) Large-system Computing: In large-system computing, the processing task of multiple users is performed on a single centralised computer. In most business organisations, the central computer will be a mainframe or minicomputer. During the 1950s and early 1960s, these systems typically operated in a batch processing mode using punched cards and tapes for data input and storage. Later, on-line transaction processing became possible, permitting multiple users to simultaneously enter transactions from terminals. This meant that all inputs went directly from the terminal to the central computer for processing; after processing, all outputs to users came directly from the central computer. Most of the terminals used in these systems were called dumb terminals because they could do no processing on their own, serving only as input/output mechanisms that linked users with the central CPU.

Trying to serve multiple users via large centralized systems can have its shortcomings. Also, the central computer may function very slowly when too many users access it simultaneously during peak business periods. Due to these

shortcomings, many organisations have supplemented or replaced their centralized systems with personal computing and network computing arrangements.

(ii) Personal Computing: In personal computing computer should be readily available to an individual to perform his or her work at any time. Many tasks are individual by nature; for example, word processing, developing graphics for presentations, working with spreadsheets, and keeping personal calendars. Over time, the range of task that a personal computer can accomplish has steadily increased - largely because of the increasing availability of high-quality software. Some smaller businesses rely only on personal computers for all of their accounting, inventory management, customer database, and transaction processing operations.

Personal computers can be connected to each other or to larger computers to form networks; they can also be used as stand-alone systems. A standalone system is one that is not connected to or does not communicate with another computer system (or network).

(iii) Network Computing: In network computing arrangements, individuals do their own work on personal computers (or workstations), but are linked to other computers through to a telecommunication network that allows them to share information and resources with others. Users in these environments may share databases, memos and other messages, and work in progress (such as drafts of documents). They can also share printers, fax machines, and links to external data sources. Providing duplicates of these resources for each of the members of the work group can be very costly for many organizations.

Personal computers can be networked in numerous ways. For example, by using modems and communications software, personal computers may be linked to a large central computer via telephone lines. Alternatively, multiple personal computers (as well as such devices as printers and fax machines) may be connected to form a local area network or LAN. In some instances, the development of local area networks and other networks has made it possible for organizations to move applications that were traditionally run only on large central computers to less expensive networks.

(b) Document Image processing captures an electronic image of data so that it can be stored and shared. Imaging system can capture almost anything such as handwritten documents, photographs, flow charts, drawings etc. There are five distinct steps to document imaging. These are as follows:

Step 1: Data capture : The most common means of converting paper documents into electronic images is to scan them. The scanning device converts the text and pictures into digitized electronic code. The scanner can range from a simple hand held device to a high end, high speed scanner capable of scanning more than 2500 pages an hour. Hand-held scanners could transform text or graphical images into machine-readable data. Fax modems are also used to receive electronic images of documents.

Step 2: Indexing : Document images must be stored in a manner that facilitates their retrieval. Therefore, important document information, such as purchase order numbers or vendor numbers, is stored in an index. Great care is needed in designing the indexing scheme, as it affects the ease of subsequent retrieval of information.

Step 3: Storage : Because images require a large amount of storage space, they are usually stored on an optical disk. One 5.25 inch optical platter can store 1.4 GB or about 25,000 pages of documents. A 12-inch removable optical disk stores upto 60,000 pages of documents, and upto 100 optical disks can be stored in devices called jukeboxes.

Step 4: Retrieval : Keying in any information stored in an index can retrieve documents. The index tells the system which optical disk to search and the requested information can be quickly retrieved.

Step 5: Output : An exact replica of the original document is easily produced on the computer's monitor or on paper, or is transmitted electronically to another computer.

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

(i) they are either distinct, whole alphanumeric images produced by a process known as full character or formed character printer or,

(ii) they are formed by a dot matrix method which arranges a series of dots to assume the shape of each character being printed.

Impact printers fall into two basic categories-Serial or line printing.

(i) Serial Printers : serial printers print one character at a time, usually from left to right.

- Dot-matrix Printers Dot matrix printers utilise wire needles or pins which strike the ribbon against the paper in the pattern necessary to produce each character image. The printing head is a matrix block which consists of rows and columns of holes through which pins appear. The characters being printed are formed by activating the printing head so that certain pins appear through the holes to from a pattern which resembles each character. The pins are formed into the shape of the character to be printed, then pressed against an inked ribbon and the pattern printed on the paper. The character, whether they are letters, numbers or grammatical symbols are printed as a series of dots which merge together to form the character.

- Daisywheel Printers : 'Daisywheel' printers work in a similar manner to an electronic typewriter. The major difference is that they use a new type of printing element called a 'daisywheel'. This is a molded metal or plastic disc-shaped printing element which looks very much like a daisy - hence the name. It is about 65 m.m. in diameter and has a number of stalks or petals which radiate from a central core. On the end of each stalk is a

type character set in a similar manner to the keys as on a typewriter. This type of printer works by rotating the print element until the required character is positioned in front of the sheet of paper at the point where it will be printed. A small hammer hits the back of the stalk forcing that character against an inked ribbon and through onto the paper. All this 'happens at anything from 10 to 80 characters per second, which is far faster than a typist can type.

(ii) Line Printers : A line printer operates at much higher speeds and prints what appears to be a full line at a time. Line printers are only used where high speed and volume is necessary and where quality is the lesser requirement. Two types of line printers are discussed belows :

- Chain Printers : It has a chain that revolves at a constant speed in a horizontal plane. The complete chain has a complement of 48 numbers, alphabets and special symbols cast on 5 times over. It is confronted by a set of as many hammers as the number of print position say,160. These hammers are magnetically controlled. The continuous stationery and ribbon are inter posed between a segment of the chain and the set of hammers. When a required character on the chain faces its print position, the corresponding hammer is actuated.
- Drum Printers : These printers use a solid cylinder. There are as many bands on it as the number of print positions. Each band has cast on it the complement of 48 numerals, alphabets and special characters. The drum rotates at a constant speed confronted by a set of as many hammers as the number of bands with the inked ribbon and continuous stationery interposed. In one rotation of the drum there would be appropriate strikes by the set of the hammers. In the first strike A's are printed in the appropriate print positions, followed by B,C,.....Z,0,1.....9 and special symbols one by one.

(b) Computer Output MicroFilm (COM): It is an output technique that records output from a computer as microscopic images on roll or sheet film. The images stored on COM are the same images, which would be printed on paper. 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.

The data to be recorded on the microfilm can come directly from the computer (online) or from magnetic tape, which is produced by the computer (off-line). The data is read into a recorder where, in most systems, it is displayed internally on a CRT. As the data is displayed on the CRT, a camera takes a picture of it and places it on the film. The film is then processed, either in the recorder unit or separately. After it is processed, it can be retrieved and viewed by the user.

It has the following advantages:

- Data can be recorded at a speed of 30,000 lines/minute.
- Cost of recording is very less compared to printed output.

- Huge size data can be recorded.
- Recording space requirement is less.

It provides easy access to data, using indexing techniques.

9. (a) The various uses of Video disks are as below.

1. A video disk can store text, video, and audio data at a large.
2. Video disks can be accessed a frame at a time or played like a phonograph record.
3. Video disk can be used mostly for entertainment – for example, storing video movies or large amounts of prerecorded music.
4. Video disk systems were developed to help real estate agents conduct better searches for homes and properties for their clients.
5. Video disks are widely used for training applications.
6. Video disks are also used by automobile manufacturers to show their lines and by travel agents to interest clients in resorts.
7. In the future, some industry observers predict that many businesses will develop automatic customer service centres equipped with video disk components

(b) 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. Write-protect precaution should be observed by peeling off or sticking on (as applicable) the aluminum square on the notch.

