CVTEE / DVTEE 101

ICT Resources and Applications- I

School of Vocational Studies

उत्तराखण्ड मुक्त विश्वविद्यालय

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UNIT- 1

FUNDAMENTALS OF DIGITAL COMPUTER- I

1.1 INTRODUCTION

This unit presents a broad survey of concepts and terminology related to today's digital computers. Here, the idea of computer literacy is introduced. A computer is also a tool intended to assist the user in accomplishing information-based tasks ranging from locating and acquiring data/information to processing it and to presenting or transmitting it as output. Besides, it allows the user to browse the web pages, read a book, play a video game, watch a movie, etc.

When you look at a desktop computer, it comprises a monitor, keyboard, mouse, and a vertical or horizontal box called a system unit. It is acceptable to refer to all of these components as a computer. Technically, the systems unit houses the actual 'computer' or programmable machine (hardware, firmware and, software), which executes (carries out) or responds to a sequence of program instructions. A computer system then is a collective term for a computer (housed within the system unit), as well as these other components that are

attached to it to allow the user to input data and view output using different devices. Some of these components include a monitor, keyboard, mouse, printer, disk drives, scanners, microphones, and speakers, which are also referred to as peripherals. The peripherals work together to help the user accomplish a given task effectively. It is the system unit that accepts and processes the data, and generates the results. Other peripheral devices such as the hard drive store the data and results, which can be viewed on the monitor.

The peripheral devices mentioned above are collectively called hardware devices, since they can be physically attached to the computer. However, computer systems also include software, or programs that are integral in the functioning of some of these peripheral devices and are necessary to make the computer operate. Every computer system requires an operating system. An operating system is a program that establishes communications with the various peripherals and acts as a bridge to other application-specific software programs. An operating system is like the command centre of the ship. It makes all of the decisions about how the computer will function and work with others.

1.2   OBJECTIVES

After the successful completion of this unit, you will be able to-

* Define the term and its components.
* Understand the Input devices and output devices used.
* Define Computer Generations and key applications of computers.

1.3   DEFINITION OF COMPUTER

A computer is an electronic processing device, which accepts inputs, processes the input data, and generates the output. In other words, a computer is an electronic device, operating under the control of instructions (software) stored in its own memory unit, that can accept data (input), manipulate data (process), and produce information (output) from the processing. COMPUTER stands for- Common Operating Machine Particularly Used for Training Education and Research.

The minimum requirements for a functional computer system include; a keyboard, a CPU and memory, and a monitor. The data is usually entered via the keyboard and the information is usually presented through a screen. However, information can also be presented through speakers or any other output devices e.g. screen projector, printer.

The way components inside a computer fit together helps describe how the computer works. Data comes in through an Input Device, and is sent to the CPU by the memory. CPU processes the data based on the input data and the program is installed in the computer memory. When the CPU has finished processing the data, it is presented through the output device as information. The information can be stored in the computer memory or presented through an Output Device.

1.4   COMPONENTS OF COMPUTER

To perform computer functionalities, we need some hardware and software. In a general way computer is an electronic device which perform particular tasks. It takes input and processes

INPUT → PROCESS → OUTPUT

it to produce an output. Primarily there are three main components of a digital computer- Input Unit, Processing Unit and, Output Unit.

Input Unit-

It takes different types of input data from various input devices like-keyboard, mouse, light pen, scanner, MICR, Bar Code Reader, etc. Whenever you want to instruct anything to a computer, input device (s) is (are) needed. If you want to write an application on a computer, you need an input device called "KEYBOARD".

List of input devices-

- Keyboard
- Mouse
- Joystick
- Light pen
- Trackball
- Scanner
- Graphic Tablet (touch screen)
- Microphone
- Magnetic Ink Character Reader (MICR)
- Optical Character Reader (OCR)
- Bar Code Reader
- Optical Mark Reader (OMR)

Keyboard

Mouse

Joy Stick

Microphone

MICR

Scanner

OMR

Details about some frequently used input devices-

Keyboard-

Keyboard is a frequently used input device. A keyboard is just like a traditional typewriter, although keyboard has some additional keys used for performing additional functions.

Num Lock, Caps Lock, and Scoll Lock indicators

Function keys   Control keys

Saitek

Keyboard   Wrist pad   Arrow keys   Keypad

The above keyboard has 104 keys. Most of the keyboards are common. Generally, keyboards can be categorized into 6 parts as follows:

Typing Keys-

These keys consist of key letters (A-Z) and digit keys (0-9) which are the same as typewriters.

Numeric Keypad-

Some keyboards have this numeric keypad. Numeric keypad is placed into the right side of the keyboard just shown in the above keypad.

Function Keys-

At the top of the keyboard, 12 function keys are present where each key has a unique task. The function of these keys varies application to application.

Control Keys-

It includes Home, End, Insert, Delete, Page Up, Page Down, Control(Ctrl), Alternate(Alt) and Escape(Esc) key. Each key has some special function or worked into combination with some other keys.

Special Purpose Keys-

Keyboard also contains some special purpose keys such as Enter, Shift, CapsLock, NumLock, Spacebar, Tab, and Print Screen.

Arrow Keys-

It consists of four directional arrow keys named as-left arrow, right arrow, up arrow and down arrow.

Mouse-

This is a commonly used pointing device. A mouse can be used to control the position of the cursor on the screen, but it cannot be used to enter text or any data into the computer. Douglas Engelbart called the father of mouse and invented it in 1963.There are basically

three kinds of mouse- Mechanical Mouse, Optical Mouse, and Cordless Mouse.

A mouse contains the following functional buttons-

- Click (Left Click)
- Right Click
- Scrolling (Middle Button)
- Double Click

Scanner-

A scanner is an input device just like a photocopy machine. It is used when a paper has some information and it is to be transferred to the computer for further manipulation. The scanner captures images from the source, which are then converted into a digital form that can be stored on the disk.

Processing Unit-

The Processing unit is also called a Central Processing Unit (CPU). CPU is the brain of your computer. It performs all types of data processing operations and stores data & intermediate results for a while (during processing). It also controls the operation of all parts of the computer system. In general terms, CPU can be understood as the following-

- Control Unit (CU) - It controls the various component of a computer.
- Arithmetic and Logic Unit (ALU) - This subunit of the CPU performs all the arithmetic and logical operations such as- addition, subtraction, multiplication, division, and comparison.

Note- Apart from the processing unit, memory unit is an indispensable part to the smooth running of a program. Whenever you need to store information in a computer, you need memory. Computer memory is basically sub divided into two broader categories as-

(i)   Primary Memory (also known as Main Memory).
(ii)   Secondary Memory (also known as Storage / Permanent Memory).

Note-We will have a detail discussion about memory unit further in this book.

Output Unit-

The processed data is called output. After processing, either the results are stored in the memory or sent to the output unit. Some examples of different output devices are- CRT (Cathode Ray Tube) monitor, LCD (Liquid Crystal Display) monitor, LED (Light Emitting Diode) monitor, printer, speaker, screen projector, plotter, etc.

Monitor-

A monitor is a commonly used output device which displays information in a similar way to that of a television screen. Generally, the size of a monitor is 19-inch, 20 inch and 21 inches. Broadly speaking, there are three different types of monitors-

Cathode Ray Tube (CRT)

Liquid Crystal Display (LCD)

Light Emitting Diode (LED)

Printer-

A printer is a hard copy output device i.e. it provides the output in a hard copy/printed form. There are two types of computers- Impact Printer and Non- impact printers.

Impact Printers– refers to all those printers whose printing heads touches the paper, for e.g. dot matrix printer.

Non- Impact Printer– refers to all those printers whose printing heads do not touch the paper, for e.g. laser and inkjet printer.

1.5   EVOLUTION OF COMPUTER

Today most of the jobs mainly depend on either the creation or collection and distribution of information. This topic addresses the different advancements in computer technology and the various types of computers and their critical components. As each new computer generation improves on its previous generation, there has been a corresponding reduction in size (or miniaturization) of computer circuitry. In contrast to this miniaturization, the speed, power, and memory of computers have proportionally increased. Although this topic will describe the major developments of each computer generation, it is more important to consider how technology has influenced the development of current computer systems. The detailed description of computer evolution is discussed in the next title.

1.6   GENERATION OF COMPUTER

- First Generation (Year 1946 - 1959)

- Second Generation (Year 1959 - 1965)

- Third Generation (Year 1965 - 1971)

- Fourth Generation (Year 1971 - 1980)

- Fifth Generation (Year 1980- Onwards)

First Generation (1946 - 1959)-

First-generation computers were vacuum tube- b a s e d computers popular in the period 1946-1959. These vacuum-based computers were expensive, extremely large, and less cost-effective as they consumed a lot of electricity. The language used for storing and processing data was machine language. Some of the first-generation computers are:

Electronic Numerical Integrator and Calculator (ENIAC) built at the University of Pennsylvania in the year 1946 by John Eckert and John Mauchly. Electronic Discrete

Variable Automatic Computer (EDVAC) developed in 1950 at Cambridge University. UNIVAC-1 developed in 1951. The following drawbacks were there in first-generation computers as-

- They were extremely large.

- Operational speed was very slow.

- Electric consumption was very large.

- They have no operating system.

- The programming capability was very low.

Second Generation (1959 - 1965)-

The computers from 1959- 1965 were transistor-based second generation computers. In this generation, vacuum tubes were replaced by more durable transistors. Transistors are more compact than vacuum tubes as they are made up of semiconductors. Some of the computers of the second generations are:

IBM 1620- Its size was smaller as compared to the first-generation computers, used mostly for scientific purposes.

IBM1401- used for business applications.

CDC3600- used for scientific purposes.

The salient features of this generation are-

- They were smaller in size than the first generation computers.

- Operational speed relatively faster and more reliable than first-generation computers.

- Electricity consumption was relatively lesser than first-generation computers.

- They had higher capacity internal storage.

Third Generation (Year 1965 - 1971)-

The third- generation computers from 1965 to 1971 were Integrated Circuit (IC) based. These ICs are more compact than a transistor and were called chips. Single ICs has many transistors, resistors and capacitors, placed on a single thin of silicon. So, the computer built of such components became smaller. Some of the computers developed during this period were-

IBM360- developed by IBM in the year 1964.

PDP8- developed by DEC in the year 1965.

The salient features of this generation are-

- Relatively small in size.

- Relatively low cost.

- Operating system is used.

- More reliable and high operational speed.

- Large memory capacity.

Fourth Generation (1971 - 1980)-

The computers from the period 1971-1980 were Very Large Scale Integrated (VLSI) microprocessor-based fourth generation computers. VLSI circuits were used in these computers. VLSI circuits having about 5000 transistors and other circuit elements and their associated circuits on a single chip made it possible to have microcomputers of the fourth generation. As a result, fourth-generation computers became more powerful, compact, reliable, and affordable giving rise to personal computer (PC) revolution. In this generation time sharing, real-time networks, and distributed operating systems were used. All the high-level programming languages like C, C++, DBASE etc., were developed during this generation.

The salient features of this generation are-

- They have a very high speed.

- Low costs in comparison to the preceding generations.

- Smaller in size.

- Reliability is very high.

- Hardware failure is very low.

- Very low heat generation.

Fifth Generation (1980- Onwards)-

The fifth generation of computers developed 1980 onwards were Ultra Large Scale Integrated (ULSI) microprocessor-based. In this generation, the VLSI technology was replaced by more advanced ULSI technology. ULSI is a set of ten million electronic components into a single chip. This technology is based on parallel processing with hardware and software support. A key advancement of this generation is machine learning/artificial learning.

The salient features of this generation are-

- Working based on artificial intelligence or machine learning.

- Working based on image and graphics recognition.

- Highly efficient in solving highly complex problems including decision making, logical reasoning, and many more.

1.7   CLASSIFICATION OF COMPUTER

Computers of this age can be broadly categorized in the following two ways-

- Based on the size of memory

- Based on speed.

Based on the size of the memory, computers can be further classified into-

- Micro Computer
- Mini Computer
- Mainframe Computer
- Super Computer

Micro Computer-

The speed of a micro computer is very low with similar low capacity of storage. Its CPU is a microprocessor. The first microcomputers were built of 8-bit microprocessor chips. The most common microcomputer is a personal computer (PC). The PC supports many input and output devices. An improvement of the 8-bit chip is 16-bit and 32- bit chips. Examples of microcomputers are- IBM PC, PC-AT, etc.

Mini Computer-

This is designed to support more than one user at a time. It possesses a large storage capacity and operates at a high speed than a microcomputer. The mini computer is used in a multi-users system in which various users can work at the same time. This type of computer is generally used for processing large volumes of data in an organization. They are also used as servers in Local Area Networks (LAN).

Mainframe Computer-

32-bit computers are generally called mainframe computers. They operate at a very high speed, have very large storage capacity, and can handle the workload of many users simultaneously. They are generally used in centralized databases. The mainframe computers are also used as controlling nodes in Wide Area Network (WAN). Examples of mainframe computers are- DEC, ICL and IBM 3000 series.

Super Computer-

A supercomputer is the fastest and most expensive. The processing speed of this type of computer is very high, so they are relatively costly. They also have multiprocessing techniques. One of the ways in which supercomputers are built is by interconnecting hundreds of microprocessors. Supercomputers are mainly used for weather forecasting, biomedical research, remote sensing, aircraft design, and other advanced areas of science and technology. Some examples of supercomputers are- CRAY YMP, CRAY2, NEC SX3, CRAY XMP, and PARAM from India.

1.8   APPLICATION OF COMPUTERS

The range of computer applications has penetrated each possible field. Some of the key areas are -

- Business- A computer performs faster calculations and provides accurate and reliable results which have made it possible to integrate with business organizations. Some of the areas where computer performs different roles are- Payroll calculations, Budgeting, Sales analysis, financial forecasting, and Managing employee database, Maintenance of stocks, etc.

- Education- Some of the key areas where computers are used are- student management systems, teaching tools, learning management systems, etc.

- Marketing/Advertising – Computers have revolutionized the advertisement industry where you can create art and graphics, write, revise and copy, and print and disseminate ads and sell more and more products.

- Banking- In this day and age, banking is mostly dependent on computers. Some of the facilities provided using computers are − Online accounting facility, checking current balance, making deposits and overdrafts online, checking interest charges, ATM, shares, etc.

- Insurance- Insurance companies keep all the records up-to-date with the help of computers. Some of the other important functions are- amount calculation, customer MIS, maturity, etc.

- E-Learning- Computers have bought a boom in the popularisation of e-learning. One can sit at home and enrich his/her learning with not just textual information but also pictorial and animated information which are easier to learn.

- Military- Computers are largely used in defence and military operations. Modern tanks, missiles, weapons, etc are some devices that can be handled by a computer.

- Desktop publishing- With desktop publishing, you can create page layouts for entire books on your personal computer.

- Medicine- Computers are a great help in the diagnosis of diseases. Various computer led software are used in magnetic resonance imaging to examine the internal organs of the human body. Computer software is also used in storing patient data and performing surgeries.

The list of areas where computer application is endless in this day and age no place has been left untouched. The above mentioned are some of them.

1.9 POINTS TO REMEMBER

- Assembly Language- It is the first step to improve the programming structure. You should know that a computer can handle numbers and letters. The symbolic programming of assembly language is easier to understand and saves a lot of time and effort of the programmer.

- High-Level languages- Assembly language and machine level language require deep knowledge of computer hardware whereas in a higher language you have to know only the instructions (Language Grammar) in English words and logic of the problem irrespective of the type of computer hardware you use.

- Von Neumann Architecture also known as the Von Neumann model is a design model for a stored-program concept wherein the computer consists of a CPU, memory and Input/output devices. The program is stored in the memory and the CPU fetches an instruction from the memory at a time and executes it.

- Freeware- Freeware is software that is distributed without demanding any cost for its usage. These programs are available either as fully functional software for an unlimited period.

- Open Source- The term 'Open Source' is very close to 'free software' but not identical. We say this because, the source code of open-source software is readily available to users as well under a copyright, and one is freely allowed to redistribute the software. The concept of an open-source program relies on the fact that a user can review a source-code for eliminating possible bugs/error in it.

- Shareware- Shareware is demonstration software that is distributed for free but for a specific evaluation period only, say, 15-30 days (Say trial version). After the evaluation period, the program gets expired and a user can no longer access the program. Only if you are interested in using the program further, the shareware provider may require you to purchase a license for the software.

- Spyware- Spyware goes a few steps further and surreptitiously installs software on your computer. The spyware may contain a code that sends information about the user's computer to the developer or some other location whenever the user is connected to the Internet.

- Malware- Typically referred as 'Malicious Software', Malware is any program with mala fide intentions which exploits data of a computer without its user's consent.

1.10   GLOSSARY

- Cache Memory- Cache is a type of memory and is similar to RAM. A cache is used by the computer to move data between the RAM and CPU.

- Bit- Represents a binary digit which is the amount of information obtained by asking a 'yes' or 'no' question. This is also the smallest unit of information stored on a computer as a 0 or 1.

- Byte- Data is stored on a computer in the form of bytes. A byte is one character, which may be a number or letter. A byte is composed of 8 consecutive bits.

- Flash Drive- This is a small portable hard drive that plugs into a USB port and allows you to transport files between different computers. Also called a thumb drive.

- Graphical User Interface (GUI) - A program that helps you work easily with your operating system. Also, application programs by providing pictures and visual clues enhance your experience at work. Windows is the GUI on PCs.

- Modem- This is a way to transfer data through a telephone or cable line generally by the Internet. It may be internal or external. Some modems are used to fax or act as answering machines.

- Motherboard– The circuit board that functioning parts of the computer connect to be the motherboard. The CPU, RAM, and cache all plug into the motherboard.

- NIC (Network Interface Card) – A card is put in the computer allowing connection to a network.

- Sound Card– This device allows the computer to reproduce music, sounds, and voices. The computer needs a sound card to hear the audio portion of web sites or often to play multimedia games.

- USB Port– The Universal Serial Bus is accessed through small rectangular port on the front or back of computer that allows peripheral devices such as digital cameras and external hard drives to connect to the computer. See Ports for other types of connections.

- App- A type of application software designed to run on a mobile device, such as a Smartphone or tablet computer (also known as a mobile application).

- Bug- An error in a software program. It may cause a program to unexpectedly quit or behave in an unintended manner. The process of removing errors (bugs) is called debugging.