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.

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. 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. The main enemies of a diskette are temperature and direct sunlight, dust, liquids and vapors and electromagnetic interference. Diskette should be protected from them. Care should be taken to clean the disk drive head to remove dust regularly.

10. (a) A software is a collection of programs and routines associated with a computer which facilitates the programming and operation of the computer.

The various types of the software is discussed below.

System Software : It comprises those programs that direct the computer in performing tasks that are basic to proper functioning of the computer system or commonly needed by system users. It includes (i) assemblers and compilers, (ii) diagnostic routines, (iii) utility programs, (iv) supervisory programs, and (v) library of

subroutines. The system software of one computer system may differ in many ways from that of another.

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 specializes in writing systems program.

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

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.

General-Purpose Software : This software provides the framework for a great number of business, scientific, and personal applications. Spreadsheet, data bases, Computer-Aided Design (CAD) and word processing software etc. fall into this category. Most general-purpose software is sold as a package. The software is accompanied by user-oriented documentation such as reference manuals, keyboard templates, and so on. It is then upto the user of the software to create the application. For example, an accountant can use spreadsheet software to create a template for preparing a balance sheet of a company. An aeronautical engineer can use CAD software to design an airplane or an airport. A personnel manager can use word processing software to create a letter and so on.

(b) The various types of Operating Systems used in Microcomputer are:

MS/ PC-DOS : The origins of Microsoft's Disk Operating System (MS-DOS) lie in the prelaunch era of the IBM PC. It is a single user 16 bit OS called PC-DOS (Personal Computer Disk Operating System). Originally MS-DOS was designed to be an operating system that could run on any 8086-family computer. All 8086-family computers closely emulated IBM's hardware, and a single version of MS-DOS was all that was needed for the market.MS-DOS was usually the OS supplied with a PC comparable and PC-DOS was usually the OS which was supplied with an actual IBM PC.

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 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) A 32-bit architecture which provides for a multi tasking environment.

(b) A friendly interface fitted with 'one click' access.

(c) Windows 95 is network ready i.e. it is designed for easy access to network resources.

(d) 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:

(i) Stable multitasking environment

(ii) Enhanced security features

(iii) Increased memory

(iv) Network utilities

(v) 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.

Windows Vista : 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 that 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.
- 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.

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 due to varied hardware demand of this application. Another more serious problem with the original OS/2 that it was unable to support many existing PC applications. So users faced problems due to lack of compatibility between their original applications and OS/2.

11. (a) Managerial decision-making is likely to be most effective when managers are able to quickly access information they need on demand. Since ready access to relevant data and information is essential for effective decision-making, managers need to know what information is available and how to access it, as well as how it can be used to make decisions.

All issues regarding the effective management of data fall into at least one of the following categories:

Content : What data should the organisation collect in the future? What data is it currently collecting?

Access : In what ways must organised users access data in order to effectively perform their jobs? This question involves the timing required to get data to users when they need it, and also the issues of which users have a right to which data.

Organisation: In what ways should data be logically and physically organised to the key the types of data accesses required by users?

Accuracy : Which validation, editing and auditing procedures are necessary in every stage of the input processing, output cycle to ensure that data and information generated from the data are correct?

Integrity : What controls are necessary in each stage of the input-processing-output-storage cycle to ensure that data are up-to-date and that changes to specific occurrences of data are made everywhere in the system?

Security: How will data be protected from such possible events as unauthorized access, unauthorized modification, outright theft, and malicious or unintentional destruction?

Privacy: How will data be safeguarded to protect the rights of individuals to privacy?

Cost: How should data-related costs be controlled? To which sets of data and information needs should scarce resources be allocated?

(b) The indexed sequential file organisation or indexed sequential access method (ISAM), is a hybrid between sequential and direct access file organisations. The records within the file are stored sequentially but direct access to individual records is possible through an index. This index is analogous to a card catalog in a library.

Cylinder Index

Cylinder	Highest Record key in the Cylinder
1	84
2	250
3	398
4	479
5	590

Cylinder 1 Track Index		Cylinder 2 Track Index		Cylinder 3 Track Index	
Highest Record key in the		Highest Record key in the		Highest Record key in the	
Track	Track	Track	Track	Track	Track
1	15	1	94	1	280
2	40	2	110	2	301
3	55	3	175	3	330
4	75	4	225	4	365
5	84	5	250	5	398

To locate a record, the cylinder index is searched to find the cylinder address, and then the track index for the cylinder is searched to locate the track address of the desired record. To illustrate, we assume that the desired record has a key value of 225. The cylinder address is 2, since 225 is greater than 84 but less than 250. Then, we search the track index for cylinder 2 and find that 225 is greater than 175 and equal to 225, therefore, the track address is 4. With the cylinder address, control unit can then search through the records on track 4 within cylinder 2 to retrieve the desired records.Indexed sequential organisation combines the best features of sequential organisation with best features of directs access by means of the index.

Disadvantages are the extra storage requirements to accommodate any subsequent insertions, the extra storage for the indexes and the time needed to process the indexes and the need to periodically reorder the file.

12. (a) A data base is a repository for related collection of data. It is a computer file system that uses a particular file organization to facilitate rapid updating of individual records, simultaneous updating of related records, easy access of information by all applications programs and rapid access to all stored data which

must be brought together for a particular routine report or inquiry or a special purpose report or enquiry.

The main types of databases are discussed below:

(i) Operational data bases: These data bases store detailed data needed to support the operations of the entire organization. These are also called subject area data bases, transaction data bases and production data bases.

(ii) Management data bases: These data bases store data and information extracted from selected operational and external data base. They consist of summarized information mostly needed by the top management and other end users as part of their decision support systems and executive information systems to support managerial decision-making.

(iii) Information warehouse data bases: It stores data from current and previous years. It contains data that has been extracted from the various operational and management databases of an organization. It is a central source of data that has been standardized and integrated so that it can be used by different levels of management in an organization.

(iv) Distributed data bases: These are data bases of local work groups and departments at regional offices, branch offices, manufacturing plants and other work sites.

(v) End user data bases: These data bases consist of data files developed by end users at their workstations. For example, users may have their own electronic copies of documents they have generated with word processing package or received by electronic mail.

(vi) External data bases: Access to external, privately owned online data bases or data banks is available for a fee, to the end users and organizations from commercial information services.

(vii) Text data bases: Text data bases are natural outgrowth of the use of computers to create and store documents electronically. Thus, online data base services store bibliographic information such as publications in larger text data bases. They are also available on CD-ROM or optical disks.

(viii) Image data Base: A wide variety of images can also be stored electronically in image data bases. For example, electronic encyclopedia is available on CD-ROM. It can be used in document image processing. Thousands of pages of business documents can be optically scanned and stored as document images on a single optical disk. Workers can view and modify documents at their own workstations and electronically transfer them to the workstations of other end users in the organization.

(b) Advantages of DBMS are as follows:

1. Data Sharing: The data from the entire company is available at one place and at the disposal of the users who need them, which helps them to analyze a large store of information.

2. Reduced Data Redundancy: A database minimizes duplication of data from file to file.

3. Improved Data Integrity: Because data redundancy is minimized, data inconsistency and the threat to data integrity are substantially reduced.