1.11   CHECK YOUR PROGRESS

Descriptive type questions-

a)   What do you understand by Computer Generation?

b)   Draw a block diagram of a digital computer and explain it briefly.

c)   Explain input and output devices used in the computer.

d)   Write down some important applications of a computer.

Objective type questions-

a)   Which of the following are components of the Central Processing Unit (CPU)?

[A] Arithmetic logic unit, Mouse [B] Arithmetic logic unit, Control unit

[C] Arithmetic logic unit, Integrated Circuits [D] Control Unit, Monitor

b) If a computer has more than one processor then it is known as

[A] Uniprocessor [B] Multiprocessor [C] Multithreaded [D] Multiprogramming

c) In which of the following form, data is stored in the computer?

[A] Decimal [B] Binary [C] Hexadecimal [D] Octal

d) GUI stands for.....

[A] Graphical user Instrument [B] Graphical unified Interface

[C] Graphical unified Instrument [D] Graphical user Interface

Answer (Objective type questions)-

[a] Arithmetic logic unit, Control unit [b] Multiprocessor [c] Binary [d]Graphical user Interface

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UNIT- 2

FUNDAMENTALS OF DIGITAL COMPUTER- II

2.1   INTRODUCTION

The major components of a computer system include Central Processing Unit (CPU), input and output devices. The CPU comprises a set of electronic circuits kept within the system unit. The CPU is the brain of a computer system and is responsible for processing the data i.e. input from peripheral devices and output to another peripheral device. The Central Processing Unit (CPU), also known as the processor or microprocessor has components that control the operating system and other software installed on the computer. The CPU also sends commands and data to the peripherals attached to the computer, such as the monitor or printer.

Therefore, the speed (how fast the electrons move around the chip) at which the CPU executes its tasks (or commands) determines how quickly you can view or hear the output from the command such as printing a page or allowing you to view a letter on the monitor. This speed is called 'clock speed' and is measured in megahertz (MHz). A computer system that responds to commands quicker means that it's clock speed is working faster to execute these commands. Table 2 compares some common CPUs and their clock speeds. Different

CPUs use different silicon chips to execute the commands and process data. Different types of chips have different clock speeds based on the technology that was used to create them.

2.2   OBJECTIVES

After the successful completion of this unit, you will be able to-

• Understand the concept of storing data into computers.

• Know about computer memory e.g. primary memory and secondary memory.

2.3   REPRESENTATION OF DATA IN COMPUTERS

Data and instructions cannot be entered and processed directly into computers using human language. Any type of data- numbers, letters, special symbols, sound or pictures must first be converted into machine-readable form i.e. binary form. Due to this reason, it is important to understand how a computer together with its peripheral devices handles data in its electronic circuits, on magnetic media, and in optical devices. Electronic components, such as microprocessor, are made up of millions of electronic circuits. The availability of high voltage(on) in these circuits is interpreted as '1' while a low voltage (off) is interpreted as '0'.This concept can be compared to switching on and off an electric circuit. When the switch is closed the high voltage in the circuit causes the bulb to light ('1' state). On the other hand, when the switch is open, the bulb goes off ('0' state). This forms a basis for describing data representation in digital computers using the binary number system.

It has proved difficult to develop devices that can understand natural language directly due to the complexity of natural languages. However, it is easier to construct electric circuits based on the binary or ON and OFF logic. All forms of data can be represented in a binary system format. Other reasons for the use of binary are that digital devices are more reliable, small, and use less energy as compared to analog devices.

Bits, bytes, nibble, and word

The terms bits, bytes, nibble, and word are used widely in reference to computer memory and data size.

Bits: is the basic unit of data or information in digital computers, expressed in binary forms 0 or 1.

Byte: a group of bits (8 bits) used to represent a character. A byte is considered as the basic unit of measuring memory size in computer.

A nibble: is half a byte, which is usually a grouping of 4 bytes.

Word: two or more bits make a word. The term 'word length' is used as the measure of the number of bits in each word. For example, a word can have a length of 16 bits, 32 bits, 64 bits, etc.

Computers not only process numbers, letters and special symbols but also complex types of data such as sound and pictures. However, these complex types of data take a lot of memory and processor time when coded in a binary form. This limitation necessitates the need to develop better ways of handling long streams of binary digits. Higher number systems are used in computing to reduce these streams of binary digits into manageable form. This helps to improve the processing speed and optimize memory usage.

Number systems and their representation-

A number system is a set of symbols used to represent values derived from a common base or radix. As far as computers are concerned, number systems can be classified into two major categories:

- decimal number system
- binary number system

While the other number systems include: octal number system and hexadecimal number system.

2.4   COMPUTER MEMORY

Computer memory is used to store information (data and instructions) in a digital computer. A memory is divided into several small parts called memory cells. Each memory cell or location has a unique address in the form of machine language (0/1). It is useful to know how to store information on a computer because this will allow us to ascertain about the amount of space that will be required to store a data set which in turn will allow us to determine what software or hardware we will need to be able to work with a data set and to decide upon an appropriate storage format. The computer memory is divided into main and auxiliary memory. Main memory also called primary memory and secondary memory also called storage memory. Main memory holds instructions and data when a program is in execution, while auxiliary or secondary memory holds data and programs not currently in execution and acts as a storage medium.

2.5   PRIMARY MEMORY

Primary memory holds instructions and data currently being processed by the CPU- the intermediate results produced during the execution of the process. The instructions and data remain in primary memory which can be accessed by the CPU directly and quickly.

Functions of Primary Memory

- Holding data and instructions for the task assigned by the input device before processing.

- Holding intermediate results while processing.

- Holding data and information after processing unless they are transferred to the output unit.

- Holding programs and instructions from the secondary storage device.

- Holding system programs like an operating system.

Types of Primary Memory-

- Random Access Memory (RAM)

- Read-Only Memory (ROM)

Random Access Memory (RAM)-

It is a volatile or temporary memory. Its contents get lost once the power supply is switched off. It is also called read/write (R/W) memory. It allows CPU to read as well as write data and instructions over it. It temporarily holds software, programs /instructions before and after processing of the data. RAM is used during the execution of instructions. RAM is considered 'random access' because you can access any memory cell directly. RAM is made up of semiconductor material; therefore it is also called semiconductor memory, just like processors and ROM types of chips. In comparison to other memory devices (storage memory), RAM is much faster to read and write instructions, and data. RAM is also named direct access memory because the operating system, application programs, and data currently in use are stored in RAM directly accessed by the CPU/processor.

The Random Access Memory is further divided into- (i) Dynamic Random Access Memory (DRAM) (ii) Static Random Access Memory (SRAM).

Dynamic Random Access Memory (DRAM)-

It makes use of a transistor and a capacitor to form a memory cell standing for a single bit of data. DRAM is not able to retain information for a longer time even if the power supply is on because it needs refreshing frequently. It is slower and less expensive than SRAM.

Static Random Access Memory (SRAM)-

In SRAM flip flops are used for retaining memory. Typically, it uses four to six transistors for each memory cell. It does not have a capacitor and hence does not require refreshing. It can store information until the power supply is "on". It is faster and expensive in comparison to DRAM and primarily used in the processor's cache memory.

Note- Apart from SRAM and DRAM, some other types of RAM are also available. Few are as follows:

a)   Fast Page Mode Dynamic Random Access Memory (FPM DRAM) – This memory is a bit faster in comparison to the conventional DRAM. The access time is improved for

this memory as it sends row address only once for accessing the neighbouring locations in memory. Despite its name, it is still one of the slowest RAMs used today. This memory is not considered good for high-speed memory buses over 66 MHz.

b) **Extended Data Output Dynamic Random Access Memory (EDO DRAM)** – It can be seen as an improved version of "FPM DRAM", as it can retain data valid for a longer period than FPM. Due to this feature, it is known as the extended data output. It stores 265 bytes of data information into latches and these latches hold the next same amount of information. This arrangement makes it possible for programs to be executed sequentially without any delay.

c) **Synchronous Dynamic Random Access Memory (SDRAM)** – SDRAM is a generic name that refers to the many dynamic random access memories that are synchronized with the system bus. It carries data between the CPU and the memory controller hub. It uses the features called pipelining, which accepts new data before to finish previous processing data.

d) **Double Data Rate - Synchronous Dynamic Random Access Memory (DDR- SDRAM)** - Double data rate SDRAM was introduced later to give an alternative to single data rate SDRAM. DDR SDRAM provides better speed than Synchronous Dynamic Random Access Memory and also consumes a lesser amount of energy. The transfer rate of data became just double as it is capable of sending data on both rising and falling edges of the clock pulse.

e) **Double Data Rate Type2 - Synchronous Dynamic Random Access Memory (DDR2- SDRAM)** – The speed of DDR2- SDRAM is just double in comparison to the DDR SDRAM because its input/output buffer frequency is doubled.

f) **Double Data Rate Type3 - Synchronous Dynamic Random Access Memory (DDR3 SDRAM)**– DDR3- SDRAM is considered as an improved version of DDR2 SDRAM. It also doubles the speed of DDR2 SDRAM. Its power consumption is lesser and the rates of data transfer range from 800Mbps to 1600 Mbps.

g) **Double Data Rate Type4 - Synchronous Dynamic Random Access Memory (DDR4 SDRAM)** – This RAM is a higher-speed successor to the technology used by DDR3 SDRAM. This provides better system-level reliability, capacity, performance scalability, and power efficiency in comparison to all of its previous memories. Such as- DDR3 SDRAMs.

Read-Only Memory (ROM)

It is a non-volatile memory whose contents are not lost even the electric power is off. It stores instructions for computer start-up. During the computer start-up operation, the main memory (RAM) of the computer is empty because of its volatile nature, so that the computer gets

instructions from the ROM to start-up (booting) operation. The contents of ROM cannot be written or erased by the user only trained programmers and technicians can alter or write or erase the contents of ROM. ROM chips are generally designed at the time of manufacturing. ROM also performs the BIOS (Basic Input Output System) functions.

Types of Read-Only Memory

- Programmable Read-Only Memory (PROM)

- Erasable Programmable Read-Only Memory (EPROM)

- Electronically Erasable Read-Only Memory (EEPROM)

a) **Programmable Read-Only Memory (PROM) -** The data stored in PROM cannot be modified and therefore it is also known as a 'one-time programmable device'. It is made as a blank memory as a result when you want to write on a PROM chip, a ROM burner is required to write data onto a PROM chip.

b) **Erasable Programmable Read-Only Memory (EPROM)-** Unlike programmable ROM; erasable programmable ROM can write/modify data more than once. When ultraviolet rays of some specific wavelength fall into EPROM's chip glass panel, the bits of memory come back to 1 and the chip enables them to write.

c) **Electronically Erasable Read-Only Memory (EEPROM)-** Electrically Erasable Programmable ROM is as same as Erasable Programmable ROM, but the same work of erasing the stored data is performed with an electric current. EEPROM is a type of non-volatile memory and used in computers and other electronic devices. It used to store relatively small amounts of data and also allows individual bytes to be erased and reprogrammed. It stores a computer system's BIOS (Basic Input Output System). Unlike EPROM the entire chip does not have to be erased for changing some portion of it.

2.6   SECONDARY MEMORY

Secondary memory is where programs and data are kept on a long-term basis. Common secondary storage devices are the hard disk and optical disks. A hard disk might have a storage capacity of one terabyte (TB). A hard disk is slow in accessing speed compared to the main memory. Secondary memory has enormous storage capacity, especially hard disk. Some of the secondary storage devices are explained below-

a) **Hard Disk Drive (HDD)-** Hard disks are stored permanently inside their drive, which is normally installed into the computer box where you cannot see any part of it. Hard Disks can store a lot of data and are used to store most of the information on computers. The advantage of HDD is cost and capacity. The disadvantage of HDD is that they make a lot of noise, are slow, and prone to failure. They are slowly being replaced by solid-state drives (SSD).

b) **Floppy Disk Drive (FDD)-** Floppy disks are small disks that you can pop in and out of their drive. All you can see of their drive is a slit in the computer box with a button and a light. You can put in different disks and then take them out and give them to someone so that you can transfer data between your computers. FDD's are now obsolete. They can store only about 1.44 MB, which is way too little. They are prone to damage and are now unsupported for many years.

c) **Compact Disk (CD)-** The most popular kind of optical disk is the Compact Disc (CD). CDs can still be put into and taken out of their drive, making them good for buying programs and for transferring data nowadays. The normal CDs that you buy with programs on them are CD-ROMs. They are called so because like ROM, they are read-only. You can also get CD-Rs and CD-RWs, which are not read-only and are not erasable and erasable, respectively. However, CD-R cannot be deleted once it is written(a process known as finalizing). CDs can store around 700MB. And, because CDs store their information with variations in the shape of the disk that reflects a laser differently, they cannot be damaged as easily. However, one should still never touch the shiny surface of the CD. CDs are now being replaced by online media, and do not feature in many new computers anymore.

d) **Digital Versatile Discs (DVD)-** DVDs are another kind of Optical disc that works identically to CDs; however, they can store much more information than CDs. DVDs can store usually about 4.3 GB, but dual-layered DVDs can store up to about 9 GB and DVD-RAM can store about the same amount. They are sometimes called Digital Video Discs because of their extensive use in video and films.

e) **Flash memory-** Nowadays, one can get memory cards that are called flash memory or, more properly, EEPROMs. These are cards that operate just like ROM that isn't read-only, so they don't lose their information when the power is cut.

f) **Solid State Disks (SSD)-** SSDs are based on flash memory. They are much quicker than HDDs, do not make much noise and heat, but they are costlier than HDD's, but the cost of SSDs are rapidly declining. Another concern with SSDs is that the cells on the SSD can last only up to a specific number of write cycles. However, they are not of much concern to home users, as SSDs utilize features such as TRIM to extend lifespan. The lifespan of the SSD will usually be mentioned, which could be anywhere between 30 - 150 TB more than the average lifespan of a computer.

2.7 *POINTS TO REMEMBER*

- Data and instructions cannot be entered and processed directly into computers using human language. Any type of data- numbers, letters, special symbols, sound or pictures must first be converted into machine-readable form i.e. binary form.

- The CPU is the brain of a computer system and is responsible for processing the data i.e. input from peripheral devices and output to another peripheral device.

- Byte: a group of bits (8 bits) used to represent a character. A byte is considered as the basic unit of measuring memory size in computer.

- Word: two or more bits make a word. The term 'word length' is used as the measure of the number of bits in each word. For example, a word can have a length of 16 bits, 32 bits, 64 bits, etc.

- Computer memory is used to store information (sometimes also called data and instructions) in a digital computer. A memory is divided into several parts called memory cells.

- Main memory holds instructions and data when a program is in execution, while auxiliary or secondary memory holds data and programs not currently in execution and acts as a storage medium.

2.8   GLOSSARY

- PROM- Programmable Read-Only Memory.

- EPROM- Erasable Programmable Read-Only Memory.

- EEPROM- Electronically Erasable Read-Only Memory.

- ROM- Read-Only Memory.

- HDD- Hard Disk Drive.

- FDD- Floppy Disk Drive.

- CD- Compact Disk.

- DVD- Digital Versatile Discs.

- SSD- Solid State Disks.

- SDRAM- Synchronous Dynamic Random-Access Memory.

- DDR- Double Data Rate.

- EDO DRAM- Extended Data Output Dynamic Random-Access Memory.

- SRAM- Static Random-Access Memory.

- DRAM- Dynamic Random-Access Memory.

- Bit- Binary Digit.

2.9   CHECK YOUR PROGRESS

Descriptive type Questions-

a)   Distinguish between RAM and ROM

b)   Write short notes on: Primary memory and Secondary memory

c)   'Computers play an important role in our daily lives'. Discuss in your own words.

d)   How data is stored in a computer? Define.

Objective type questions-

a)   EEPROM stands for............

b)   RAM is of two types........... & ....

c)   Main memory is also known as...........

d)   Pen drive is an example of .... storage device.

e)   ROM is volatile memory. (True/False)

f)   Analog computers use continuous physical quantities like voltage. (True/False)

Answers (Objective type questions)-

[a]Electronically Erasable Programmable Read Only Memory [b] DRAM & SRAM [c] Primary memory [d] Secondary[e] False [f] True.

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UNIT- 3

ICT RESOURCESAND APPLICATIONS- I

(Hardware Resources and Applications)

3.1　INTRODUCTION

In the previous unit, you have learned about the representation of data in a computer, the concepts of bits and bytes as well as the various memory-hierarchy levels. Till now, you know well about the digital computer. The information present in a computer can be easily transferred through the Internet to anyone across the globe.

In this unit, you would explore various hardware tools that can be used as Information and Communication Technology (ICT) resources. ICTs are tools that support users to communicate/transfer the information across the globe. The usage of ICT has been witnessed in various domains like Education, Healthcare, Banking, Insurance, etc. To realize the importance of ICT one must understand the peripheral devices and expertise various ICT Tools.

3.2　OBJECTIVES

After the successful completion of this unit, you will be able to-

• 　Understand the overview of hardware resources used.

- Explore ICT hardware resources used for Technology Enabled Learning.

- Explore the uses of different hardware resources.

3.3   *MEANING OF ICT (HARDWARE) RESOURCES*

Information and Communication Technology (ICT) includes the products which help the user to store, access, disseminate, or receive information. These products comprise of all the software applications, hardware resources like computer, CDs, videotapes, multimedia, telephone, scanner, etc. The world of ICT exists due to the advent of the Internet. So, it becomes highly important to understand the concept of Internet before moving further.

ICT is thus the integration of information, computation, and technological advancements. It has made our life simple. It has changed the dimensions of our work, learning, and dealings in business. In fact, it has changed the whole ecosystem of society and its people.

Just look around your surroundings, you would find your siblings getting study material from their school through mobile phones, your parents chatting with your relatives, sharing their experiences through smartphones, your neighbours paying their bills online, your cousin purchasing goods online, your friend studying through online courses, your doctor using medical instruments with the support of ICT. There are so many devices that are linked together to do daily business viz. CD, USB, smart phones, digital camera, remote controls, printers, scanners, etc.

Hardware is the most visible part of any information system: the equipment such as computers, scanners, and printers are used to capture data, transform it, and present it to the user as an output. In this unit, we will focus mainly on the personal computer (PC) and the commonly used peripheral devices.

Some commonly known range of computer systems are-

- **Supercomputers**- The term Supercomputer is used to denote the fastest computing engines available at any given time that are used for running exceptionally demanding scientific applications.

- **Mainframe computers**- It provides high-capacity processing and data storage facilities to hundreds or even thousands of users operating from dumb terminals. A dumb terminal is a display monitor that has no processing capabilities, because all it's processing it depends on the server.

- **Servers-** Servers have large data storage capacities enabling users to share files and application software though processing typically occurs on the user's own machine.

- **Workstations**- Workstations provide high-level performance for individual users in computationally intensive fields such as engineering.

- **Personal computers** (e.g. laptop/notebook computers) - They have a connected monitor, keyboard, and CPU that are developed into a convenient and flexible business tool, capable of operating independently or as part of an organizational network.

- **Mobile devices-** such as personal digital assistants or the latest generation of cellular telephones offer maximum portability plus wireless connection to the internet, although they do not offer the full functionality of a PC. Also, we are already moving into the age of wearable computers for medical or security applications, embedded computers in appliances ranging from motor cars to washing machines, and the smart card which provide identification, banking facilities, medical records, and many more.

3.4 POPULAR ICT (HARDWARE) RESOURCES

Input Devices-

Data may enter an information system in a variety of different ways and the most appropriate input device usually depends on the type of data being entered into the system. Following are the frequently used input peripherals-

- **Keyboard**- A lot of input still happens with the help of a keyboard. Usually, the information that is entered by means of a keyboard is displayed on the monitor. The layout of most keyboards is similar to that of the original typewriter on which it was modelled.

- **Pointing Devices [Mouse]**- The now ubiquitous electronic mouse is an essential input device for use with any graphical user interface. It consists of a plastic moulded housing designed to fit snugly in the palm of the hand with a small ball at its bottom. Moving the mouse across a flat surface will translate the movements into a rolling action of the ball. This is translated into electronic signals that direct the corresponding movement of a cursor on the computer monitor. Buttons on the mouse can then be used to select icons or menu items, or the cursor can be used to trace drawings on the screen.

- **Pointing devices [Trackball]**- The less popular trackball operates exactly like an 'upside-down' mouse except that the ball is much larger and instead of the mouse being moved over a surface the user manipulates the ball directly. Originally popular in educational laboratory settings and for laptop computers, trackballs are now mainly confined to exhibition displays and other public terminals.

- **Touch Screens**- Touch-screens are computer monitors that incorporate sensors on the screen panel itself or its sides. The user can indicate or select an area or location on the screen by pressing a finger onto the monitor. Light and touch pens work on a similar principle, except that a stylus is used, allowing much finer control. Touch pens are more commonly used with handheld computers such as personal organizers or digital assistants. They have a pen-based interface whereby a stylus (a pen without ink) is used

on the small touch-sensitive screen of the handheld computer, mainly by means of ticking off pre-defined options. Although, the fancier models support data entry either by means of a stylized alphabet, which resembles a type of shorthand, or some other more sophisticated handwriting recognition interface.

- **Digitizer-** Digitizer tablets also use a pressure-sensitive area with a stylus. This can be used to trace drawings. A similar conceptual approach is used for the touchpad that can be found on the majority of new notebook computers, replacing the more awkward joystick or trackball. The user controls the cursor by moving a finger across a fairly small rectangular touch-sensitive area below the keyboard, usually about 5 cm by 7 cm. A large number of game interfaces have been developed to provide a more realistic and natural interface in various gaming situations and simulations: the joystick, steering wheel, foot pedal, and other gaming devices. They all perform functions similar to the mouse in that they allow the user to control a cursor or simulate generally real-time motion control. You can contact your nearest game arcade for further details.

- **Optical scanners and readers [Optical Scanner]-** Optical Scanners use light-emitting devices to illuminate the printing on paper. On the basis of the amount of light emitted, a light sensor determines the position and darkness (or colour) of the markings on the paper. Special-purpose optical scanners are in use by postal services to read and / interpret hand-written postal codes. General-purpose scanners are used with personal computers to scan in images or text. These vary from handheld devices (see picture) to flatbed scanners which feed input documents one sheet at a time. A common use of optical scanners is the scanning of black-and-white or colour images and pictures. When scanning text, it is necessary to load additional optical character recognition (OCR) software that converts the scanned raster-image of the text into the equivalent character symbols, so that they can be edited using word processing software.

- **Optical scanners and readers [Barcode Scanner]-** Barcode scanners detect sequences of vertical lines of different widths, the ubiquitous barcode as found also on the back of this book. These scanners have become very popular with retailers due to the fact that all pre-packaged products are now required to have a product bar code on their packaging, following the standard laid down by the South African Article Numbering Association (SAANA). Libraries and video shops now also commonly use bar code scanners. They are more generally used for tracking and routing large numbers of physical items such as for asset inventory purposes in many larger organizations, postal items by the postal services and courier services, or for luggage handling by airlines.

- **Optical scanners and readers [Optical mark readers]-** Optical mark readers are capable of reading dark marks on specially designed forms. The red multiple-choice answer sheets in use at many educational and testing institutions are a good example.

- **Magnetic Card Reader**- A magnetic card reader reads the magnetized stripe on the back of plastic credit-card size cards. These cards need to be pre-recorded following certain standards. Although the cards can hold only a tiny amount of information, they are very popular for access (door) control and financial transactions (ATMs and point-of-sale terminals).

- **Magnetic ink character recognition (MICR)**- MICR uses a special ink (containing magnetisable elements) and a distinct font type. It is used mainly in the banking sector for the processing of cheques.

- **Touch-tone devices**- Touch-tone devices can use a voice telephone to contact computer-based switchboards or enter information directly into remote computers. Many corporate telephone help-lines rely on the customer pressing the touch-tone telephone buttons to route his/her call to the correct operator by selecting through a menu of possible options. Indian banks also enable their clients to perform a number of banking transactions via telephone.

- **Biometric devices**- Biometric devices are used to verify personal identity based on fingerprints, iris or retinal scanning, hand geometry, facial characteristics, etc. A scanning device is used to capture key measurements and compare them against a database of previously stored information. This type of authentication is becoming increasingly important in the control of physical access.

- **Voice-recognition devices**- Voice-recognition devices has recently made a strong entry into the market with the availability of low-cost systems that work surprisingly well with today's personal computers. These systems allow for voice control of most standard applications (including the operating system). With voice control, the computer recognizes a very limited number (50 or less) of frequently used, programmable system commands ("save", "exit", "print") from a variety of users. In fact, these systems are not only used for the interface of computer programs, they are also slowly making an appearance in consumer appliances, novelty items, and even motor cars too.

Output Devices-

Output devices are used to transform computer-readable data back into an information format that can be understood by humans. Input devices collect data from users and process it at the CPU finally sending it to us an output. Following are the output devices used in computers-

- **Display screens [Cathode Ray Tube]**- The desk-based computer screen is the most popular output device. The standard monitor works on the same principle as the normal TV tube: a ray gun fires electrically charged particles onto a specially coated tube (hence the name Cathode-Ray Tube or CRT). When the particles hit the coating, the coating is being excited and emits light. A strong magnetic field guides the particle

stream to form the text or graphics on your familiar monitor. CRTs vary substantially in size and resolution. Screen size is usually measured in inches diagonally across from corner to corner.

- **Display screens [Liquid Crystal Display] -** A technology that has received much impetus from the fast-growing laptop and notebook market is the liquid crystal display (LCD). LCDs have matured quickly, increasing in resolution, contrast, and colour quality. Their main advantages are lower energy requirements and their thin flat size. Although alternative technologies are already being explored in research laboratories, they currently dominate the "flat display" market.

- **Display screens [Light Emitting Diodes]-** Organic light-emitting diodes (OLED) can generate brighter and faster images than LED technology and require thinner screens, but they have less stable colour characteristics, making them more suitable for cellular telephone displays than for computers.

- **Screen Projectors-** Originally developed for the projection of video films, the current trend towards more portable LCD-based lightweight projectors is fuelled by the needs of computer-driven public presentations. They are rapidly replacing the flat transparent LCD panels that needed to be placed on top of an overhead projection unit. Though the LCD panels are more compact, weightless, and are much cheaper.

- **Printers-** Printers are the most popular output device for producing permanent, paper-based computer output. Although they are all hardcopy devices, a distinction can be made between impact and non-impact printers. With impact printers, a hammer or needle physically hits an inked ribbon to leave an ink impression of the desired shape on the paper. The advantage of the impact printer is that it can produce more than one simultaneous copy by using carbon or chemically-coated paper. Non-impact printers, on the other hand, have far fewer mechanically moving parts and are therefore much quieter and tend to be more reliable.

- **Plotters-** Plotters are mainly used for engineering and architectural drawings. A plotter consists of one (or several, in the case of colour plotters) pen(s) affixed to an arm. As the arm moves across the sheet of paper, the pen draws lines onto the paper. It is ideal for line drawings such as plans, especially in cases where the paper size exceeds that which can be accommodated by the other types of printers.

- **Sound output-** It is required by most multimedia applications and sophisticated games. The sound card in many of today's personal computers synthesizes sound by drawing from a library of stored sounds, essentially using the same process as found in music keyboards.

- **Musical Instrument Digital Interface (MIDI) -** Modern day music production would be impossible without a vast array of electronic instruments and keyboards. These are

typically controlled by a personal computer by means of Musical Instrument Digital Interface, a common standard for linking, controlling and processing electronic music.

- **Speech synthesis-** Speech synthesis is the production of speech-like output using an artificial voice. Although the lack of intonation still makes the voice sound artificial, the technology is reasonably mature and can be found anywhere from talking clocks and luxury cars to automated responses for telephonic directory enquiries.

ICT Resources, helpful for technology-enhanced learning-

- **Tablet-** A tablet computer (or sometimes called a tablet) is a type of computer that can be carried easily. Users control a tablet mostly by using its touch screen with multi-touch technology similar to a smartphone. The screen can be anywhere from 7 inches (18 cm) (sometimes called a phablet) to 12 inches (30 cm) in size, but many have a screen size of about 10 inches (25 cm) diagonal. Almost all tablet computers can access the Internet using Wi-Fi, and many can use mobile phone networks like 2G, 3G, and 4G. Tablets are lighter, more portable, have longer battery life, make less heat, and do not need a mouse or keyboard to be connected. Typing is usually done on the touch screen with a 'virtual keyboard' that appears on the screen.

- **Interactive Whiteboard-** An interactive whiteboard is a large interactive screen that connects a computer and a projector. The projector projects the computer's desktop onto the screen of the interactive whiteboard. The user can control the computer by using a special pen, finger, or another tool to touch the screen of the interactive whiteboard. Normally, interactive whiteboards are fixed on walls. However, there are some mobile interactive whiteboards. Interactive whiteboards are used in many different places such as in classrooms, in workgroups, and in training rooms for professional coaching. Interactive whiteboards are the modern version of the traditional whiteboards used in schools.

- **Graphic Card-** It is a circuit board that is placed inside the computer system to display images through the monitor. It ensures high-quality video at a high speed.

- **Sound Card-** It helps the computer to convert digital signals into sound waves so that one can hear it. The sound card audio ports are placed at the back of the computer system and marked with different colours. For example white/yellow colour is used to mark digital out whereas the blue colour is used for sound in.

- **Network Card-** Network Interface Card (NIC) helps the computer system to interconnect with local networks or the Internet. It contains the circuitry which is required to communicate and interact using wired or wireless connections. Wired connections are referred as Ethernet Connection (used in LAN) and wireless as in Wi-Fi. It would not be possible to even send an email without NIC.

- **Modem**- Modem Stands for Modulator Demodulator. In order to share the data, we require two modems, sending modem and receiving modem. The sending modem converts the data into signals which can be transmitted through a phone line. The receiving modem demodulates the signals back to digital data. It converts the data in a suitable form so that it can be transferred from one device to another by changing analog signals into digital signals and vice versa. It is an interface between the user and the internet. There are two types of modem- (i) Ethernet - It is a wired modem which can be plugged into any network card, (ii) Wireless - It connects to a computer using wireless LAN(WLAN)

- **Router-** It is the device that ensures the transfer of data from one network to the other. The information is sent from the source in small packets. It is the responsibility of the router to forward these data packets to the marked destination (receiver) by following appropriate routing protocol for find the optimum route.

3.5   ICT (HARDWARE) RESOURCES AND APPLICATIONS

Information and communication technology (ICT) can complement, enrich, and transform education for the better. UNESCO shares knowledge about the many ways technology can facilitate universal access to education, bridge learning divides, support the development of teachers, enhance the quality and relevance of learning, strengthen inclusion, and improve education administration and governance. We need to continue making new efforts to further develop the capacities of teachers and learners to make effective use of appropriate technologies for learning. Technology-enabled learning aims to focus on increasing access to quality teaching and learning by supporting policy formulation and innovation in the application of ICT in education, and the development of ICT skills. In order to understand the role and applications of ICT (hardware) in technology-enabled education one must be aware of hardware resources used in accessing ICT in everyday life.

3.6   POINTS TO REMEMBER

- To share data (send or receive) in networks we require two modems- sending modem and receiving modem.

- There are two types of modem- (i) Ethernet- It is a wired modem that can be plugged into any network card (ii) Wireless- It connects to a computer using wireless LAN (WLAN).

- The Network Interface Card (NIC) helps the computer system to interconnect with local networks or the Internet.

- An interactive whiteboard is a large interactive screen that connects a computer and a projector.

- Plotters are mainly used for engineering and architectural drawings.

- Biometric devices are used to verify personal identity based on fingerprints, iris or retinal scanning, hand geometry, facial characteristics, etc.

- Digitizer tablets also use a pressure-sensitive area with a stylus. This can be used to trace drawings.

3.7   GLOSSARY

- Router- A device that ensures the transfer of data from one network to the other network.

- Modem- Stands for Modulator Demodulator. It converts the data in a suitable form so that it can be transferred from one device to another by changing analog signals into digital signals and vice versa.

- Sound Card- It helps the computer to convert digital signals into sound waves so that one can hear it.

- Screen Projectors- Originally developed for the projection of video films, the current trend towards more portable LCD-based lightweight projectors are in demand.

- MICR- Uses a special ink (containing magnetisable elements) and a distinct font type. It is used mainly in the banking sector for the processing of cheques.

- Supercomputers- The term Supercomputer is used to denote the fastest computing engines available at any given time that is used for running exceptionally demanding scientific applications.

3.8   CHECK YOUR PROGRESS

Descriptive type questions-

a)   Define the role of hardware resources to the functioning of a computer system.

b)   List the input devices with their right uses.

c)   Explain the uses of different types of computer systems available.

d)   What do you understand by output devices? List the popular output devices.

Objective type questions-

a)   A sound card helps the computer to convert digital signals into sound waves so that one can hear it.(True/False)

b)   MIDI stands for Musical Instrument Digital Interface.(True/False)

c)   Organic Light-Emitting Diodes (OLED) can generate brighter and faster images than Light Emitting Diodes (LED). (True/False)

d)   A magnetic card reader reads the magnetized stripe on the back of plastic credit-card size cards. (True/False)

e)   Servers have large data storage capacities where users unable to share files and application software. (True/False)

Answers (objective type question)-

[a] True   [b] True   [c] True   [d] True   [e] False

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UNIT- 4

ICT RESOURCES AND APPLICATIONS- II

(Software Resources and Applications)

4.1   INTRODUCTION

There is an urgent need for quality software and digital materials for use in schools. Teachers and students must become discerning and knowledgeable ICT users. The school environment has to be fully supportive of ICT, making available expert assistance and advice to the teacher in this rapidly-changing field. New forms of curriculum and assessment are called for new ways of organising schools if the dramatic educational potential of ICT is to be delivered and realised. A report made by the National Institute of Multimedia Education in Japan proved that an increase in the use of ICT in education with integrating technology to the curriculum has a significant and positive impact on student achievements. The results specifically showed that the students who are continuously exposed to technology through education has better 'knowledge', presentation skills, innovative capabilities, and are ready to take more efforts into learning as compared to their counterparts. In this unit, we will discuss ICT resources from the viewpoint of software resources used for technology-enhanced education.

4.2   OBJECTIVES

After the successful completion of this unit, you will be able to-

• Understand the overview of the software and its role.

• Explore the types of software.

• Define Operating system, its functions, and types.

• Define programming languages.

• Explore the free and Open Source Software (FOSS).

4.3   SOFTWARE OVERVIEW

Software is a way to communicate with the blind hardware of the computer system. It consists of all the instructions that tell the hardware how to perform a task. Software is developed through a programming language. Software, commonly known as programs or apps can be broadly divided into two categories- (i) System Software and (ii) Application software.

System software helps to run the computer hardware and computer system itself. System software includes operating systems, device drivers, diagnostic tools, and more. An operating system is a type of system software that manages the hardware and creates the interface between the hardware and the user.

Application software allows users to accomplish one or more tasks. It is meant to perform several tasks for the user including word processing, web browsing, and other task which require installation of the software. Applications software are designed and developed as per the users/customers requirements.

4.4   TYPES OF SOFTWARE

[1] System Software-

System software comprises device drivers, operating systems, servers, software components, and programming software (for writing programs through tools such as editors, linkers, debuggers, compilers/interpreters, and others). The most important is the operating system, here we will discuss the operating system.

Operating System-

An operating system handles signals or instructions received from input and output devices, manages memory usage, and control peripherals. Therefore, the operating system is the most important program a computer must run on. DOS (Disk Operating System), Microsoft Windows XP, and Mac OS are some examples of personal computer operating systems. Server-level computers use operating systems such as UNIX and Microsoft Windows Server.

Portable devices, such as cellular phones, smartphones, and personal data assistants use specialized, 'embedded' operating systems that enable them to do many tasks. Some of the functions operating system include- starting the computer (also called 'booting'), managing and monitoring other programs, memory management, communications management, management of peripheral devices, enabling interaction between the user and the computer system through the use of external input devices, monitoring and security of access to data and applications.

Today's personal computers use a Windows-based operating system that incorporates many of the original concepts in DOS. Operating systems differ in functionality, flexibility, and ease of use. Today there are a number of different operating systems in use. They can be as either classified as personal operating systems, network (client/servers) operating systems, and handheld operating systems.