4. Data Independence: A database system keeps descriptions of data separate from the applications that use that data. Thus, changes in the data definitions can occur without changing the application program that uses the data.

5. Increased Application Programmer and User productivity: An Application program development tool offered by DBMS improves the programmer's productivity. The users can also increase their productivity by using query languages and report generators that allow them to produce reports from the database with little technical knowledge.

6. Improved Data Administration and Control: Since the responsibility of database is at one person's hand, it permits better enforcement of standards for defining data elements and data relationships. Moreover, access to data, privacy of data, updates and deletions of data become much easier to control.

7. Increased Emphasis on Data as a Resource: Establishing database administration and deploying a database management system results in greater corporate attention to information systems and aids to managerial decision making and long-range planning using the database as the basic information resource.

Disadvantages of Databases are as follows:

1. Concurrency Problems: When more than one user utilizes a database management system, problems can occur if the system is not designed for multiple users. One of these problems is concurrent access to records, or concurrency. Another way to avoid concurrency problems is to lock only the record being used.

2. Ownership Problems: In a file-based system, employees who run application problems on application specific files frequently feel that the data in those files are theirs and theirs alone. Users, such as payroll department personnel, develop ownership of the files in the system. When a database of such files is created, the data is no longer the specific property of application users, but instead is owned by the entire company. Any user with a need should be able to obtain the authority to read or otherwise access the data. Giving up ownership of data may be traumatic for any company employees and managers. However, for a database to be successful, the data must be viewed and treated as a corporate resource, not as an individual's property.

3. Problems of Resource: A database management system usually requires extra computing resources. Much more data must be stored on-line to answer queries. As a result, more terminals may be needed to put managers and other users on-line and make it available to managers. Communication devices may

be needed to connect the extra terminals to the database. It may even be necessary to increase the size or number of CPUs to run the extra software required by the DBMS.

4. Problems of Security: A database must have sufficient controls to ensure that data is made available only to authorized personnel and that adding, deleting, and updating data in the database are accomplished only by these personnel. The manager must realize that access security means more than merely providing log-on codes, account codes, and passwords. Security considerations should include means of controlling physical access to terminals, tapes, and other devices. Security considerations should also include the non-computerized procedures associated with the database, such as forms to control the updating or deletion of records or files and procedures, for storing source documents.

13. (a) Real Time systems: The term real time system refers to the technique of updating files with transaction data immediately after the event to which it relates occurs. Real time system is basically on-line system with one specialty in inquiry processing. The response of system to the inquiry itself is used to control the activity. Real time systems usually operate in multi programming and multi processing. This increases both availability and reliability of the system. CPU's in real time systems should possess capability of what is known as program interrupts.

Some of the leading areas for real-time applications are sales order processing, transport and travel reservation, manufacturing control system, and airline reservation system.

(i) Sales Order Processing - Real-time systems offer the possibility of a greatly prompt service to the customer. His order can be processed within virtually no time. The finished goods inventory file may have data terminals throughout the sales territory. The CRT's can be made to display the invoice on a terminal for the salesman who is in the customer's plant and can input the particulars there and then ! The customer would get to know of the availabilities instantaneously. All appropriate journal entries would be made immediately in the general ledger. The invoice can also be posted to the accounts receivable file instantaneously. The selection of warehouse that is closest to the customer can also be made and a copy of the invoice could be displayed at the warehouse terminals. Besides, the following functions can be performed rapidly.

- The inquiries about the customer's accounts status can be answered by the salesman.
- Credit appraisal can be carried out on-line.
- Sales analysis master file can be updated online. This file provides a ready information to the sales manager regarding sales trends, etc.
- Inventory replenishment orders can be determined as a part of the sales order processing.

(ii) Transportation and Travel Reservation - These activities pertain notably to hotel chains and airline reservation. Data terminals would be located at each reservation point so that customer reservations can be confirmed quickly. The various accounting calculations can also be performed and the relevant files updated.

(iii) Retail Sales - Credit checking and inventory control functions can be performed.

(iv) Manufacturing control system - Production control, inventory control, purchasing, receiving, scheduling, shipping, quality control, responding to various inquiries and cost control can all be performed on real-time. Efficiency, man-machines utilisation and service are enhanced by real-time, and responses to inquires quicker and control tighter.

(v) Airline Reservation System - An airline reservation system reflects an upto the minute status. A number of data terminals are located at various reservation offices of airlines. A customer can go to any of these reservation counters to enquire about the availability of seat or for cancellation of tickets in a particular flight. Airline reservation agents communicate with the centralised computer via these remote terminals and the computer immediately responds back. The system simultaneously updates the date base as soon as a seat on any flight is filled or becomes available.

(b) Decision Support Systems: These are information processing systems which help the managers in decision making process. Advancement in hardware technology, interactive computing design graphics capabilities and programming languages has helped in the development of decision supports systems. These systems support management decision making process by solving relatively unstructured problems. A friendly computer interface eases the communication between the user and the decision support system.

A decision support system has four basic components - (i) the user, (ii) one or more databases, (iii) a planning language, and (iv) the model base. These are briefly discussed below:

(i) The user: The user of a decision support system is usually a manager with an unstructured or semi-structured problem to solve. The manager may be at any level of authority in the organization (e.g., either top management or operating management). Typically, users do not need a computer background to use a decision support system for problem solving. The most important knowledge is a thorough understanding of the problem and the factors to be considered in finding a solution. A user does not need extensive education in computer programming since he has to concentrate on what should be accomplished rather than on how the computer should perform each step.

(ii) Databases: Decision support systems include one or more databases. These databases contain both routine and non-routine data from both internal and external sources. The data from external sources include data about the operating environment surrounding an organization – for example, data about economic conditions, market demand for the organization's goods or services, and industry competition.

Decision support system users may construct additional databases themselves. Some of the data may come from internal sources. An organization often generates this type of data in the normal course of operations. The database may also capture data from other subsystems such as marketing, production, and personnel.

(iii) Planning languages: Two types of planning languages that are commonly used in decision support systems are: (1) general –purpose planning languages and (2) special-purpose planning languages. General-purpose planning languages e.g. languages in most electronic spreadsheets allow users to perform many routine tasks such as retrieving various data from a database or performing statistical analyses. Special-purpose planning languages are more limited in what they can do, but they usually do certain jobs better than the general-purpose planning languages. Some statistical languages, such as SAS, SPSS, and Minitab, are examples of special purpose planning languages.

(iv) Model base: The planning language in a decision support system allows the user to maintain a dialogue with the model base. The model base is the "brain" of the decision support system because it performs data manipulations and computations with the data provided to it by the user and the database. The analysis provided by the routines in the model base is the key to supporting the user's decision. The model base may dictate the type of data included in the database and the type of data provided by the user. Even where the quantitative analysis is simple, a system that requires users to concentrate on certain kinds of data can improve the effectiveness of decision making.

14. (a) Data Communications is the transfer of data or information between a source and a receiver. The source transmits the data and the receiver receives it. The actual generation of the information is not part of Data Communications nor is the resulting action of the information at the receiver. Data Communication is interested in the transfer of data, the method of transfer and the preservation of the data during the transfer process.

Many organisations have multiple users of computers; some of these users are geographically remote from the organization's headquarter offices. Even within an office building, there may be hundreds or thousands of employees who use a particular computer. Users have several options to choose from in communicating data to and in receiving data from the computer. These include the following:

- People may have to depend on mail delivery or messenger service to bring data to and from the computer. This usually involves delays and dependency on intermediaries. Also, the cost of such delivery service has risen rapidly.
- Each unit of the organization can be supplied with its own computer. However, it is not frequently economically feasible to do this for all units.
- Data may be transmitted, via communications links, between remote locations and the computer. Just as the telephone and telegraph services have speeded up oral and written messages between people, so data transmission can speed up the flow of data messages.