To interact with the computers a user uses a part of the operating system called a user interface. The functions of the user interface are to start application programs, manage secondary storage, such as hard disks, as well as manipulate files and folders, and finally shut down the computer safely. The three principal types of interfaces are-

- Graphical User Interface (GUI)
- Command-line interface/Character User Interface (CUI)

A graphical user interface is a form of user interface that allows users to interact with electronic devices through graphical icons, menu and an audio indicator such as primary notation. A GUI is a user-friendly interface that eliminates the need to remember complex computer commands. CUI is a way for users to interact using commands with computer programs. In CUI based computers user interacts using text-based commands. Examples CUIs are MS-DOS and the Windows Command Prompt.

Functions of an Operating System-

- Managing computer resources- The operating system allows application software programmes such as word processing, spreadsheet, and database packages to communicate with the computer's hardware. For example, if you work on a document in Excel and you want to print the document, you just press the print button on the toolbar. Excel will direct the operating system to select a printer to print the document. The operating system then notifies the computer to begin sending data and instructions to the appropriate program to get the document printed. The operating system, therefore, acts as an interface between the application programmes and the hardware.

- Managing files and memory- The operating system manages all files on a computer. It keeps tracks of the locations where programmes and data are stored within the computer's memory. For example, when you open a file that has been saved to the hard

drive you are first instructing the computer to find the file and then to open it. The operating system also allows you to easily find files stored in secondary storage devices. Other file management functions include copying, erasing, renaming, and backing-up files.

- Maintaining security- In networks and larger computers, each user is given a user name or ID and password to gain access to the computer system. The operating system keeps a register of all these names so that only persons with valid usernames and passwords can access the system. This prevents access by hackers and unauthorised persons. The operating system also keeps a log to records users logged in, the length of time each user stayed on the system, and the tasks they performed. Administrators can check the log to look for security breaches and the abuse of resources.

- Managing tasks- A computer can perform many tasks simultaneously. One way of doing this is multi-tasking – the ability of the computer to run more than one programme at the same time. For example, a user can listen to music on his/her computer while typing a document or typing an e-mail while another e-mail is being sent. In the case of networks, the multiuser operating system allows more than one user to access the same data at the same time.

- Providing a user interface- Many operating systems functions are never apparent on the computer's display screen. What you see on the screen is called the user interface. The interface helps the user to interact with the computer.

Types of operating systems-

[a] Batch operating system-

It is a type of operating system where users directly do not interact with the computer system. The user prepares his/her job in the form of batch (a group of tasks) and submits it to the computer for processing. To speed up processing, jobs with similar needs are batched together and run as a group. The batch operating system have some difficulties- lack of interaction between the user and the job, slower speed of the mechanical I/O devices than the CPU, difficulty in providing the desired priority, etc. However, some advantages involved with the batch operating system are- It is very difficult to guess time required for any job to complete, processors of the batch systems know how long the job would be when it is in a queue, the idle time for the batch system is very less, etc.

[b] Time-sharing operating systems-

Time-sharing is a technique that enables many people located at various terminals to use a particular computer system at the same time. Time-sharing or multitasking is a logical extension of multiprogramming. The processor's time which is shared among multiple users simultaneously is termed as time-sharing. The main difference between Multiprogrammed

Batch Systems and Time-Sharing Systems is that in the case of Multi programmed batch systems, the objective is to maximize processor use, whereas, in Time-Sharing Systems, the objective is to minimize response time.

[c] Distributed Operating System–

The distributed operating systems are referred to as loosely coupled systems or distributed systems. These system's processors differ in size and function. The major benefit of working with these types of operating system is that it is always possible that one user can access the files or software which are not present on his system but some other system connected within this network i.e., remote access is enabled within the devices connected in that network.

[d] Network operating System-

A Network Operating System runs on a server and provides the server the capability to manage data, users, groups, security, applications, and other networking functions. The primary purpose of the network operating system is to allow shared file and printer access among multiple computers in a network, typically a local area network (LAN), a private network, or to other networks. Examples of network operating systems include Microsoft Windows Server 2003, Microsoft Windows Server 2008, UNIX, Linux, Mac OS X, Novell NetWare, and BSD. The network operating systems are having the following features- centralized servers, high security at the server level, upgrades to new technologies and hardware that can be easily integrated into the system, etc.

[e] Real-time operating System-

A real-time system is defined as a data processing system in which the time interval required to process and respond to inputs is so small that it controls the environment. The time taken by the system to respond to an input and display of required updated information is termed as the response time. A real-time operating system must have well-defined, fixed time constraints, otherwise, the system will fail. For example, scientific experiments, medical imaging systems, industrial control systems, weapon systems, robots, air traffic control systems, etc.

[2] Application Software-

Computer software is basically programs and procedures intended to perform specific tasks on a computer system. The user directly deals with the application software for a specific purpose. The application software (program) also called end-user programs or apps can be a single program or a group of small programs often referred as an application suite. Some examples of application software are-

- Word processing software (example- MS Word, WordPad, and Notepad).

- Database software (example- Oracle, MS Access, MY SQL, etc).

- Spreadsheet software (example- Apple Numbers, Microsoft Excel, Open Office).

- Multimedia software (example- Real Player, Media Player, VLC player, etc).

- Presentation Software (example- Microsoft PowerPoint, Keynotes, open office, etc).

- Enterprise Software (example- Customer relationship management system, Hospital Management Software, etc).

- Information Worker Software (example- Documentation tools, resource management tools, etc).

- Educational Software (example- dictionaries like Encarta and Britannica, mathematical software like MATLAB and others like Google Earth, NASA World Wind).

- Simulation Software (example- Flight and scientific simulators).

- Application Suites (example- OpenOffice, Microsoft Office).

- Software for Engineering and Product Development (example- IDE or Integrated Development Environments).

Utility programs-

Utility programs, as the name suggests not only help in executing various crucial tasks for the operating system but also help in the overall maintenance of the computer system. Operating systems such as Windows, macOS, and Linux come with their own set of utility programs to maintain and execute different utility functions such as formatting, compressing, scanning, exploring, and much more. Utility programs also assist with the management of computer functions, resources, and files. Some common tasks performed by utility programs are- Disk Defragmentation, Disk Clean-up, File Management, Compression, Disk Management, Antivirus, Firewall, etc.

4.5   PROGRAMMING LANGUAGES

Do you use various applications (apps) in your smart phone? Do you ever think about how to develop these apps? Answer is simple, all the applications are developed using programming languages. There are a bunch of programming languages available. A computer is a device that can accept human instruction, processes it, and responds to it. In other words, a computer is a computational device which is used to process the data under the control of a computer program.

Computer programming languages allow us to give instructions to a computer in a language the computer understands. Just as many human-based languages exist, there is a list of computer programming languages that programmers can use to communicate with a computer. The portion of the language that a computer can understand is called a binary. Translating programming language into computer understandable language (or in binary) is

known as 'compiling.' Each programming language has it's own translator (except machine language). Some popular languages of computer are- C, Python, C++, C#, R, Ruby, ADA, Java, Visual BASIC, Perl (Practical Extraction and Report Language), PHP, JavaScript, PROLOG (Programming in Logic), Document formatting languages (e.g. TeX, PostScript, SGML), etc.

A computer program is a sequence of instructions along with data to process needful action. In other words, a computer is a computational device that is used to process the data under the control of a computer program. So, these computer programs are written using a programming language which is called high-level programming languages. High-level programming languages are nearly human languages which are more complex than the computer understandable (computer only understands binary language) language which is called machine language, or low-level language. Basically, computer programming languages are divided into two categories, as- low-level language and high-level language.

Example of a low-level programming language is machine language.

Examples of some high-level programming languages are- FORTRAN (Formula Translation), ALGOL (Algorithmic Language), LISP (List Processing), COBOL (Common Business-Oriented Language), BASIC (Beginner's All-purpose Symbolic Instruction Code), SQL (Structured Query Language), Pascal, Logo, Ada, etc.

Note- The advantages of both the low- and high-level programming language are merged within the middle-level languages. Examples of such languages are- C, C++, JAVA, C#, etc.

Characteristics of a programming Language–

- A programming language must be simple, easy to learn and use, have good readability, and is human recognizable.

- A portable programming language is always preferred.

- Programming language's efficiency must be high so that it can be easily converted into machine code and executed consumes little space in memory.

- A programming language should be well structured and documented as it is suitable for application development.

- Necessary tools for development, debugging, testing, and maintenance of a program must be provided by a programming language.

- A programming language should provide a single environment known as the Integrated Development Environment (IDE).

- A programming language must be consistent in terms of syntax and semantics.

4.6   INTRODUCTION TO OPEN SOURCE SOFTWARE

Open-source software is released through a specific kind of license that makes its source code legally available to end-users. There are many such licenses, but typically software is considered open source if-

It is available in source code form without additional cost i.e. users can view the code that comprises the software and make any kind of changes to it they want.

The source code can be repurposed into other new software, meaning anyone can take the source code and distribute their program from it.

Is open-source software always free?

Open-source software does not necessarily mean that executable software is given always free because converting that source code into an enforceable code requires expertise, time, and servers.

Open-source software is also sometimes conflated with the free software movement, which can add to the confusion around whether open source means 'free.' The free software movement grew out of the 'hacker culture' of the 1970s and was formally founded by Richard Stallman as part of the GNU Project and the non-profit Free Software Foundation. Usually, 'free software' is meant to emphasize freedom in the rights of end-users, but can sometimes be confused as meaning 'free of cost.'

One thing is interesting, neither free software nor open-source software denotes anything about cost both the kinds of software can be legally sold or given free. The primary difference between them has to do with the sharing. For free software, if you make changes to source code and want to share them, you also have to share those changes back with the original project. For open-source software, there is typically no such restriction. Despite their practical differences, free software and open-source software do share common values. Both the terms 'free' and 'Open Source' are combined in a common phrase, as "Free and Open Source Software" (FOSS).

FOSS vs. Proprietary Software-

The key difference between proprietary software and FOSS is the availability of the source code. Proprietary or commercial software like Microsoft Windows and Adobe Photoshop are not available to end-users as source code where free software like the Linux kernel and open-source software such as Google Chromium (the basis of the Chrome web browser) are available as source code through their respective licenses.

The Open source license allows software to be freely used, modified, and shared. It should also be approved by the Open Source Initiative (OSI), a license must go through the Open Source Initiative's license review process. Some popular open-source licenses are- Apache

License 2.0, BSD 3-Clause 'New' or 'Revised' license, BSD 2-Clause 'Simplified' or 'FreeBSD' license, GNU General Public License (GPL), GNU Library or Lesser General Public License (LGPL), MIT license, Mozilla Public License 2.0, Common Development and Distribution License and Eclipse Public License version 2.0.

Why does Open-source software matter?

Open-source software matters to everyone, not just programmers because it unlocks the potential of many more people to become innovators than a closed-source (proprietary Software) model. Open source communities, for instance, are organized around open source projects where anyone with skills can join and contribute code. These groups still maintain standards around contributing to open source projects just like proprietary software teams do but they open up this process to anyone in the world who wants to contribute.

This open-source development model has resulted in some of the most important applications and cloud platforms in use today. The most popular of which comprise LAMP (Linux, Apache, MySQL, PHP), a model of service stacks that undergird much of the web.

Brief about LAMP-

Linux- is an open-source Operating System (OS) and the largest open source project in the world.

Apache- is an open-source cross-platform web server that played a key role in the early web.

MySQL- is an open-source Relational Database Management System (RDBMS) used by many database-driven web applications.

PHP- a general purpose scripting language used in software development (Perl or Python languages are sometimes substituted).

Other examples of popular open source technologies include the Android mobile OS, the Mozilla Firefox web browser, the widely-used version control system Git, and the two related office suites OpenOffice and LibreOffice. On a broader scale, most innovation in the areas of cloud computing, big data, and artificial intelligence have been derived from open-source software projects.

Open-source software has other advantages for businesses and individual programmers. When source code is open, it makes it easier for anyone to study it to develop new programming skills. Open-source licensing also allows students to get practice by editing the code and sharing it with friends and the broader open-source community, or even contributing fixes to existing open source projects. The open-source software also offers businesses the ability to customize it to meet their specific needs. Some also prefer open-source software because there are many more developers looking for security vulnerabilities when the source code is openly available and has an active community supporting it. The

open-source way is so effective because it can attract tremendous technical talent much of the innovation in technology is taking place in the open source community, and people all over the world end up using open-source software.

SourceForge (https://sourceforge.net)-

SourceForge is an Open-Source software community resource dedicated to helping open-source projects as successful as possible. It helps to create a premiere resource for open-source software development and distribution.

With the tools it provides, developers on SourceForge create powerful software in over 502,000 projects and host millions of registered users. It also connects more than 32 million monthly users with all of these open source projects and serves more than 2.6 million downloads a day. The SourceForge business software directory lists over 50,000 software titles. IT professionals come to SourceForge to develop, download, review and publish open source, and business software. SourceForge is the largest, most trusted destination for Open Source Software discovery, software reviews, and software development on the web.

4.7   POINTS TO REMEMBER

- Software is a way to communicate with the blind hardware of the computer system. It consists of all the instructions that tell the hardware how to perform a task.

- System software helps to run the computer hardware and computer system itself. System software includes operating systems, language translators, device drivers, diagnostic tools, and more.

- Application software is the category of programs which include word processing, web browsing, and almost any other task for which you might install the software. Applications software are designed and developed as per the users/customers requirements.

- An operating system handles signals or instructions received from input and output devices, manages memory usage, and control peripherals.

- Some of the functions operating system include- starting the computer (also called 'booting'), managing and monitoring other programs, memory management, communications management, management of peripheral devices, enabling interaction between the user and the computer system through the use of external input devices, monitoring and security of access to data, and applications.

- To interact with the computers, a user uses a part of the operating system called a user interface, which is basically of two types e.g. Graphical User Interface (GUI), Character User Interface (CUI).

- The operating system manages all files on a computer. It keeps tracks of the locations where programmes and data are stored within a computer's memory.

- A Network Operating System runs on a server and provides the server the capability to manage data, users, groups, security, applications, and other networking functions.

- Time-sharing is a technique that enables many people located at various terminals to use a particular computer system at the same time.

- Utility programs not only help in executing various crucial tasks for the operating system but also help in the overall maintenance of the computer system.

- Computer programming languages allow us to give instructions to a computer in a language the computer understands. Just as many human-based languages exist, there is a list of computer programming languages that programmers can use to communicate with a computer.

- Open-source software is released through a specific kind of license that makes its source code legally available to end-users.

4.8 GLOSSARY

- GUI- Graphical User Interface.

- CUI- Character User Interface.

- LAMP- Linux, Apache, MySQL, and PHP.

- FOSS- Free and Open Source Software.

- IDE- Integrated Development Environment.

- DOS- Disk Operating System.

4.9 CHECK YOUR PROGRESS

Descriptive type questions-

a) Why does open source software matter?

b) Define FOSS and Proprietary Software.

c) Is open-source software always free?

d) What do you understand by programming languages?

e) Define the role of Application software.

f) Briefly define the types of operating system.

g) Why Operating system is important for the execution of a computer system?

Objective type questions-

a)   System software includes operating systems, language translator, device drivers, etc. (True/False)

b)   Operating systems differ in functionality, flexibility, and ease of use. (True/False)

c)   The operating system manages only folders on a computer. (True/False)

d)   A Network Operating System runs on a server and provides the server the capability to manage data, users, groups, security, applications, and other networking functions. (True/False)

e)   The operating system keeps tracks of the locations where programmes and data are stored within the computer's memory. (True/False)

f)   A computer program is a sequence of instructions along with a memory to process needful action. (True/False)

g)   The Open source license allows software to be freely used, modified, and shared. (True/False)

Answers (objective type question)-

[a] True   [b] True   [c] False   [d] True

[e] True   [f] False   [g] True

4.10   BIBLIOGRAPHY/ REFERENCES

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* https://opensource.org/licenses

4.11   SUGGESTED READINGS

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- Rajaraman V. "Fundamentals of Computers", Prentice Hall India Pvt., Limited.

UNIT- 5

ICT RESOURCES AND APPLICATIONS- III

5.1   INTRODUCTION

The applications of ICT in our daily life have changed the ways individuals access and elaborate knowledge. In the 21st century, digital skills are essential for learning and even living a successful life (accessing resources at anytime and anywhere). In order to grab the new opportunities, digital technologies are opening possibilities in many areas. Individuals have to develop the right set of skills to make meaningful use of these technologies in their life. Increasing use of digital technologies at work (especially in teaching & learning) is raising the demand for new skills along with the following directions-

• ICT specialist skills to programme, develop applications, and manage networks.

• ICT generic skills to use such technologies for professional purposes.

• ICT complementary skills to perform new tasks associated to the use of ICTs at work, e.g. information-processing, self-direction, problem-solving, and communication.

Raising the demands of new-age skills, digital technologies are also creating new opportunities for skills development. Massive Online Open Courses (MOOCs) and Open Educational Resources (OER) modify learning methods and give access to quality resources to a larger population. The use of digital technologies in formal education and vocational training has the potential to improve learning, although the outcomes depend on the capacity to link these tools to effective pedagogy. Here we are going to elaborate on some useful ICT resources and repositories for future use and access as well as we will briefly describe the overview of the Learning Management System (LMS).

5.2   OBJECTIVES

After the successful completion of this unit, you will be able to-

- Define new age learning skills.
- Explore open education and learning initiatives.
- Explore digital repositories for e-learning.
- Define Learning Management System.

5.3   ICT RESOURCES AND NEW AGE LEARNING SKILLS-

Knowledge involves two components, e.g. inter-linked content and skills. Content includes facts, ideas, principles, evidence, and descriptions of processes or procedures. Generally, subject instructors are well trained in content and have a deep understanding of the subject areas in which they are teaching. Skill development is the process of lifelong learning. The new-age learning skills include-

- Communications Skills- With the traditional communication skills of reading, speaking, and writing coherently and clearly we need to add social media communication skills. These might include the ability to create a short YouTube video to capture the demonstration of a process or to pitch sales, the ability to reach out through the Internet to a wide community of people with one's ideas, to receive and incorporate feedback, to share information appropriately, and to identify trends and ideas.

- The ability to learn independently- To take responsibility for working out what you need to know and where to find that knowledge. This is an ongoing process in knowledge-based work because the knowledge base is constantly changing. It could be learning about new equipment, new ways of doing things or learning from whom do you need to get the job done.

- Ethics and responsibility- Are the essential values required to build trust in both the real and the business world where there are many different players and a greater degree of reliance on others to accomplish one's own goals.