There are three basic types of data transmission techniques as discussed below:

(i) Circuit switching: Circuit switching is what most of us encounter on our home phones. We place a call and either get our destination party or, in case we encounter a busy signal, we cannot transmit any message. A single circuit is used for the duration of the call.

(ii) Message switching: Some organizations with a heavy volume of data to transmit use a special computer for the purpose of data message switching. The computer receives all transmitted data; stores it; and when an outgoing communication line is available, forwards it to the receiving point.

(iii) Packet switching: It is a sophisticated means of maximizing transmission capacity of networks. This is accomplished by breaking a message into transmission units, called packets and routing them individually through the network depending on the availability of a channel for each packet. Passwords and all types of data can be included within the packet and the transmission cost is by packet and not by message, routes or distance. Sophisticated error and flow control procedures are applied on each link by the network.

(b) Various storage techniques used in Network Storage Systems are as below.

1. Storage Area Network (SAN): A storage area network is a dedicated, centrally managed, secure information infrastructure which enables any- to- any interconnections of servers and storage system. A SAN has following salient features:

   - Facilitates universal access and sharing of resources.
   - Supports unpredictable, explosive information technology growth.
   - Provides continuous service.
   - Improves information protection and disaster tolerance.
   - Enhances security and data integrity of new computing architecture.

2. Network-Attached Storage (NAS): It is a dedicated shared storage solution connected to a network, allowing the file and data sharing among different clients of the network. It is platform and operating system independent. It can be attached with the network without switching off the network and requires no changes to the existing file servers.

   A NAS device is a stand-alone, single-purpose and high performance system. It is used to satisfy the storage requirement of different users with its own operating system, integrated hardware and software. NAS devices are suitable for heterogeneous networks. NAS is a totally integrated network system with SCSI hard disk drives and is basically a modular file server. It runs independently and provides excellent services to all the users. It functions even if the network server is down.

3. Direct attached storage (DAS), is a storage device that connects directly to a single server. Network workstations access the server to connect to this storage. Because the server may be handling distributed applications such as e-mail or databases, the performance of DAS is typically not as high as that of networked storage. DAS uses the security features of the server's network operating system.

(c) Communication protocols are sets of rules or conventions that must be adhered to by both the communicating parties to ensure that the information being exchanged between them is received and interpreted correctly. A protocol defines the following three aspects of digital communication.

(i) Syntax – The format of data being exchanged, character set used, type of error correction used, type of encoding scheme being used.

(ii) Semantics – Type and order of messages used to ensure reliable and error-free information transfer.

(iii) Timing – Define data rate selection and correct timing for various events during data transfer.

Communication protocols are defined in layers, the first of which is the physical layer or the manner in which node in a network are connected to one another. Both the network software and network-interface card have to adhere to a network protocol. The RS-232 C connector is the standard for some communication protocols. Subsequent layers, the number of which vary between protocols, describe how messages are packaged for transmission, how messages are routed through network, security procedures and the manner in which messages are displayed.

A number of different protocol codes are in use. For example, X.12 is the standard for electronic data interchange (EDI) X.75 is used for interconnection between networks of different countries, and XMODEM is used for uploading and downloading files. The set of most common protocols used on the Internet is called TCP/IP.

15. (a) Electronic Data Interchange (EDI) is the transmission, in the standard syntax, of unambiguous information of business or strategic significance between computers of independent organizations. The users of EDI do not have to change their internal databases. However, users must translate this information to or from their own computer system format, but this translation software has to be prepared only once.

In simple terms, Electronic Data Interchange (EDI) is computer-to-computer communication using a standard data format to exchange business information electronically between independent organizations.

EDI does not aid in transmitting documents but dynamically moves data between companies computer systems. Computer-to-computer transfer can be direct, between two companies using an agreed upon data protocol, or it can be performed by a third party, service – vendor. Users can transmit business documents like

quotes, shipping notices and even payment orders electronically to customers and suppliers. Design documents, electronic fund transfers and database transactions also come under EDI umbrella.

The following advantages are observed for use of EDI:

(i) Issue and receive orders faster – Since most purchasing transactions are routine, they can be handled automatically, utilizing the staff for more demanding and less routine tasks.

(ii) Make sales more easily – Quotes, estimates, order entry and invoicing will proceed more smoothly and efficiently. Orders received electronically ensure that information is available immediately, so that an organization can respond faster and be more competitive.

(iii) Get paid sooner – Invoices received electronically can be reconciled automatically, which means they are earmarked for payment in one's trading partner's accounting department sooner and in turn, one's own purchasing department is in a position to negotiate for better terms including faster payment.

(iv) Minimize capital tied up in inventory – For manufacturing organizations with a just- in-time strategy, the right balance is crucial but every organization stands to benefit from reducing order lead times.

(v) Reduce letters and memos – Letters and memos do not follow rigid rules for formatting. They can be handled by an electronic mail system.

(vi) Decrease enquiries – Customers or suppliers can make direct on-line enquiries on product availability, or other non-sensitive information instead of consuming staff's previous time.

(vii) Make bulk updates of catalogues and part listings – One can provide updates of data files, such as catalogues to customers or part listings to franchisees.

(b) A data centre is a centralized repository for the storage, management and dissemination of data and information. It is highly secure, fault-resistant facilities, hosting customer equipment that connects to telecommunications networks. The purpose of data centre is to provide space and bandwidth connectivity for servers in a reliable, secure and scaleable environment.A data centre also provides certain facilities like housing website, providing data serving and other services for companies. The primary goal of the data centre is to deploy the requisite state of the art redundend infrastructure and system as to maximize availability and prevent or mitigate any potential downtime for customers.

Services Provided by Data Centre: Some of the value added services that data centres provide are:

(i) Database Monitoring:

- This is done via a database agent, which enables the high availability of the database through comprehensive automated management.

(ii) Web Monitoring:

- Assess and monitor website performance, availability, response and integrity from a visitor's perspective.
- Report on HTTP, FTP service status, monitor URL availability, verify web content accuracy and changes.

(iii) Backup and restore:

- Provide centralized multi-system management capabilities
- Provide comprehensive integral management solution to data storage using backup agent for the operating systems, database and applications.

(iv) Intrusion detection:

- Detect malicious activity on the host – based ID systems and, network-based ID systems,
- Provide automated network security assessment and policy compliance evaluation.

(v) Storage on demand:

- Provide back-end infrastructure as well as expertise, best practices and process to give a robust and cost-effective storage strategy. Data storage infrastructure provide security, reliability and availability of data to meet company demands.

16. (a) Data Integrity Controls (i.e. controls on the possible value a field can assume) can be built into the physical structure of the fields. In order to have the correct database, DBMS needs to have certain controls on the data fields. Some of the security controls that DBMS imposes on data fields are as follows:

(i) Data Type: In the data field, the data type defines the type of data to be entered in the field. It may be numeric, character etc.

(ii) Length of data field: The length of data field defines the maximum number of characters or digits (depending upon the data type) to be entered in the data field. It may be 256, 65536 etc.

(iii) Default value: It is the value a field will assume unless a user enters an explicit value for an instance of that field. Assigning a default value to a field can reduce data entry time and entry of a value to that field can be skipped. Default value helps in reducing the probability of data entry errors for most common values.

(iv) Range Control: This limits the set of permissible values a field can assume. The range may be numeric lower to upper bound or a set of specific values. Range control must be used with caution since the limits of range may change with time. A

combination of range control and coding led to Y2K problem, in which a field for the year was represented by only the numbers 00 to 99.

(v) Null Value Control: Null value is an empty value. Each primary key field must have an integrity control that prohibits a null value. Any other required field may also have a null value control placed on it depending upon the policy of the organization. For example, a university may prohibit adding a course to its database unless that course has a title as well as value to the primary key, course-ID. Many fields legitimately may have null values so this control is to be used only when truly required.

(vi) Referential Integrity: This control on a field is a form of range control in which the value of that field must exist as the value in some field in another row of same or different table. That is the range of legitimate values comes from the dynamic contents of a field in a data base table, not from some pre-specified set of values. Referential integrity guarantees that only some existing cross-referencing value is used, not that it is the correct one.

(b) Following five areas of DBMS managements are be considered when trying to maintain a well-tuned database:

(i) Installation of database

- Correct installation of the DBMS product.
- Ensuring that adequate file space is available.
- Proper allocation of disc space for database.
- Allocation of data files in standard sizes for I/O balancing.

(ii) Memory Usage – One should know about following memory management issues:

- How the DBMS uses main memory ?
- What buffers are being used ?
- What needs the programs in main memory have?
- Knowledge of above issues can help in efficient usage of memory.

(iii) Input / Output (I/O) contention

- Achieving maximum I/O performance is one of the most important aspects of tuning.
- Understanding how data are accessed by end-users is critical to I/O contention.
- Simultaneous or separate use of input and / or output devices.
- Clock speed of CPU requires more time management of I/O.

- Spooling/Buffering etc. can be used.
- Knowledge of how many and how frequently data are accessed, concurrently used database objects need to be striped across disks to reduce I/O contention.

(iv) CPU Usage

- Multi programming and multi processing improve performance in query processing
- Monitoring CPU load.
- Mixture of online/back ground processing need to be adjusted.
- Mark jobs that can be processed in run off period to unload the machine during peak working hours.

17. (a) Section 87: This Section has been discussed in Chapter 13 – Miscellaneous of IT Act, 2000. According to this section, Central government has powers to make rules regarding the following:-

(i) The manner in which any information may be authenticated by digital signature.

(ii) The electronic form in which filings, issue, grant or payment shall be effected.

(iii) The matter relating to the type of digital signature, manner and format in which it may be affixed.

(iv) Security procedure for creating secure electronic record.

(v) Qualifications and experience of Controller, Deputy Controller & Assistant Controller.

(vi) Requirements for applying for a license to issue Digital Signature Certificate.

(vii) The format of application form for license, period of validity of license and amount of fees payable.

(viii) The form and fee for renewal of license.

(ix) The fee to be paid to the Certifying Authority for issue of a Digital Signature Certificate.

(x) The qualification and experience of the adjudicating officer.

(xi) The salary, allowances and other terms and conditions of service of Presiding Officer.

(b) The "Cyber Regulations Appellate Tribunal" has appellate powers in respect of orders passed by any adjudicating officer.

The section 48 of IT Act, 2000 allows to establish one or more Appellate Tribunals to be known as Cyber Regulations Appellate Tribunals. The Tribunal shall consist of one person only, called the Presiding officer, who shall be appointed by notification by the Central Government. Such a person must be qualified to be a judge of High Court. He shall hold office for a term of five years or upto a maximum age limit of 65 years, whichever is earlier.

Section 58 of IT Act provides for the procedure and powers of the Cyber Appellate Tribunal. The Tribunal shall also have the powers of the civil Court under the Code of Civil procedure, 1908.

Some of the powers specified are in respect of the following matters.

- Summoning and enforcing the attendance of any person and examining him on oath.
- Requiring production of documents and other electronic records.
- Receiving evidence on affidavits
- Reviewing its decisions
- Issuing commissions for examination of witness etc.

Section 61 provides that no court shall have jurisdiction to entertain any suit or proceeding in respect of any matter which an adjudicating officer has jurisdiction to determine.

18. (a) The set of detailed instructions which outline the data processing activities to be performed by a computer is called a program. Computer programming is a process which results in the development of a computer program. Computer programming process may be sub-divided into six separate phases.

(i) Program analysis - In this stage, the programmer ascertains for a particular application (e.g., up-dating of the stock file) the outputs required (i.e., the up-dated stock file, listing of the replenishment orders, stock movements report, stock valuation report etc.), the inputs available (i.e., the stock master file, the receipts and issues transaction file) and the processing i.e., updating the physical balance, computing stock value for various items, determination of placement of the re-plenishment order etc.). The programmer then determines whether the proposed application can be or should be programmed at all.

(ii) Program design - In this stage, the programmer develops the general organisation of the program as it relates to the main functions to be performed. These layouts, and flowcharts etc. are provided to the programmer by the system analyst. The flow-chart depicts the flow of data, documents etc. very clearly, what are the steps to be repeated or what are the alternatives or branches at particular step are shown conspicuously. Such details may be difficult to bring out in descriptive language.

(iii) Program Coding - The logic of the program outlined in the flowchart is converted into program statements or instructions at this stage. For each language, there are specific rules concerning format and syntax. Syntax means vocabulary, punctuation and grammatical rules available in the language manuals which the programmer has to follow strictly and pedantically.

(iv) Program debugging - The assembly compilation run can detect only few syntax errors. Considering that a program of average size would include thousands of instructions, there is an ample scope for the programmers to make errors technically known as bugs. Since the branches in a program tend to proliferate, a large number of transactions would have to be devised for a thorough test.