- Teamwork and flexibility- Although many workers work independently or in very small companies they depend heavily on collaboration and the sharing of knowledge with others in related but independent organizations.

- Thinking Skills- e.g. critical thinking, problem-solving, creativity, originality, and strategizing are one of the most important skills needed in a knowledge-based society. The teaching community should have always pride in themselves on teaching such intellectual skills.

- Digital Skills- Most knowledge-based activities depend heavily on the use of information technology. However, the key issue is that these skills need to be embedded within the knowledge domain in which the activity takes place. The use of digital technology needs to be integrated and evaluated through the knowledge-base of the subject area.

- Knowledge Management- Is perhaps the most over-arching of all the skills. Knowledge is not only rapidly changing with new research, new developments, and rapid dissemination of ideas and practices over the Internet. But the sources of information are increasing with a great deal of variability in the reliability or validity of the information.

5.4 OPEN EDUCATION AND OPEN LEARNING INITIATIVES

Open education is education without academic admission requirements and is typically offered online. Open education broadens access to the learning and training traditionally offered through formal education systems. The qualifier 'open' refers to the elimination of barriers that can preclude both opportunities and recognition for participation in institution-based learning. One aspect of openness or 'opening up' education is the development and adoption of open educational resources. (Source: https://en.wikipedia.org/wiki/Open_education).

Programs are commonly offered by the educational institutions in online mode or using open and distance learning mode like e-learning, MOOC, and Open Course Ware to eliminate the entry barriers e.g. with no academic admission requirements. Where many e-learning programs are free to follow the costs of acquiring a certification may be a barrier. Thus, many open education institutes offer free certification schemes accredited by organizations.

In other words, open education is a collection of practices that utilize online technology to freely share knowledge. The open education movement not only includes the sharing of knowledge but also follows the following features-

- Publishing research in open journals (open access publishing)

- Releasing data to be reused by others (open data)

- Using, sharing and collaboratively creating software and computer code (open-source software)

- Flexible admission policies to institutions or courses (open admissions or open registration)

- Student assignments that promote student publishing or participating on the open web (open teaching or open pedagogy)

- Sharing of teaching and research practices (open scholarship)

- Sharing and reuse of teaching and learning materials (open educational resources) including courses (open courseware) and textbooks (open textbooks)

The above literature is a thematic idea to briefly understand the open education and the types of activities that the 'open education' encompasses. The 'open education' develops the learning opportunity for the deprived section of the society with quality learning material globally. To grab the advantages of open education movement someone needs to have basic IT literate and Internet savvy.

List of useful resources to access quality learning material-

[a] Open Learning initiatives at Carnegie Mellon University (https://oli.cmu.edu/learn-more-about-oli)-

You may visit the above link, to freely access the bunch of courses offered under Open Learning initiatives (OLI).

[b] Open Learning Initiative at Stanford University (http://oli.stanford.edu)-

Open Learning initiative courses are openly and freely available to anyone in the world at Stanford University who wants to learn- whether you are a student at a college or university or learning on your own; you can avail the OLI courses using the following link- http://oli.stanford.edu.

[c] Open Learning at Harvard (https://www.extension.harvard.edu/open-learning-initiative)-

One can visit the Harvard Open learning initiatives and explore the open courseware (free courses).

[d] Open Learning at lumen learning (https://lumenlearning.com/courses)-

One can visit the lumen learning (https://lumenlearning.com/courses) initiatives of open learning and explore the open courseware (free courses).

5.5 LIST OF POPULAR DIGITAL REPOSITORIES FOR TECHNOLOGY ENABLED EDUCATION

Online Learning Resources (under the NMEICT, MHRD, Govt. of India)-

- E-PG Pathshala (epgp.inflibnet.ac.in) - e-PG Pathshala is an initiative of the MHRD under its National Mission on Education through ICT (NME-ICT) being executed by the UGC. e-Adhyayan, e-Pathya, and UGC-MOOCs are more initiatives of NMEICT where under e-Adhyayan 700+ e-Books and video contents for the Post-Graduate Courses are provided.

- NCERT e-books (www.ncert.nic.in/textbook/textbook.htm)-

- Spoken Tutorial (www.spoken-tutorial.org)- It is an educational content portal where one can learn various Free and Open Source Software by oneself. The courses offered are of self-paced, multi-lingual that anybody with a computer and a desire for learning, anyone can learn from any place, at any time and in a language of their choice.

- Digital Library Inflibnet (www.inflibnet.ac.in)- The Ministry of Human Resource Development (MHRD) has formed e-ShodhSindhu merging three consortia initiatives, namely UGC-INFONET Digital Library Consortium, National Library, and Information Services Infrastructure for Scholarly Content (NLIST) and Indian National Digital Library in Engineering Sciences and Technology (INDEST)-All India Council for Technical Education (AICTE) Consortium. The e-ShodhSindhu provides current as well as archival access to more than 15,000 **core** and peer-reviewed journals and many bibliographic, citation, and factual databases in different disciplines.

- SWAYAM PRABHA (TV Channel)-

- E-pathshala (www.epathshala.nic.in)-

- Tamanna (www.ncert.nic.in/tamanna/tamanna.html)-

- NISHTHA (www.itpd.ncert.gov.in)-

- Talk to Teacher (aview.in)- A-VIEW is an indigenously built multi-modal, multimedia e-learning platform that provides an immersive e-learning experience that is almost as good as a real classroom experience. A-VIEW is part of the talk to a teacher program coordinated by IIT Bombay and funded by the Ministry of Human Resource Development (MHRD).

- Consortium for Educational Communication (www.cec.nic.in)- It is an Inter-University Centers set up by the University Grants Commission (UGC) of India. It has been established to address the needs of higher education through the use of a powerful

medium of television along with the appropriate use of emerging Information Communication Technology (ICT).

- FOSSEE (www.Fossee.in)- Free Open Source Software for Education (FOSSEE) project promotes the use of FOSS tools to improve the quality of education in our country. This project aims to reduce dependency on proprietary software in educational institutions.

- E-Kalpa (www.dsource.in)- This project presents three initiatives – providing digital online content for the design, a social networking environment for design & higher learning, and creating a digital resource database on design. The project would focus on knowledge accumulation, storing and dissemination, and education in four sectors - University, Industry, Government, and the Informal sector.

- Virtual Labs (www.vlab.co.in)- This initiative has been taken by the Ministry of Human Resource Development (MHRD). Virtual Labs project is a consortium activity of 12 participating institutes among them, the IIT Delhi is coordinating institute. Virtual Labs do not require any additional infrastructural setup for conducting experiments at user premises. The intended beneficiaries of this project are- all students and faculty members of science and engineering, high-school students whose inquisitiveness will be triggered, researchers, and engineering colleges who can share the given resources.

- Open Source Courseware Animations Repository (http://oscar.iitb.ac.in/oscarHome.do)-

- E-Yantra (www.e-yantra.org)- The e-Yantra is an initiative to spread education in embedded systems and robotics by IIT Bombay, sponsored by the Ministry of Human Resource & Development (MHRD). The objective of this project is to provide hands-on learning to engineering students who have limited access to labs and mentors. The goal is to create the next generation of (Embedded Systems) engineers in India with a practical outlook to take on challenging problems and provide solutions.

- Quantum & Nano Computing (www.dei.ac.in/dei/quantumNano)- The Quantum-Nano Centre is a multidisciplinary centre at Dayalbagh Educational Institute, Agra. The mission of this project is to aggressively explore and advance the application of quantum-nano systems to a vast array of relevant information processing techniques.

- Expert Database & National Researcher Network (vidwan.inflibnet.ac.in)-

- Indian Research Information Network System (irins.org/irins)-

Open Educational Resources-

- NPTEL (www.nptel.ac.in)-

- SWAYAM (www.swayam.gov.in)-

- NROER (www.nroer.gov.in)-

- Saylor Academy (www.saylor.org)-

- OER Commons (www.oercommons.org)-

- Khan Academy (www.khanacademy.org)-

- MIT BLOSSOMS (www.blossoms.mit.edu)-

- COL Virtual Learning (www.colvee.org)-

- Directory of OER (www.doer.col.org)-

- COL's Institutional Repository (www.oasis.col.org)-

- Virtual University of Pakistan (www.ocw.vu.edu.pk)-

- LabXchange (www.labxchange.org)-

- MIT Open CourseWare (www.ocw.mit.edu)-

- Lumen Courses (www.lumenlearning.com)-

- MERLOT- Online Learning Resources (www.merlot.org)-

- eCampus- Learning Resources (www.ecampusontario.ca)-

- Skills Commons (www.skillscommons.org)-

Quizzes/ Testing / Games-

- Book Widgets (www.bookwidgets)- Worksheets, simulations, games & more for use in classrooms and multi-touch books.

- Class kick (www.classkick.com)- Easy real-time feedback & formative assessment.

- Class marker (www.classmaker.com)- Easy online testing.

- Class tools (www.classtools.net) - Several class tools of any kind.

- DeckToys (https://deck.toys) - Drag-and-drop lesson creation, differentiate the right way, full control over your lesson delivery and tracking your progress in real-time.

- Educaplay (educaplay.com) - Create numerous interactive games with instant feedback.

- Flipgrid (https://info.flipgrid.com) - Create a Grid - that's your classroom or community. Add a Topic or two to spark the discussion. Your students share short video responses to ignite a dialogue. Super simple. Super powerful..

- Google Forms (http://forms.google.com)- Easy for quizzes, evaluations or questionnaires.

- Goosechase - Scavenger hunts for the masses. Bold, crazy, and highly addictive. Incredibly easy to use with all the power you could ever want.

- Gynzy - Gynzy is an online whiteboard helping teachers create engaging lessons plans to engage students in the classroom.

- H5P (www.h5p.org) - Create, share, and reuse interactive HTML5 content in your browser.

- Learnclick (www.learnclick.com) - Create online cloze quizzes. Simply mark words to turn them into gaps, dropdown or drag & drop quizzes.

- Poll Everywhere (www.polleveryone.com)- Live interactive audience participation. Engage your audience or class in real-time.

- Quizizz (www.quizizz.com) - Quizizz is a fun review tool that allows the entire class to practice together. It's completely free.

- SurveyMonkey (www.surveymonkey.com)- Create Surveys, Get Answers.

5.6 BRIEF OVERVIEW OF LEARNING MANAGEMENT SYSTEM

The Learning Management System (LMS) may be defined in the user perspective as a virtual environment that aims to simulate face-to-face learning environments with the use of Information Technology. In LMS, the interaction happens through devices that enable communication either synchronously or asynchronously allowing the creation of different strategies to encourage dialogue and active participation of students. Learning Management Systems are web-based systems that enable teachers and students to share materials, submit & return assignments, and to communicate online. The LMS, mediation involves both the acquisition of competences and communication skills for all the teachers and students as well as creation of interactive moments and practical application possibilities for collaborations. To establish such communication we used chat rooms, forums, blogs, video blogs, etc.

The LMS is enabled to integrate multiple media, different languages & resources while enabling alternative technologies and presenting information in an organized manner to fulfil its main purpose which is the construction of learning through interaction. The well-planned and designed courses perform the key role in teaching-learning using LMS, which is necessary for e-learning quality. There are several LMS (software) options available in the market including commercial or proprietary and free and open-source software. Some top rated LMS options are- BlackBoard (proprietary), Breeze, Moodle (Free and Open Source), plus dotLRN and the Sakai Project, etc.

In relation to quality standards in LMS, considering the development of information technology and the growing use of these LMS environments, the importance of identifying

those that comply with minimum requirements arises. These requirements can be expressed in terms of reliability, scalability, security, sustainability, and adoption of international standards of quality. Reliability can be obtained through the experience of large universities in using virtual fields for face-to-face or distance education. Scalability is needed to attend to the large numbers of students, a fundamental characteristic of e-learning. The adoption of international quality standards largely depend on the developer team and the options for meeting the needs and goals of users which can differentiate virtual environment.

5.7   POINTS TO REMEMBER

- The applications of ICT in our daily life have changed the ways individuals access and elaborate knowledge.

- Individuals have to develop the right set of skills to make meaningful use of ICT in their life. Increasing use of digital technologies at work (especially in teaching learning) is raising the demand for new skill sets.

- Knowledge involves two components e.g. content and skills

- Most knowledge-based activities depend heavily on the use of information technology.

- Open education is education without academic admission requirements and is typically offered online. Open education broadens access to the learning and training traditionally offered through formal education systems.

- The open education is a collection of practices that utilize online technology to freely share knowledge.

- The Learning Management System (LMS) may be defined in the user perspective as a virtual environment that aims to simulate face-to-face learning environments with the use of Information Technology.

5.8   GLOSSARY

- LMS- Learning Management System.

- OLI- Open Learning initiatives.

- Knowledge Management- Knowledge is not only rapidly changing with new research, new developments and rapid dissemination of ideas and practices over the Internet but the sources of information are also increasing with a great deal of variability in the reliability or validity of the information.

- Communications Skills- With the traditional communication skills of reading, speaking and writing coherently and clearly we need to add social media communication skills.

5.9   CHECK YOUR PROGRESS

Descriptive type questions-

a)   What do you understand by new-age learning skills? Explain.

b)   Explain Open Education.

c)   List five digital repositories for e-learning.

d)   Briefly explain the learning management system.

Objective type questions-

a)   LMS may be defined as a virtual environment that aims to simulate face-to-face learning environments with the use of Information Technology. (True/False)

b)   In LMS, the interaction happens through either synchronous communication or asynchronous communication. (True/False)

c)   The objective of the E-Yantra project is to provide hands-on learning to engineering students who have limited access to labs and mentors. (True/False)

d)   Virtual Labs project is a consortium activity of JNU and Delhi University to provide virtual practical experience. (True/False)

e)   Open education is a collection of practices that utilize online technology to freely share knowledge. (True/False)

f)   FOSSEE stands for Free Open Source Software for Enterprise. (True/False)

g)   A-VIEW is an indigenously built multi-modal, multimedia e-learning platform that provides an immersive e-learning experience. (True/False)

Answer (objective type questions)-

[a] True   [b] True   [c] True   [d] False

[e] True   [f] False   [g] True

5.10   BIBLIOGRAPHY/ REFERENCES

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- https://en.wikipedia.org/wiki/Open_education
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- https://www.scielo.br/scielo.php?script=sci_arttext&pid=S1807-17752016000200157
- https://www.todaysteachingtools.com/lijst-van-ict-tools.html
- www.vlab.co.in (Virtual Labs).
- www.aview.in (Talk to Teacher).
- www.spoken-tutorial.org (Spoken Tutorial).

- www.cec.nic.in (Consortium for Educational Communication).

- www.e-yantra.org (E-Yantra).

- www.inflibnet.ac.in (Digital Library Inflibnet).

- www.dei.ac.in/dei/quantumNano (Quantum & Nano Computing).

- www.Fossee.in (Free Open Source Software for Education project).

- www.dsource.in (E-Kalpa).

- epgp.inflibnet.ac.in (E-PG Pathshala).

- vidwan.inflibnet.ac.in (Vidwan- Expert Database and National Researcher Network).

- irins.org/irins (Indian Research Information Network System).

- nroer.gov.in/welcome (National Repository of Open Educational Resources).

5.11 SUGGESTED READINGS

- http://oasis.col.org/handle/11599/2447

- Education for the 21st Century- Impact of ICT and Digital Resources, IFIP 19th World Computer Congress, TC-3 Education, August 21-24, 2006, Santiago, Chile, Editors: Kumar, Deepak, Turner, Joe (Eds.)

- https://docs.moodle.org/39/en/Main_page

- https://opentextbc.ca/teachinginadigitalage/chapter/section-1-3-the-skills-needed-in-a-digital-age/

UNIT- 6

INTRODUCTION TO TEXT EDITOR (MS WORD) - I

6.1   INTRODUCTION

MS-Word is a powerful word processor that allows you to create memos, fax coversheet, web pages, reports, mailing labels, brochures, tables, and many other professional and business applications. MS Word provides easy graphics handling, calculation of the data tables, ability to create a mailing list, list sorting, and efficient file management.

6.2   OBJECTIVES

After the successful completion of this unit, you will be able to-

* Describe how to create, open and save a word document

* Discuss MS-Word working tools.

6.3   STARTING MS WORD

A text editor is any word processing program that you can use to type and edit text. Word Pad and Notepad for Windows and SimpleText and Text Edit for the Mac are common text editors. Large programs such as Microsoft Word and Word Perfect are also text editors.

Microsoft Word allows you to create professional-quality documents, reports, letters, and résumés. Unlike a plain text editor Microsoft Word has features including spell check, grammar check, text and font formatting, HTML support, image support, advanced page layout, and more.

Step 1 Click Start Button

Step 2 Click on the 'sub-menu' icon.

Step 3 Click on 'Microsoft Office 2007' from the sub-menu.

Step 4 Click on the 'Microsoft office word 2007'.

Basics of MS-Word

- **Tabs: -** Tabs are the predefined functions and features in the word processor which can be applied for developing certain characteristics on the entered text.

- **Active tab: -** Active tab comprises of seven tabs- home, insert, page layout, references, mailing, review, and view.

- **Ribbon: -** Each tab of the active tab menu has its specific groups of related commands termed as the ribbon.

- **Rulers: -** Rulers help us to control the margins of the page and indentation of the paragraphs. They are also used for aligning the images and the text.