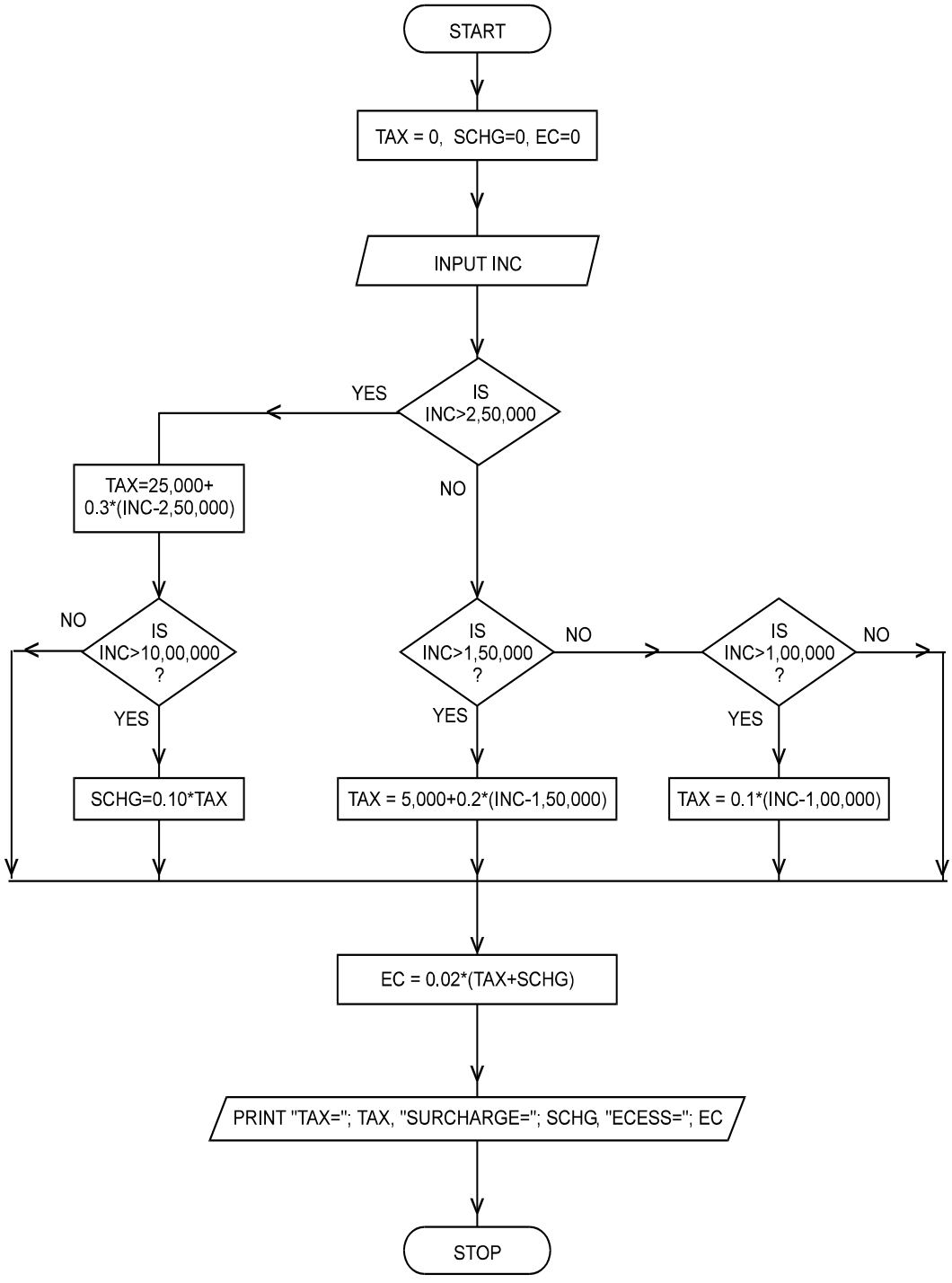
In a survey conducted by the IBM, It is estimated that program of some scope (trivial programs excluded) may require as many as 20 rounds of debugging before it is thoroughly cleansed of bugs.

(v) Program documentation - Each program should be documented to diagnose any subsequent program errors, modifying or reconstructing a lost program. Program documentation including the following may be assembled.

- The program specifications i.e., what the program is supposed to do.
- The program descriptions i.e., input, output and file layout plans, flowcharts etc.
- The test data employed in debugging the program.
- The operation manual which details the operating instructions for the computer operator, viz., insert the data floppy when program has been read into the memory, or load the paper on the printer etc.
- The maintenance documentation that is listings of any subsequent amendments to the program.

(vi) Program maintenance - The requirements of business data processing applications are subject to continual change. This calls for modification of the various programs. There are usually a separate category of programmers called maintenance programmers who are entrusted with this task. This should bring out the necessity of writing programs in the first place that are simple to understand.

(b) The flowchart is given on next page


START
TAX = 0, SCHG=0, EC=0
INPUT INC
IS INC>2,50,000
YES
NO
TAX=25,000+ 0.3*(INC-2,50,000)
IS INC>10,00,000 ?
NO
YES
SCHG=0.10*TAX
IS INC>1,50,000 ?
NO
YES
TAX = 5,000+0.2*(INC-1,50,000)
IS INC>1,00,000 ?
NO
YES
TAX = 0.1*(INC-1,00,000)
EC = 0.02*(TAX+SCHG)
PRINT "TAX="; TAX, "SURCHARGE="; SCHG, "ECESS="; EC
STOP

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

A decision table is divided into four parts:

(i) Condition stub: It contains statements i.e., the factors to be considered in making a decision.

(ii) Action stub: It introduces one or more actions i.e., steps to be taken when a certain combination of conditions exists.

(iii) Condition entries: It lists in its various columns the possible permutations of answers to the questions in the condition stub.

(iv) Action entries: It lists in its columns corresponding to the condition entries, the actions contingent upon the set of answers to the questions in that column.

(b) Decision Table

Conditions	Rules			
	1.	2.	3.	4.
	Condition entries			
Sales region code <10	Y	Y	N	N
Invoice amount < Rs. 10,000	Y	N	Y	N
Action Stub	Action entry			
Delivery charges				
Add Rs. 100 to invoice total		X		
Add Rs. 150 to invoice total				X
Add Rs. 200 to invoice total	X			
Add Rs. 250 to invoice total			X	

20. (a) MS-WORD offers a wide variety of formatting features to enable user to choose the options that best suits his specific needs. Five main formatting features are discussed below:

(i) Modify Fonts – Font refers to the print type, style and size of characters used in printing. The use of different fonts changes the look of the text. Word 2000 offers a number of different font types to choose from, e.g. Times New Roman, Arial, Courier, CG Times etc. The default font in any Word document is Times New Roman. Besides the regular style, font can be made either bold, italic or bold italic. Underlining the text can further enhance the style. Word 2000 also offers eleven different effects that can be applied to text. Text can be shadowed, outlined, embossed, engraved etc.

(ii) Paragraph Alignment – Alignment of lines for the written text is the most common convention followed. Each line of written matter on a page maintains a constant horizontal distance from the left edge of the page. Word makes alignment effortless even while offering four types of alignment to text. They are Left, Right, Centre and Justify.

(iii) Indenting & Line spacing – Indenting of paragraph means that we specify the distance of the text from the margin. By using indenting, the selected paragraphs stands out from the other text in the document. Increasing or decreasing the indent alters the distance of the text from the margins. Word also offers some special indentation features like 'First-line' only and 'Hanging' indents.

Various types of paragraph indent options are available in Word 2000. Line spacing determines the amount of vertical space between lines of text. By increasing the line spacing, the readability of document increases. Word offers several options for line spacing.

(iv) Numbers and Bullets – While writing certain kind of communication, e.g. business or legal communication, it is convenient to state the ideas point by point. This usually happens in letter where user is trying to put across his views and wishes to give reasons. Word offers numbers and bullets options to highlight each new point in the list. It is also possible to have multi-level bullets and numbering.

(v) Headers and Footers – When a user wants to insert some information to appear on every page, he can insert this using the Header and Footer option. Header is placed in the top margin while footer is placed in the bottom margin of a page. One can use the same header and footer throughout a document or header and footer can be changed for part of the document by inserting a section break.

(b) (i) Clip Gallery: Clip Gallery is a collection of multimedia effects available in MS-WORD. Multimedia effects such as sound and videos are particularly welcomed by the users. The clips can be used in the following manner:

Insert Clip: Select 'Insert/Picture/Clipart'. A dialog box 'Microsoft Clipart Gallery' will appear on the screen. Select 'Clipart' tab on it and then choose the category. In the adjoining window all the related clips can be found. The user can search through and select the appropriate clip and click at the <Insert>button. The clip selected will be placed in the document, at the cursor position.

Resizing Clip: The clip on the document may not be of the desired size. It can be resized. The user can select the clip by clicking anywhere on it. Eight sizing handles appear on the boundary of the clip. On taking pointer to a desired handle, the pointer gets changed into a double-headed click. The user can click and drag the handle in the desired direction. When the required size is achieved, the mouse pointer can be released.