- **Document header/footers: -** Headers and footers are being used to display descriptive
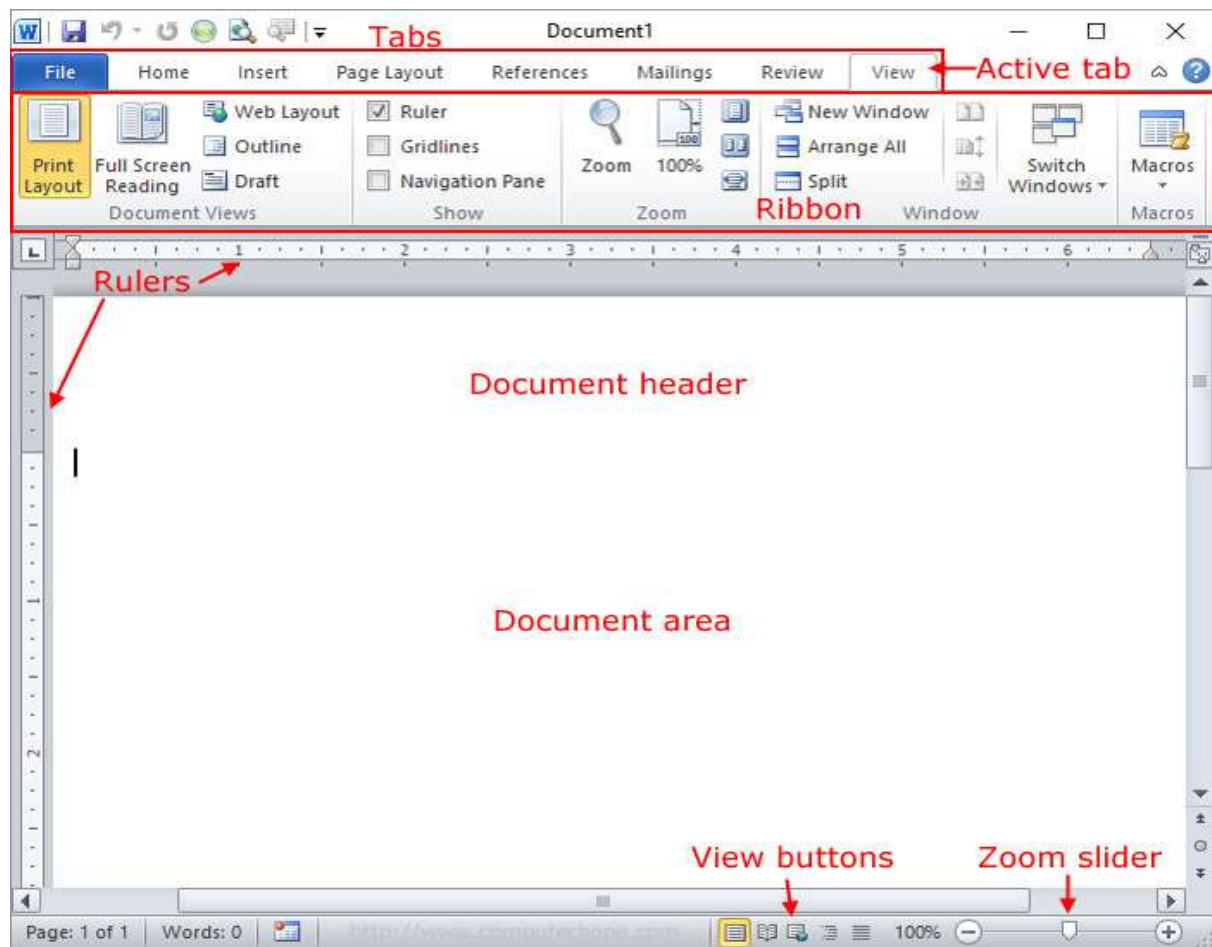
information such as page number, document name, date/or time, etc.

- **Document area: -**Document area is a huge blank section of the word processor window which allows the user to enter the contents. This area contains infinite number of pages which is being incremented automatically when the previous page is filled.

- **View buttons: -** View button is a feature that allows us to see how the document appears or presented.

- **Zoom slider: -** Zoom slider is used to zoom in or zoom out the document pages.

There are many basic operations and functions that we should know before start working in the MS-word, which are listed below:

[1] To move the insertion point to the beginning or end of the document

Press H+> or H+B.

[2] To convert a document created in an earlier version of Word

Click the Microsoft Office Button, and then click Convert.

[3] To view multiple pages

- On the View toolbar, click the Zoom button.

- In the Zoom dialog box, click the many pages arrow, select the number of pages, and then click OK.

[4] To adjust the magnification of a document

- On the View toolbar, click the Zoom button.

- In the Zoom dialog box, enter the percentage or type an amount in the Percent box and then click OK.

[5] To display the Document Map

On the View tab in the Show/Hide group, select the Document Map check box.

[6] To display thumbnails of pages

- On the View tab, in the Show/Hide group, select the Thumbnails check box to display or hide non-printing characters.

- On the Home tab, in the Paragraph group, click the Show/Hide ¶ button.

[7] To display a document in a different view

- On the View tab, in the Document Views group, click the button for the desired view, or

- Click a view button on the View toolbar at the right end of the status bar.

[8] To switch among open documents

On the View tab in the Window group click the Switch Windows button and then click the name of the document you want to switch to.

[9] To view multiple open documents

On the View tab in the Window group, click the Arrange All button.

[10] To open a new document

Click the Microsoft Office Button, click New and then in the New Document window double-click Blank document.

[11] To save a document for the first time

- On the Quick Access Toolbar, click the Save button or click the Microsoft Office Button and then click Save As.

- If Browse Folders is shown in the lower-left corner of the Save As dialog box, click it and then navigate to the location where you want to save the file.

- In the File name box, type a name for the document, and then click Save.

[12] To create a new folder while saving a document

- Click the Microsoft Office Button, and then click Save As.

- In the Save As dialog box, navigate to the folder where you want to create the new folder.

- On the dialog box's toolbar, click the New Folder button

- Type the name of the new folder, press F, and then click Open.

- In the File name box, type a name for the document, and then click Save.

[13] To preview how a document will look when printed

Click the Microsoft Office Button, point to print, and then click Print Preview.

[14] To print a document with the default settings

Click the Microsoft Office Button, point to print, and then click Quick Print.

[15] To print a document with custom settings

- Click the Microsoft Office Button, and then click Print.

- In the Print dialog box, modify the settings as needed, and then click OK

[16] To select text

- Word: Double-click the word.

- Sentence: Click in the sentence while holding down the H key.

- Paragraph: Triple-click in the paragraph, or double-click in the selection area to the left of the paragraph.

- Block: Click to the left of the first word, hold down the G key, and then click immediately to the right of the last word or punctuation mark.

- Line: Click in the selection area to the left of the line.

- Document: To delete the text Triple-click in the selection area.

- Select the text and then press A or Z.

[17] To undo an action

On the Quick Access Toolbar click the Undo button.

[18] To move the text by dragging

- Select the text and then point to the selection.

- Hold down the mouse button, drag the text to its new location and then release the mouse button.

[19] To save the text as a building block

- Select the text. Then on the Insert tab, in the Text group, click the Quick Parts button, and then click Save Selection to Quick Part Gallery.

- In the Create New Building Block dialog box, type a name for the building block, make necessary changes to the settings, and then click OK.

[20] To insert a building block in a document

Click where you want to insert the building block. Then either type the name of the building block, and press #; or click the Quick Parts button on the Insert tab in the Text group and select the building block from the Quick Part gallery.

[21] To insert the date and time

- Click where you want the date or time to appear. Then, click the Date & Time button on the Insert tab in the Text group.

- In the Date and Time dialog box under Available formats click the format you want, and then click OK.

[22] To use the Thesaurus

- Double-click the word you want to replace. Then, click the Thesaurus button on the Review tab in the Proofing group.

- In the Research task pane, point to the word you want to insert in place of the selected word, click the arrow that appears, and then click Insert.

[23] To research information

- Click Research on the Review tab present in the Proofing group,

- Type the research topic in the search for box present in the Research task pane.

- Click the arrow of the box below the Search for box, click the resource you want to use, and then in the results list, click a source to view its information.

[24] To translate a word or phrase into another language

- Select the word or phrase, and then on the Review tab, in the Proofing group, click the Translate button.

- In the Translation area of the Research task pane, select the desired languages in the form and to boxes to display the translation.

[25] To display a document in Outline view

On the View toolbar, click the Outline button.

[26] To display specific heading levels in Outline view

On the Outlining tab, in the Outline Tools group, click the Show Level arrow, and in the list, click a heading level.

[27] To collapse or expand heading levels in Outline view

Click anywhere in the heading to be collapsed or expanded. Then on the Outlining tab, in the Outline Tools group, click the Collapse or Expand button.

[28] To demote or promote headings in Outline view

Click the heading to be demoted or promoted. Then on the Outlining tab, in the Outline Tools group, click the Demote or Promote button.

[29] To move content in Outline view

Collapse the heading whose text you want to move. Then on the Outlining tab, in the Outline Tools group, click the Move Up or Move Down button.

[30] To find text

- On the Home tab, in the Editing group, click the Find button.

- On the Find tab of the Find and Replace dialog box, specify the text you want to find, and then click Find Next.

[31] To replace text

- On the Home tab, in the Editing group, click the Replace button.

- On the Replace tab of the Find and Replace dialog box, specify the text you want to find and the text you want to replace it with, and then click Find Next.

- Click Replace to replace the first instance of the text, Replace All to replace all instances, or Find Next to leave that instance unchanged and move to the next one.

[32] To check spelling and grammar

- On the Review tab, in the Proofing group, click the Spelling & Grammar button.

- In the Spelling and Grammar dialog box, click the appropriate buttons to correct the errors Word finds or to add words to the custom dictionary or AutoCorrect list.

- Click OK when Word reaches the end of the Spelling and Grammar check, and then click Close.

[33] To remove personal information from a document

- Click the Microsoft Office Button, point to Prepare, and then click Inspect Document.

- In the Document Inspector dialog box, select the items you want to check and then click Inspect.

- In the Document Inspector summary, click the Remove All button to the right of any items you want to remove, and then close the Document Inspector dialog box.

[34] To mark a document as final

- Click the Microsoft Office Button, point to Prepare, and then click Mark as Final.

- Click OK in the message box, click Save, and then click OK in the finalization message.

[35] Changing the Look of

Click the paragraph or select the text to which you want to apply a style. Then on the Home tab, in the Styles group, click the thumbnail of the style you want to apply in the Quick Styles gallery.

6.4   WORKING WITH DOCUMENT

Entering and saving text in a document-

Entering and saving of the data in MS-word is very easy. A blinking cursor appears in the text area which decides the position of the text which is to be entered. We can enter the contents in the text area with not only various formats of writing but also different sizes, shapes, and colours. We can also apply certain features like bold, italic, and underline and can arrange the position of the contents through various aligning icons. We can save the entered content by shortcut key (CTRL+S) OR can go through various steps given below:

Step 1: Click on the 'office button' present at the top left corner of the screen.

Step2: Now, click on the 'save' option from the menu. Or Click on the 'Save As' option to provide a custom name to your document.
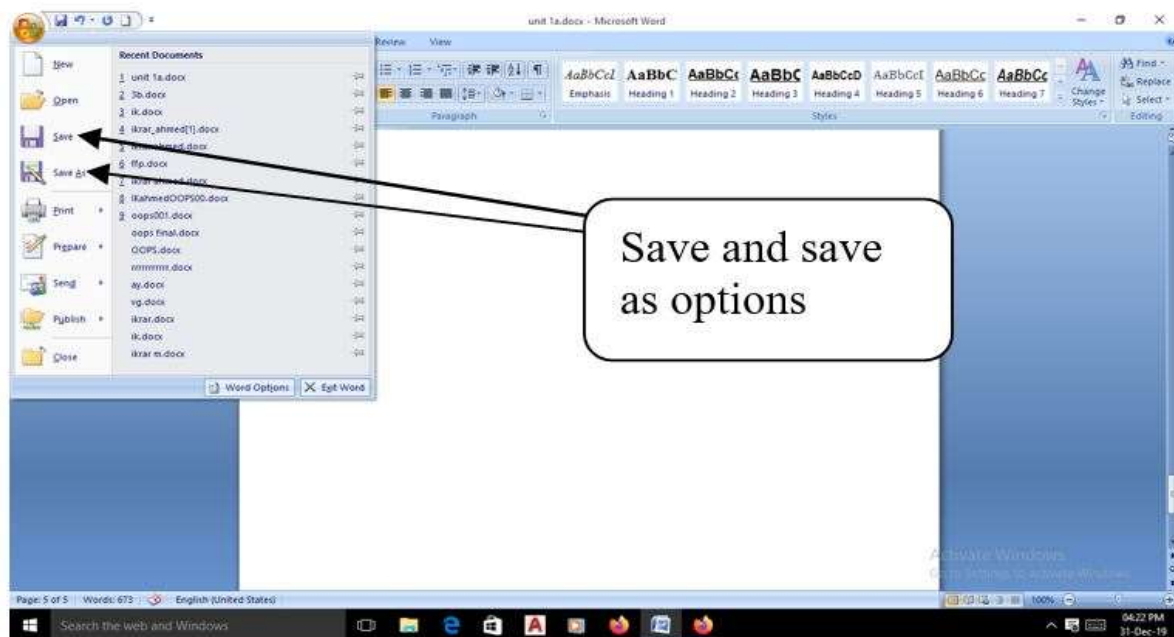

Closing the MS Word-

If you want to close the MS-Word window you just have to click on the 'X' icon present on the right top corner of the window. As you click on the 'X' icon, a small dialog box appears which asks you for saving the document. If you want to save the document just click on the 'Yes' option that will close the window after saving your document or else click on the 'No' option that will close the window without saving your document.

## Opening an existing document-

We can open our previously saved documents by just clicking on the office button present at the top left part of the MS-Word window. As we click on that 'open' option from the menu a document window appears which contains all the previously saved documents. All we have
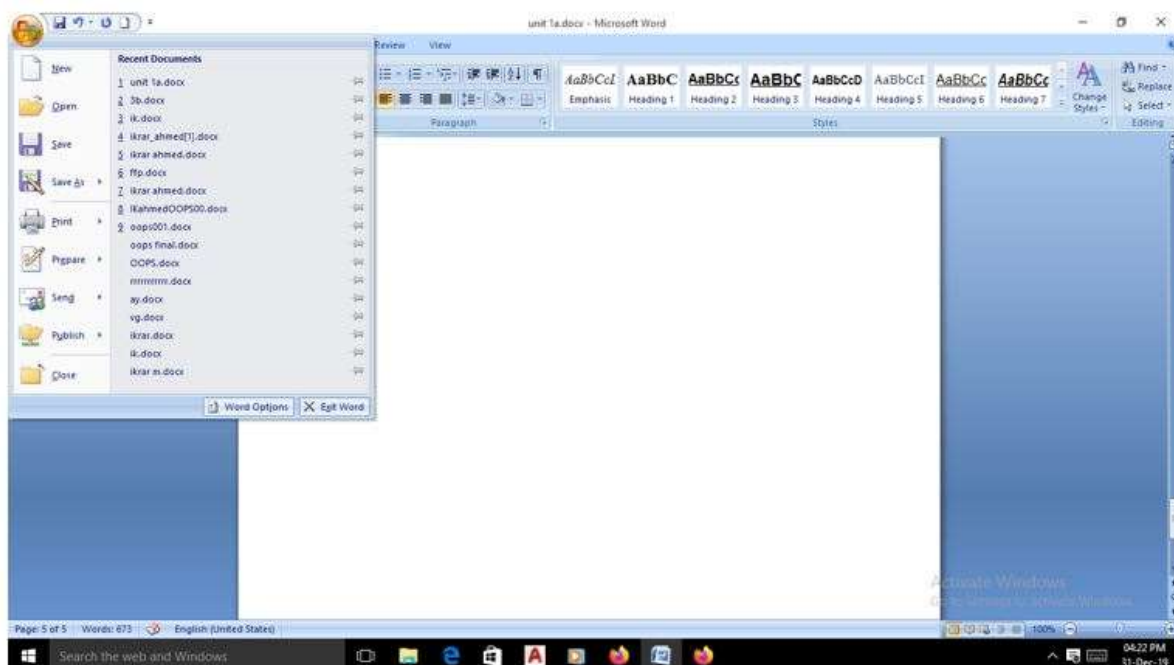
to do is select the desired document from the list and click on the 'Open'.

Copy and Cut (Move)-

Copy and the cut commands are used for transferring data from one place to another within the page or between the different pages of multiple documents. The copy command transfers the replica of the original data while the cut command transfers the original data to another place. We can perform both the operations by selecting the 'Copy' or 'Cut' options from the dialog box appears on right clicking the mouse after selecting the desired data.
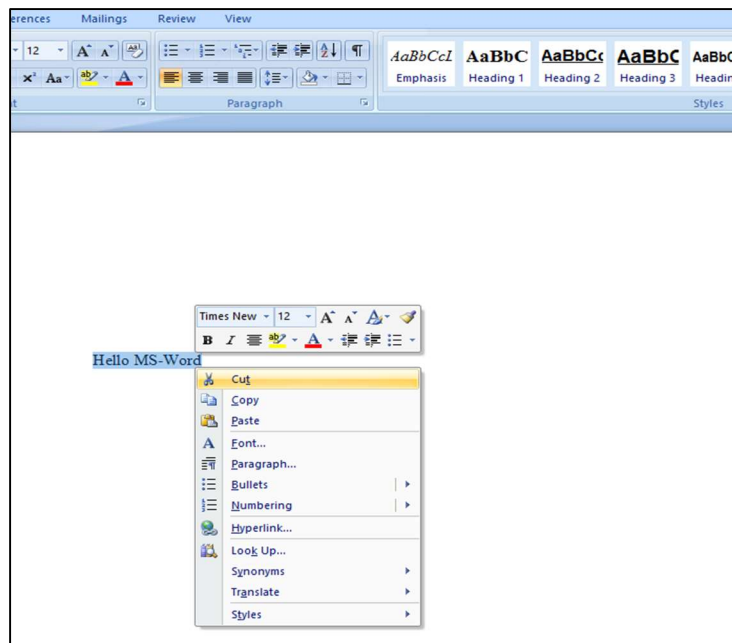
After clicking on any one of the two options, just position the mouse on the area where you want the data and select the 'paste' command by right clicking on the mouse.

6.5	***WORKING WITH SYMBOLS, GRAPHICS, AND EQUATIONS***

We have several disciplines, areas, and fields where documentation work is highly preferred. They require number of equations, pie-charts, graphs, and other quantitative properties for their documents. As a result in order to create quality documents formatting of documents is highly preferable. The common features used in MS-Word are as follows-

[1] To insert a picture

- Click where you want to insert the picture. Then click the Picture button on the Insert tab in the Illustrations group,.

- Navigate to the folder where the picture is stored, and then double-click the picture to insert it.

[2] To adjust the size of an object

Click the object. Then point to one of the handles surrounding the object and when the pointer becomes a two-headed arrow drag until the picture is the size you want.

[3] To insert clip art

- Click where you want to insert the clip art. Then on the Insert tab, in the Illustrations group, click the Clip Art button

- In the Clip Art task pane, in the Search for box, type a word describing what you are looking for, and then click Go.