(ii) Auto Text: This is a unique feature of the word. It allows storing formatted text even paragraphs and graphics. These can be recalled by pressing some keys. Auto Text

is like auto correct in that it also has dictionary of its own and can be customized. Auto text has an Auto complete tip that will complete the text without you having to type the entire word. New Auto text entries can be made for any text in the document using the Create Auto Text entry dialog box.

(iii) Spelling and Grammar: The spell checking function checks each word in the article against the dictionary and underlines it with a red curly line if the word with wrong spelling appears. Words not found in the dictionary are also marked with a read curly line. User on running the spell check function will be able to get the right spelling and rectify it. Additional words can also be added to the dictionary.

(iv) Document Editing : A powerful features through which a document can be opend and modify accordingly. The changes to a document can be done by using the Edit Feature in Word-Cut, Copy and Paste.

'Cut' removes the selected text from the document. This text can then be moved to any other parts of the document by using the 'paste' features. The text is immediately pasted as the desired location.

'Copy' does not remove the selected text from the document. Rather it duplicates selected text by using 'Paste' feature at desired location in a document.

21. (a) Various types of charts, which can be created through MS-Excel, are briefly discussed below:

(i) Pie chart: It shows only a single data series. It shows the proportionate contribution of various items that make up the data series. That is to say when a data series is given, Excel sums up the individual values in the series and calculates the percentage contribution of each in the total. This will then determine the size of each data point's pie slice. Data labels can be used in a pie chart to display either the actual value of each point or the percentage.

(ii) Line chart: In many situations, we have more than one data series to represent. In line chart, data points of one data series are connected by lines, showing an upward or downward trend in value. Each data series is a line in the chart. A line chart is usually two –dimensional.

(iii) Area charts: A variation of the line chart is the area chart. It is similar to a line chart but the area below the line is filled thus marking out an area for each data series. Thus, an area chart plots each data series one on top of the other. The magnitude of change over time is clearly visible in this chart.

(iv) Column and Bar charts: Column and bar charts are used to compare values across categories. In a bar chart the value axis is organized horizontally while the categories axis is arranged vertically. Column charts are similar to bar charts but have the categories axis at the bottom. Each bar represents a single data value in the data table. MS-Excel offers several variations in bar and column charts.

(b) (i) MOD(x/y): It is a mathematical function which computes the modules value of x/y that is the remainder that would be left when we divide x by y. For example, if x=9 and y=2, then value returned will be 1.

(ii) DCOUNT(database, field, criteria): This database function is used to count the number of cells containing numbers in the field (column) of records in the database that match the conditions specified.

(iii) LOG(x): Returns the logarithm of a number to the base 10.

(iv) TRUNC (number, num-digits): This mathematical function truncates a number to an integer by removing the fractional part of the number, if number of digits specified is zero otherwise number is truncated to specified number of digit e.g. = TRUCN (5.6,0) = 5 and = TRUNC (4.525,2) = 4.52.

(v) DMIN (database, field, criteria) It is a database function and returns the smallest number in the field of records in the database that matches the criteria specified in the formula.

(vi) VAR (num1,num2,...): It is a statistical function and it is used to estimates variance based on a sample. It ignores logical and text values.

(vii) STDEV (number1, number2, ...): It estimates standard deviation of items in a given range of cells (ignores logical and text values).

(viii) PPMT(rate,per,nper,pv,fv,type): It is a financial function, which returns the payment on the principal for a given investment based on periodic, constant payments and a constant interest rate.

(ix) DB (cost, salvage, life, period, month): It is a financial function which returns the depreciation of an asset for a specified period using the fixed-declining balance method.

(x) NPV (rate,value1,value2,....): It is a financial function which calculates the net present value of an investment by using a discount rate and a series of future payments (negative values) and income (positive values).

22. (a) The enhanced features of Power Point are briefly discussed below:

(i) Modifying the impact of slides: We can add message by adding effective text to the slides to enhance the presentation. Power point offers many different design options to suit various presentation needs. One can add objects, graphical bullets and animation. Sound and video to play in the slides can also be added. The user can modify visual impact for a presentation by using transitions.

(ii) Adding objects: Objects like clip art, Word Art, tables and charts can be inserted on all slides or to selected slides. Logos of companies can be displayed using slide master. Text, clipart, table, video clip, a sound clip, or other objects can also be added to slides in the slide view or normal view. Certain objects can be selected from the clip art gallery. Picture tools bar can be used to modify these pictures.

(iii) Creating graph bullets: Bullets are used frequently for placing text on slides and to determine the levels of various lines of text on a slide. Various types of bullets can be used and they enhance the look and clarity of the presentation. From the bullets and numbers dialogue box, characters button can be pressed to view more bullets apart from the regular bullets that are available. Bullets can be created using any picture file also.

(iv) Adding transitions and animations: Power point offers special effects and features that can enhance the work of an online presentation. One can use things such as slide transitions, timings, movies and animations etc.

By using transition, the presenter can set the way each slide appears on the screen. Speed of the transitions can also be set. Slide transitions can be accompanied by special sound effects to enhance the presentation. One can even animate pictures and charts to produce dramatic effects during presentation.

(b) (i) Slide timings: In order to run the presentation on its own, like presentation at a trade show where slides automatically change from one to another, slide timings are required to be set up for each slide of the presentation. Slide timings are considered by keeping in mind that, perfect co-ordination between speech and slides is maintained. Slide timings can be set up using the Rehearse Timing button on the Slide Sorter toolbar.

(ii) Transitions: Transitions are the way each slide appear on the screen like appearance of slide from the right, box in, box out or dissolve. For setting transitions, one can use 'Slide Transition' toolbar after selecting a slide in Slide sorter view. Speed of transition can be set as slow, medium or high. Slide transition can also be accompanied by special sound effects to enhance the presentation.

(iii) Tri-Pane View: It allows to view three different aspects of the presentation at the same time on the screen. These three views are Normal view, Outline view and Slide View.

(iv) Handouts: These are prints of slides or outline of the presentation which are given to the participants. On a handout 2,3,4,6 or 9 slides can be printed. These are slides printed without any notes.

(v) Notes: These are the points that are made regarding a slide to help in remembering about a presentation or to help the participants with details of background information regarding a slide. Notes are printed along with a small version of slide.

23. (a) The major steps to be undertaken by the auditor in the application of a CAAT are to:

(i) Set the objectives of the CAAT application

(ii) Determine the content and accessibility of the entity's files.

(iii) Define the transaction types to be tested.

(iv) Define the procedures to be performed on the data.

(v) Define the output requirements.

(vi) Identify the audit and computer personnel who may participate in the design and application of the CAAT.

(vii) Refine the estimates of costs and benefits.

(viii) Ensure that the use of the CAAT is properly controlled and documented.

(ix) Arrange the administrative activities, including the necessary skills and computer facilities.

(x) Execute the CAAT application and evaluate the results.

(b) Computer Assisted Audit Techniques (CAATs) is a significant tool for auditors to gather evidences independently. CAATs provide a mean to gain access and to analyse data for a predetermined audit objective, and to report the audit findings with evidences. It helps the auditor to obtain evidence directly on the quality of the records produced and maintained in the system. The quality of the evidences collected gives reassurance on the quality of the system processing such transactional evidences

Audit around the Computer and Audit through the Computer: Audit around the computer approach was followed in early days of data processing applications. Computer functions replicated manual processes in a straightforward fashion and left a trail of the work done which enabled auditor to follow trail of manual documents around the computer ignoring what was happening inside the computer.