- In the task pane, click a clip art image to insert it in the document, and then close the task pane.

[4] To move an object

Click the object to select it. Then point to the object, and when the pointer changes to a four-headed arrow. Finally, drag the object to the new position.

[5] To quickly copy an object

Click the object, hold down the H key, and then drag a copy of the object to its new location, releasing first the mouse button and then the F key.

[6] To insert a WordArt object

- Click where you want to insert the WordArt. Then on the Insert tab, in the Text group, click the WordArt button.

- In the WordArt gallery, click the style you want.

- In the Edit WordArt Text dialog box, type your text

- Set the size and other attributes of the text, and then click OK.

[7] To apply a drop cap

Click in the paragraph. Then on the Insert tab, in the Text group, click the Drop Cap button, and click the style you want.

[8] To draw a shape

- On the Insert tab, in the Illustrations group, click the Shapes button, and then click the shape you want.

- Point where you want the shape to appear, and then drag to draw the shape.

[9] To group drawing objects

- Hold down the H key, and click each object you want to group.

- On the Format contextual tab, in the Arrange group, click the Group button, and then click Group.

[10] To change the text wrapping of a picture

Select the picture. Then click the Test Wrapping button on the Format contextual tab in the Arrange group. Select the wrapping style and attributes as desired.

[11] To change the position of a picture

Select the picture. Then point to the picture, and when the pointer changes to a four-headed arrow. Finally, drag the picture to its new location. Or

Select the picture. Then on the Format contextual tab click the Picture button present in the Arrange group, and click More Layout Options

In the Advanced Layout dialog box, on the Picture Position tab, set the position options you want, and then click OK.

[12] To insert a symbol

- Click where you want to insert the symbol. Then on the Insert tab, in the Symbols group, click the Symbol button, and click More Symbols.

- In the Symbols dialog box on the Symbols tab select the font you want.

- Scroll through the list of symbols until you find the symbol you want, double-click it, and then click Close.

[13] To insert an equation

- Click where you want to insert the equation. Then on the Insert tab, in the Symbols group, click the Equation button.

- Type your equation in the equation box that appears in the document.

6.6   WORKING WITH DIAGRAMS AND CHARTS

[1] To insert a diagram

- Click where you want to insert the diagram. Then on the Insert tab, in the Illustrations group, click the SmartArt button.

- In the Choose a SmartArt Graphic dialog box, click the diagram layout you want and then click OK.

[2] To add text to a diagram

Click the placeholder text in the Type your text here pane or in the diagram shape, and then type your text.

[3] To resize a diagram

Drag the sizings handle around the diagram frame, and then drag the handle to increase or decrease the size of the diagram.

[4] To add a shape to a diagram

Click the diagram shape above or below where you want the new shape to appear. Then on the Design contextual tab, in the Create Graphic group, click the Add Shape arrow, and in the list, click Add Shape After, Add Shape Before, Add Shape Above, or Add Shape Below.

[5] To change the diagram layout

Click a blank area in the diagram's frame. Then click the 'More' button on the Design contextual tab in the Layouts group. In the gallery, click the layout you want.

[6] To move a diagram

Point to the diagram's frame (not one of the handles), and when the pointer changes to a four-headed arrow, drag the diagram to its new location.

[7] To change the style of a diagram

Click a blank area inside the diagram's frame. Then on the Design tab, in the SmartArt Styles group, click the 'More' button. In the gallery, click the style you want.

[8] To insert a chart

• On the Insert tab, in the Illustrations group, click Chart.

• In the Insert Chart dialog box, click the category of chart you want. Click the style you want and then click OK.

[9] To enter data in a new chart

In the Excel worksheet, replace the sample data by clicking a cell, and then type your data.

[10] To fit a column to its longest entry

Point the border between two column headings. Double click when the pointer changes to a double-headed arrow.

[11] To edit the data in a selected chart

• Click the Edit Data button on the Design tab in the Data group,.

• In the Excel worksheet, click the cell you want to edit, type the new data, and then press F.

[12] To change the type of a selected chart

- On the Design tab, in the Type group, click the Change Chart Type button.

- In the Change Chart Type dialog box, click the chart type you want, and then click OK.

[13] To change the style of a selected chart

On the Design tab, in the Chart Styles group click the more button. In the Chart Styles gallery, click the style you want.

[14] To turn a chart's gridlines on and off

On the Layout contextual tab in the Axes group click the Gridlines button. Point to Primary Horizontal Gridlines or Primary Vertical Gridlines and click the option you want.

Working with professional documents

E.g. reports, thesis, proposals, etc.

[1] To delete a building block

- In the Text group, click Quick Parts, and then click the Building Blocks Organizer.

- In the Building blocks list, select the building block you want to delete. Then, click Delete.

[2] To create a table of contents based on headings

- Position the insertion point where you want to insert the table of contents. Then on the References tab, in the Table of Contents group, click the Table of Contents button.

- In the Table of Contents gallery, click the table of contents style you want.

[3] To update a table of contents

- Click in the table of contents. Then on the References tab, in the Table of Contents group, click the Update Table button.

- In the Update Table of Contents dialog box, click Update page numbers only or Update entire table, and then click OK.

[4] To insert an index entry

- Select the word you want to mark. Then, click the Mark Entry button on the References tab in the Index group.

- Click Mark in the Mark Index Entry dialog box.

[5] To create an index

- Click where you want to insert the index. Then, click the Show/Hide button on the Home tab in the Paragraph group to turn off the display of non-printing characters.

- Click Insert Index on the References tab in the Index group. In the Index dialog box, click the Formats arrow, click an index format, select any other options you want, and then click OK.

[6] To insert a bookmark

- Select the text or item that you want to bookmark. Then on the Insert tab, in the Links group, click Bookmark.

- Type the bookmark name (with no spaces) or select one from the list of bookmarks on the Bookmark dialog box in the Bookmark name box and then click Add.

[7] To insert a cross-reference

- Click where you want to insert the cross-reference. Then type the introductory text for the cross-reference. For example, for more information, see.

- On the Insert tab, in the Links group, click the Cross-reference button.

- In the Cross-reference dialog box, click the Reference type arrow and then click the type of reference you want.

- Click the Insert reference to the arrow and then click the type of item you are referencing, if necessary.

- In the Reference type drop-down list, click the item you are referencing to. Finally, click Insert, and then click Close.

Finding a Particular Pattern-

A pattern is a simple, repeating overlay of a one-color design over a background of another color. We can apply the pattern on different objects and various sections and part of the documents with the help of given steps:

Step 1. Right-click the shape and choose Format Shape. The Format Shape dialog box opens.

Step 2. Click the Fill tab.

Step 3. Click the Pattern Fill option button. The controls change to show pattern options.

Step 4. Click the desired pattern.

Step 5. Open the Foreground Color menu and select the foreground color. As with other color selectors, you can select a theme color, a tint or shade, or a standard color.

Step 6. Open the Background Color menu and select the background color.

Step 7. Click Close to close the dialog box.

Inserting objects into a document-

Depending on the version of Word or Outlook you're using you can insert a variety of objects (such as PDF files, Excel charts or worksheets, or PowerPoint presentations) into a Word document or an email message by linking or embedding them.

[1] To insert an object

- Click Object on the Insert tab.

- Insert a new object

[2] To create a new file that is inserted into your Word document or email message

In the Object dialog box, click the Create New tab, and then select an option from the Object
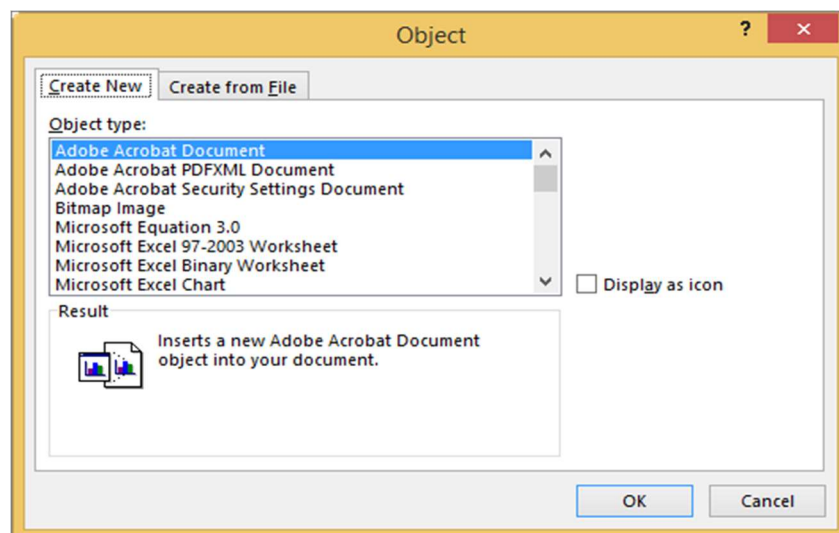
type list.

The default program for that file type opens, where you can enter any text or data you want. When you close the program, any added content or changes appear in your Word document or email message.

Select Display icon if you want the new file to appear as a clickable icon rather than the first page of your new file. If this check box is selected, you can choose a different icon by clicking Change Icon.
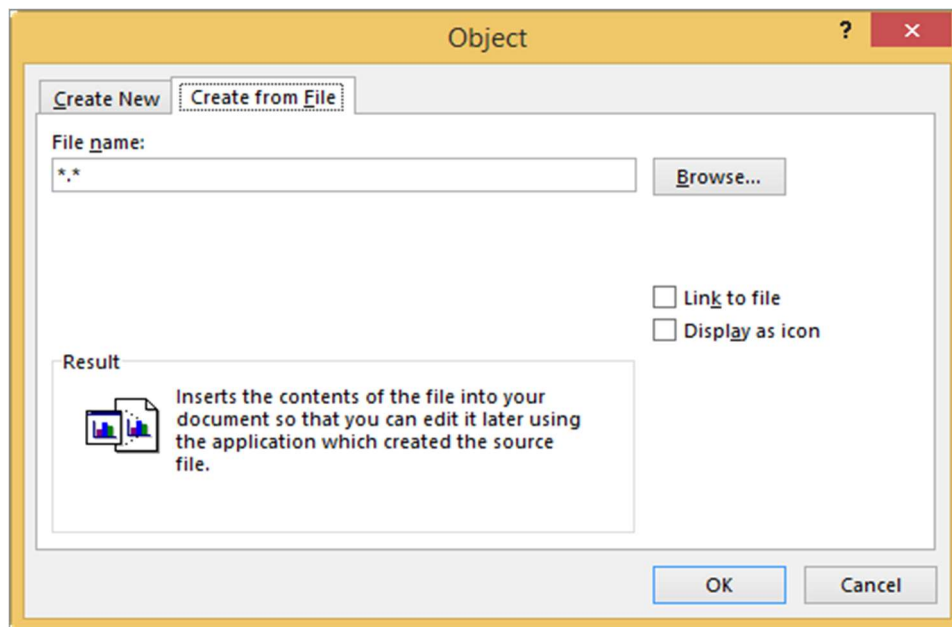
Tips:

- The information in the Result section changes based on the selected object type and whether the Display icon is selected. Use this information to help you determine what you want to insert and how you want it to appear.

- To edit the information in your inserted object, double-click the object.

[3] Link or embed an existing file

To link or embed an object that's already been created:

- In the Object dialog box, select the Create from File tab, and then click Browse to find

the file you want to insert.

- To link to the source file, rather than embedding it into your Word document or email message, select Link to file.

- Select Display as icon if you want the inserted file to appear as a clickable icon, rather than the first page of the file. If this check box is selected, you can choose a different icon by clicking Change Icon.

Tip: The information in the Result section changes based on whether link to the file and Display as icon are selected. Use this information to help you determine what you want to insert and how you want it to appear.

Embedded objects vs. linked objects

Embedded objects become part of the Word file or email message and after they are inserted. However, they are no longer connected to any source file.

Linked objects can be updated if the source file is modified. Linked data is stored in the source file. The Word files or email message (the destination file) stores only the location of the source file and it displays a representation of the linked data. Use linked objects if the file size is a consideration.

6.7   *POINTS TO REMEMBER*

- Microsoft Word is a word processing program, designed to help you create professional-quality documents.

- With the finest document formatting tools Word helps you organize and write your documents more efficiently.

- Word also includes powerful editing and revising tools so that you can collaborate with others easily.

- We have learned how to create our own documents, open existing documents, and finally save them before closing.

6.8   GLOSSARY

- **Title Bar:** It displays the document name followed by a program name.

- **Menu Bar:** It contains a list of options to manage and customize documents.

- **Standard Toolbar:** It contains shortcut buttons for the most popular commands.

- **Formatting Toolbar:** It contains buttons used for formatting.

- **Ruler:** Ruler is used to set margins, indents, and tabs.

- **Status Bar:** It displays the position of the insertion point and working mode buttons.

- **Scroll Bars:** These are used to view parts of the document.

6.9   CHECK YOUR PROGRESS

Objective type questions-

a)   ..... is the file extension for the MS-Word document.

b)   The active tab consists of ..... sub-tabs which opens the ribbon for performing various operations on the content.

c)   ..... shortcut key is used for UNDO and ..... for REDO the operations.

d)   We can save the document by one of the two ways i.e. by clicking on the SAVE AS option from the ..... button or by using ..... shortcut key for the same.

e)   We can group many objects by clicking them all while pressing holding the ..... key on the keyboard.

f)   MS-Word didn't allow us to use various patters in the objects and in the document. (True / False)

g)   A text editor is any word processing program that you can use to type and edit text. (True / False)

h)   We can change the style of the text by selecting designs from the FONT option of the HOME tab. (True / False)

i)   B option in the HOME tab is used for applying bold effect in the text. (True / False)

j)   MS-Word does not have an option for serial numbers on the pages. (True / False)

Descriptive type questions

a)   What is a word processor?

b)   How the text is made bold, italic, and underlined?

c)   How can you insert a table in your document?

d)   How can you change the case of the text?

e)   Describe various types of apply text formatting in a word document.

f)   Discuss the steps of applying paragraph formatting.

g)   Learn how to create and edit hyperlinks in word 2007.

h)   How will you insert special characters and equations in word 2007? Explain using an example.

Answer (Objective type questions)

[a] .docx [b] 7 [c] CTRL+Z, CTRL+Y [d] OFFICE, CTRL+S [e] H [f] False [g] True [h] True [i] True [j] False

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6.11   SUGGESTED READINGS

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- Illustrated Computer Concepts and Microsoft office 365 & office 2016

UNIT- 7

INTRODUCTION TO SPREADSHEET (MS EXCEL)- I

7.1   INTRODUCTION

MS-EXCEL is a very powerful and easy-to-use spreadsheet package. It is a member-application of the MS Office suite. It works very well with numbers and their complex calculations. There are numbers of spreadsheet programs but from all of them Excel is most widely used application. The best part about Excel is it can apply to many business tasks, including finance, data management, forecasting statistics, analysis, inventory, billing, and business intelligence.

7.2   OBJECTIVES

After the successful completion of this unit, you will be able to-

• Understand MS Excel interface.

• Working with MS- Excel.

7.3   STARTING MS EXCEL

Microsoft Excel is a spreadsheet program that is used to record and analyse numerical data. Spreadsheets were originally developed for bookkeeping. However, they are also useful for

data manipulation and producing for graphs. Spreadsheet as a collection of columns and rows form a table. Alphabetical letters are usually assigned to columns and numbers are usually assigned to rows. The point where a column and a row meet is called a cell. The address of a cell is given by the letter representing the column and the number representing a row.
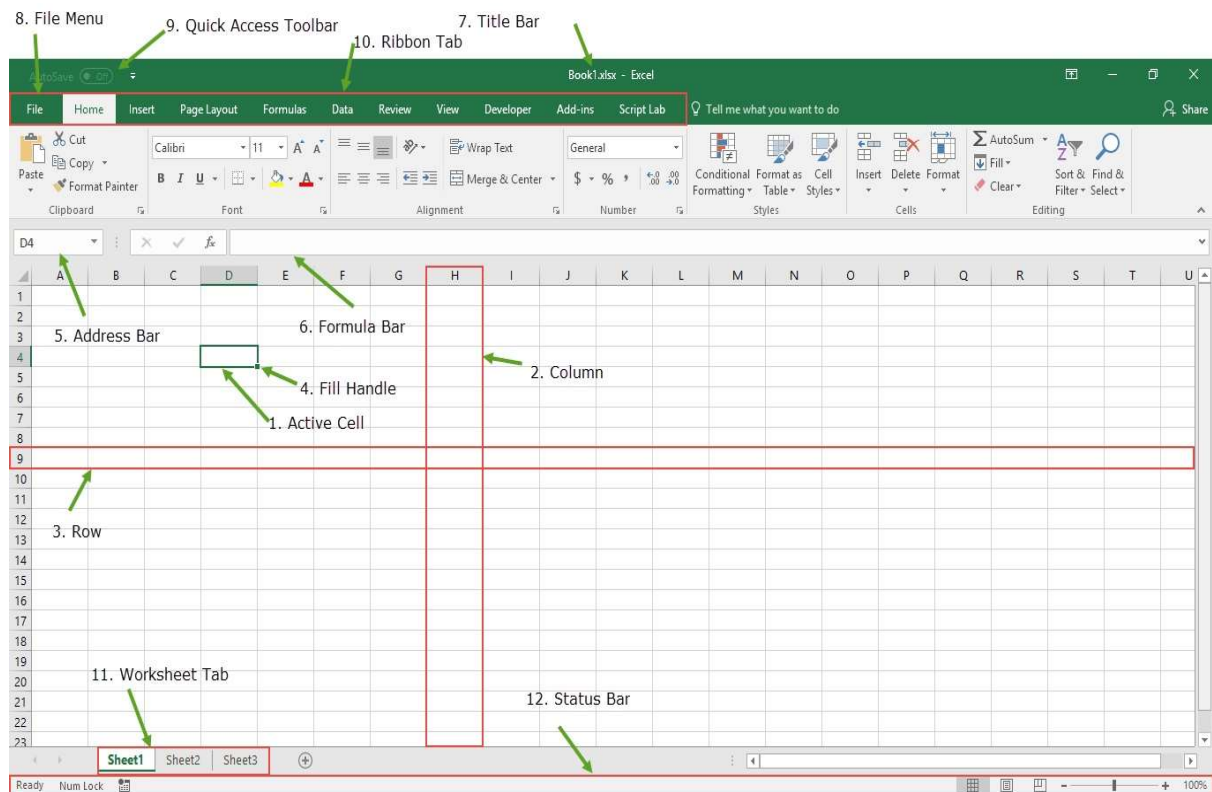
The MS Excel interface-

Starting MS Excel- To start the MS Excel, follow the steps-

Step 1- Open the Windows Start menu

Step 2- Choose All Programs then Microsoft Office followed by Microsoft Office Excel 2013

Step 3-You can create a shortcut to this software by dragging Microsoft Excel from this menu onto the Desktop using the right mouse button – select Create shortcut here, from the popup menu.