In audit around computer approach, the reliance is completely on the non-EDP segment of a system. Internal controls are reviewed and test of transactions and account balance verification procedures are performed in the same manner as in non-EDP systems. There is no attempt to test the client's EDP controls or to use the computer to perform audit procedure.

In this approach auditor verifies the system and controls that exist:

(i) to ensure correct and complete data being made available for processing

(ii) to ensure checks and controls on output for accuracy and completeness

(iii) to provide adequate data security

(iv) to prevent unauthorized amendments

(v) to provide for error detection and correction.

Under audit through the computer approach, the auditor examines the internal working of the computer system. The auditor can verify the program himself and technically satisfy himself that systems, checks, controls, error detection and data security procedures are satisfactory. The auditor uses test-checks to test the

system in operation and asks for special printouts by making use of programming facilities available within the installation. The auditor's main concern is:

(i) to check system controls

(ii) examination and testing of computer implemented controls

(iii) to improve quality of audit

(iv) to reduce time spent on detailed verification of transactions.

24. (a) (i) Payment Entry

Step 1 : In Voucher Creation press the F5 function key on the keyboard to begin Payment entries.

Step 2: Press the F2 function key on the keyboard to enter the payment entry date as 3-1-2000.

Step 3: In Particulars, to give the Dr effect: Type the alphabet 'A' and select Air Conditioner from the List of Ledger Accounts displayed on the right side of the screen and press the Enter Key.

Step 4: In the Debit Column, type the Amount as Rs.1000000 and press the Enter key.

Step 5: In the next line, to give the Cr effect: Type the alphabet 'I' and select Grindlays Bank from the List of Ledger Accounts displayed on the right side of the screen. Notice the amount automatically appears in the Credit column. Press Enter key.

Step 6: The Narration can be entered if desired in the Narration field. Press Enter to accept the payment entry.

NOTE : Similarly enter all the payment transactions from the assignment.

(ii) Receipt Entry

Step 1: In Voucher Creation press the F6 function key on the keyboard to begin Receipt

Step 2: Press the F2 function key on the keyboard to enter the receipt entry date as 1-1-2000.

Step 3: In Particulars, to give the Cr effect : Type the alphabet 'S' and select Share Capital from the List of Ledger Accounts displayed on the right side of the screen and press the Enter key.

Step 4 In the Credit column, type the Amount as Rs. 2100000 and press the Enter key.

Step 5: In the next line, to give the Dr effect: Type the alphabet 'I' and select Grindlyas Bank from the List of Ledger Accounts displayed on the right side of the

screen. Notice the amount automatically appears in the Debit column. Press Enter key.

Step 6: The Narration can be entered if desired in the Narration field. Press Enter to accept the receipt entry.

NOTE: Similarly enter all the receipt transactions from the assignment.

(b) Salient Features of Ex.NGN Package: E.X. Next Generation is one of the most user friendly business accounting software designed to work on Windows NT and 95/98. The software provides ready to use accounting modules for various business enabling online accounting within minutes of installation. The product is developed on Visual C++ and all reports are designed on Crystal reports. It has the following salient features:

(i) It is a 32 bit application, which is compatible with Windows 95/98 and Windows NT.

(ii) The software provides easy-to-use graphical user interface (GUI) as per the Microsoft GUI guidelines.

(iii) Multi-tasking facility allows to perform various functions simultaneously.

(iv) Different security passwords can be set for various activities.

(v) It supports multiple companies to be created and maintained.

(vi) Zoom in facility allows to obtain more detailed information at transaction level. Throughout the software, the user can view details on a click of a button.

(vii) The 'account selection window provides all the accounting support without requiring the user to remember various codes for different accounts.

(viii) It provides the facility to customize invoice, receipt bill, payments with some particular information, which may not be part of the pre-defined document.

(ix) It can prepare seventy two different types of reports in accounting, which includes balance sheet, profit and loss account, trial balance, stock position, financial summary, and bank reconciliation etc.

(x) It has a powerful feature, which enables the user to capture information based on various business parameters and attributes for subsequent analysis and printing of analysis reports. The user can construct queries to obtain different kinds of information based on these parameters.

25. (i) Bar Code Reader: It is the most commonly used input device in supermarkets and departmental stores. This device converts the bar code which is a pattern of printed bars on products, into a product code by emitting a laser beam which reflects off the bar code image. A light sensitive detector identifies the bar code image by recognizing special bars at both ends of the image. Once the detector has identified the bar code, it converts the individual bar patterns into numeric digits and feeds that number to the computer, just as though the number had been typed on a key board.The special bars at each end of the image are different, so the reader can tell

whether the bar code has been read right side up or upside down. After the bar code reader has converted a bar code image into a number, it feeds that number to the computer for further processing.

Bar code reader provides following advantages:

- improves accuracy of data entry
- better customer service
- faster check out at the point of sale
- greater control and reliability of inventory records
- most widely used input device after the keyboard and mouse.

Bar code readers are also used in industries that must count and track inventor.

(ii) Data Dictionary: Data dictionary is a centralized depository of information, in a computerized form, about the data in the database. The data dictionary contains the scheme of the database i.e. the name of each item in the database and a description and definition of its attributes along with the names of the programs that use them, and who is responsible for the data; authorization tables that specify users and the data and programs authorized for their use. These descriptions and definitions are covered under data dictionary.

The data dictionary is helpful in the following ways:

- If a data field is to be altered in any way or eliminated from the database, the dictionary can identify all programs that might require some modification.
- It is also helpful in protecting the integrity of database data.
- It helps programmer to quickly locate blocks of code that can be reused in new applications.
- It also ensures that all design or coding actions performed by an analyst are internally consistent with the application.

Thus, the data dictionary informs users or programmers of what data is available in database and how it is used.

(iii) Neural Networks (NN): These are computing systems structured to emulate the brain's learning process. Like the brain, NN use interconnected processors that perform many operations simultaneously and interact dynamically to learn from data as it is processed. Although NN do not handle unexpected event very well, they are very good at recognizing patterns that humans overlook and at uncovering emerging trends. Like humans, NN learn by fine-tuning their accumulated knowledge using the facts present in each new case.

(iv) Digital Signature: Digital signature is a form of security for electronic records that the dual key technology offers. The digital signature is encrypted with a private key which when attached to an encrypted message uniquely identifies the sender. Since

the encryption used in the digital signature is linked to the message sent, 'forger' will be unable to copy the digital signature by simply cutting and pasting it to another message. Section 3 of Information Technology Act gives legal recognition to electronic records and digital signatures.

The digital signature is created in two distinct steps. First, the electronic record is converted into a message digest by using a mathematical function known as "hash function" which digitally freezes the electronic record thus ensuring the integrity of the content of the intended communication contained in the electronic record. Any tampering with the contents of the electronic record will immediately invalidate the digital signature. Secondly, the identity of the person affixing the digital signature is authenticated through the use of a private key which attaches itself to the message digest and which can be verified by anybody who has the public key corresponding to such private key. This will enable anybody to verify whether the electronic record is retained intact or has been tampered with since it was so fixed with the digital signature. It will also enable a person who has a public key to identify the originator of the message.

(v) Webcasting or push technology is web-based technology. This 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 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.

Users can also download software, select the frequency with which they will receive services, and subscribe to a variety of information sources. There is very little cost involved to the user for push services because information is delivered with advertising, and users view their custom-tailored news off-line. Webcasting eliminates the frustration of the user which he/she faces while surfing the Internet to get right kind of information.