The MS Excel interface basic tools and commands-

[1] Active Cell-

A cell in the Excel spreadsheet that is currently selected by clicking on it, and highlighted by a rectangular box.

[2] Column-

A column is a vertical set of cells in a spreadsheet. Every column has its own alphabet for identity. You can select a column clicking on its header.

[3] Row-

A row is a horizontal set of cells. Every row has its own number for identity. You can select a row clicking on the row number marked on the left side of the window.

[4] Fill Handle-

It is a small dot present on the lower right corner of the active cell. It is used to fill numeric values, text series, insert ranges, insert serial numbers, etc.

[5] Address Bar-

The address bar is the small input bar at the left side of the window. It shows the address of the active cell. We can select more than one cell and then it will show the address of the first cell in the range.

[6] Formula Bar-

The Formula bar is an input bar, below the ribbon. It is used to enter a formula in a cell.

[7] Title Bar-

It lies in the middle and at the top or the window. The title bar shows the program and sheet titles.

[8] File Menu-

The file menu is a simple menu just like other applications. It contains options like (Save, Save As, Open, New, Print, Excel Options, Share, etc).

[9] Quick Access Toolbar-

You will find it just above the file menu and its purpose is to provide a convenient resting place for the Excel's most frequently used commands. You can customize this toolbar based on your comfort.

[10] Ribbon Tab-

Starting from the Microsoft Excel 2007 all the options menus are replaced with the ribbons. The ribbon contains commands organized into three components: Tabs, Groups, and Commands.

[11] Worksheet Tab-

This tab shows all the worksheets present in the workbook. By default you will see three worksheets in your new workbook with the name of Sheet1, Sheet2, and Sheet3 respectively.

[12] Status Bar-

This displays sheet information as well as the insertion point location from left to right this bar can contain the total number of pages and words in the document, language, etc.

7.4   *MS EXCEL BASIC FUNCTIONALITIES*

Exiting MS EXCEL-

When you are ready to quit Excel, you have different choices for exit the program:

- Select File -> Exit.

- Press Alt+F4.

- Click the Close button in the upper right corner of the Excel 2013 Program window.

Working with Workbook-

Excel files are called workbooks. In Microsoft Excel, a workbook is a collection of one or more spreadsheets, also called worksheet in a single file. A workbook is another word for Excel file. To create an Excel workbook from scratch click the blank workbook while starting the Excel.

Creating a new Workbook-

Whenever you start a new project in Excel you need to create a new workbook, by following the given steps-

Step 1 On the file tab, Backstage view will appear
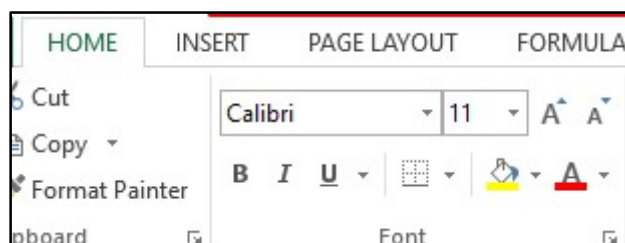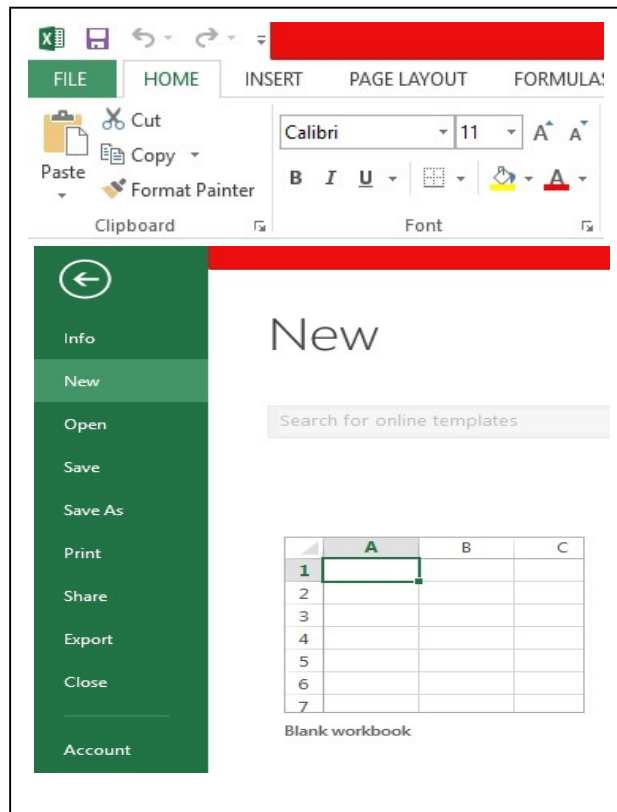
Step 2 Select New and Click the blank workbook

Step 3 A new blank workbook will appear.

Working with cells-

The interaction of rows and columns is called cell. A cell is identified with a combination of the column header and row number.

Setting Font-

You can assign any of the fonts already installed for your printer to cells in a worksheet. You
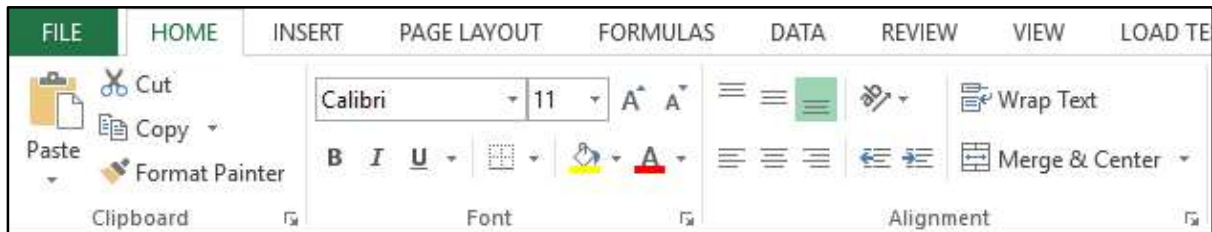
can set the font of the selected text from Home>>Font group>> select the font.

Setting font from format cell dialogue-

Step 1 Right click on cell >> Format cells >> Font Tab

Step 2 Press Ctrl + 1 or Shift + Ctrl + F

Text Formatting-

Various options available in "Home Tab" are as follows:

- Bold: It makes text highlighted by choosing Home>> Font Group>> Click B or Press Ctrl + B

- Italic: It makes text italic by choosing Home>> Font group>> Click I or Press Ctrl + I

- Underline: It makes text underlined by choosing Home>> Font group>> Click U or Press Ctrl + U

- Double Underline: It makes text double underlined by choosing Home>> Font group>> Click the arrow near U >> Select double underline

- Strike-through: It strikes the text in the centre vertically.

- Super Script: It makes content appear above the type line.

- Sub Script: It makes content appear below the type line.

Change Alignment-

You can change the horizontal and vertical alignment of the cell. By default, Excel aligns numbers to the right and text to the left. Click on the available option in the Alignment group in Home Tab to change alignment. Right click on the cell and select the format cell. In format cells dialogue select Alignment Tab. Select the available options from the vertical alignment and horizontal alignment options.

Horizontal Alignment: You can set horizontal alignment to Left, Center, Right, etc.

Left: Aligns the cell contents to the left side of the cell.

Center: Centers the cell contents in the cell.

Right: Aligns the cell contents to the right side of the cell.

Justify: Justify the text to the left and right of the cell.

Vertical Alignment: You can set vertical alignment to Top, Middle, Bottom, etc.

Top: Aligns the cell contents to the top of the cell.

Center: Centers the cell contents vertically in the cell.

Bottom: Aligns the cell contents to the bottom of the cell.

Merging of Cells-

MS Excel enables you to merge two or more cells. When you merge cells you don't combine the contents of cells. You combine a group of cells into a single cell that occupies the same space. Select Merge and Center control on the Ribbon is simpler. To merge cells, select the cells that you want to merge and then click the Merge and Center button. Select the alignment tab of the format cells dialogue box to merge cells. The Home>> Alignment Group>> Merge and Center control contains a drop-down list with these additional options:

Merge Across: When a multi-row range is selected this command creates multiple merged cells- one for each row.

Merge Cells: Merges the selected cells without applying the center attribute

Unmerge Cells: Unmerges the selected cells.

Wrap Text and Shrink to Fit-

If you have text too wide to fit the column width but don't want that text to spill over into adjacent cells you can use either the wrap Text option or the Shrink to fit the option to accommodate that text.

7.5   INSERTING, DELETING ROWS, AND COLUMNS

Inserting Rows and Columns

To insert a row or column into a Microsoft Excel worksheet:

Step 1 Select a cell in your worksheet where you would like the new row or column to be inserted. To select multiple rows or columns simply select multiple cells. [1] New rows are inserted above the selected cell. [2] New columns are inserted above the selected cell.
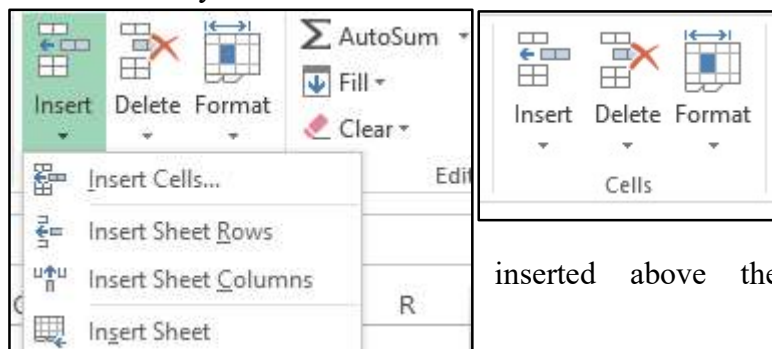
**Step 2** On the Home tab in the Cells group, click the Insert command.

Step 3 Select Insert Sheet Rows or Insert Sheet Columns:

Deleting Rows and Columns

To delete a row or column into a Microsoft Excel worksheet:

Step 1 Select a cell in your worksheet in the new row or column you wish to delete. To delete multiple rows or columns, simply select multiple cells.

Step 2 On the Home tab in the Cells group click the Delete command.
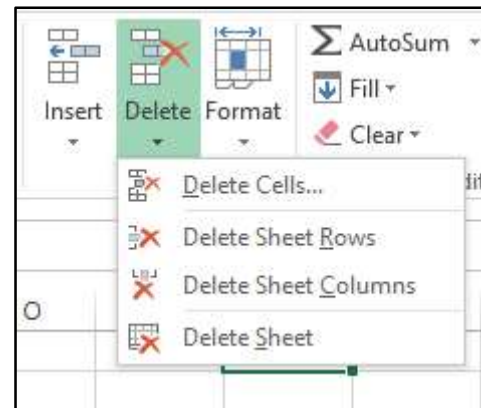
Step 3 Select Delete Sheet Rows or Delete Sheet Columns.

# *7.6   SAVING AND CLOSING WORKBOOK*

Saving a Workbook-

It's important to save your workbook whenever you start a new project or make changes to an existing one. Execute the following steps:

Step 1 Locate and select the save command on the Quick Access toolbar.

Step 2 If you are saving a file for the first time, the Save As pane will appear in the backstage view.

Step 3 You then need to select where to save the file and give it a file name. To save the workbook to your computer, select the computer, then click OneDrive to save the file to your OneDrive.
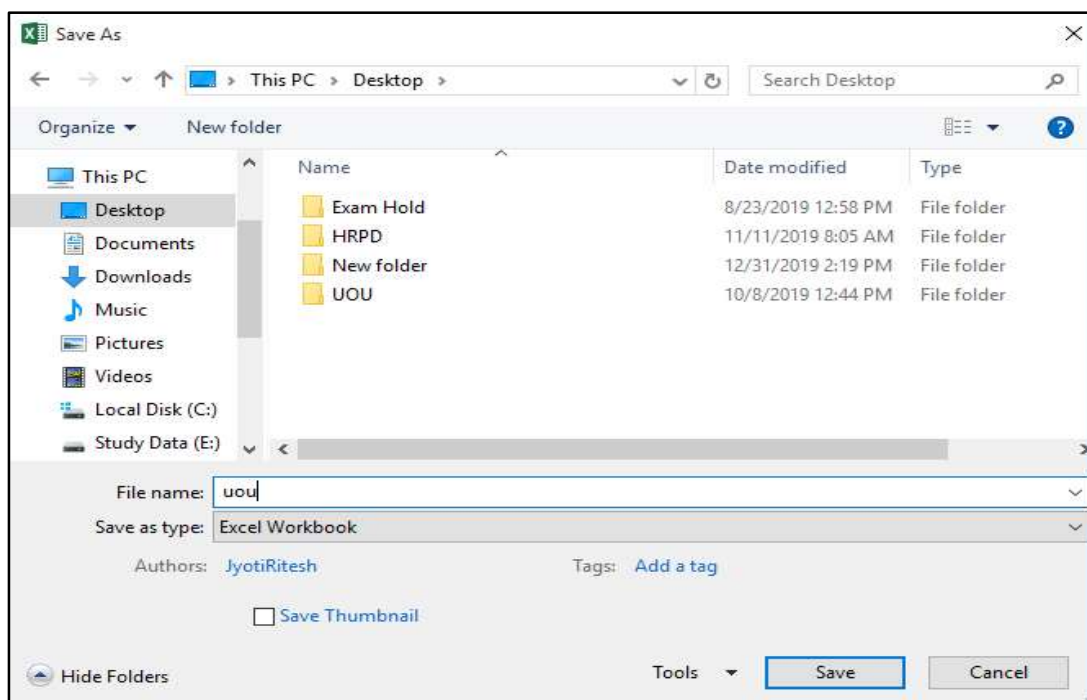
Step 4 The Save As dialog box will appear. Select the location where you want to save the workbook.

Step 5 Enter a file name for the workbook, then click Save.

Step 6 The workbook will be saved. You can click save command again to save your changes as you modify the workbook.

You can also access the save command by pressing Ctrl + S on your keyboard.

Closing a Workbook-

To close a workbook, follow the steps given below-

Step 1 Click on the File tab in the main menu.

Step 2 Click on close.

If the file gets saved then, it will get closed. Otherwise you will get a message "want to save changes in xxxx.xls".
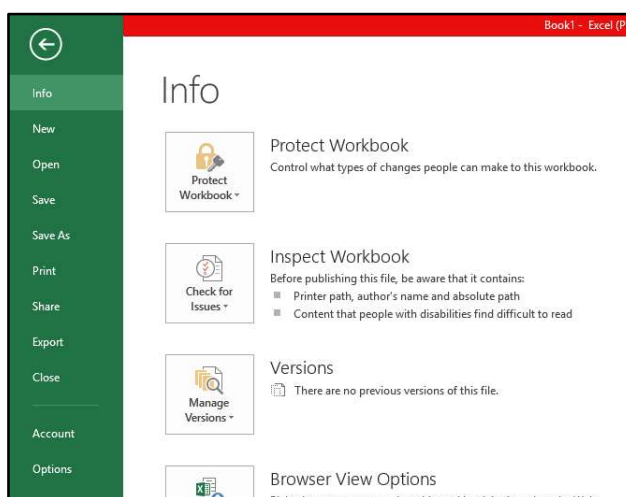
If you want to save changes just click on save.

7.7   POINTS TO REMEMBER

- MS Excel is a very powerful and easy to use spreadsheet packages, perhaps the most commonly used these days. It is a member application included in the MS Office suite.

It works very well with numbers and their complex calculations.

- Spreadsheets were originally developed for bookkeeping. However, they are also useful for data manipulation and producing for graphs. Spreadsheet as a collection of columns and rows form a table. Excel can sort and select data for a large amount of data or more complex tasks.

7.8   GLOSSARY

- Cell: A cell is a box at the intersection of a row and column in a worksheet where data is stored.

- Column: Columns are a combination of all the vertical cells joined together in a single vertical line.

- Row: Rows are a combination of all the horizontal cells joined together in a single horizontal line.

- Workbook: It is a group of worksheets, which can be stored as a unit. A workbook is stored on the disk in the form of a file with extension .xls.

- Worksheet: It is the working area of MS-EXCEL. Each worksheet of a single workbook has its own identity and is separate from other worksheets.

- Workspace: It is the working area of MS-Excel where workbooks, worksheets, and other related objects may be opened and manipulated.

7.9   CHECK YOUR PROGRESS

Objective type questions-

a)   ..... Includes some statistical functions, but for serious research work, a specialized package should be used.

b)   MS-EXCEL is a very powerful and easy-to-use..... package.

c)   ..... are a combination of all vertical cells joined together in a single vertical line.

d)   Rows are a combination of all the horizontal cells joined together in a single.....

e)   Each..... of a single workbook has its own identity and is separate from other worksheets.

f)   A cell with a dark border around it is called.....

g)   A calculation can be performed through.....

h)   A.... is a box at the intersection of a row and a column in a worksheet where data is stored.

i)   The mail merge option is in..... menu.

j)   In excel replace option is in..... menu.

Descriptive type questions-

a)   What do you mean by the range of cells?

b)   What do you mean by cell referencing and what are different types of referencing?

c)   Explain various types of charts available in MS Excel.

d)   What is the difference between copying and moving a range?

e)   What are the different components of the charts? Explain.

f)   Explain the major functions used in MS Excel.

g)   What do you use MS Excel for? Define.

h)   Which types of files can be imported and exported from MS Excel?

Answers (Objective type questions)

[a] Microsoft Excel [b] Spreadsheet [c] Columns [d] Horizontal line [e] Worksheet [f] Active [g] Excel [h] Cell [i]   Tools [j] Edit

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7.11   SUGGESTED READINGS

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*   Holloway Kari, "Writer's Guide to Microsoft Word"

*   Illustrated Computer Concepts and Microsoft office 365 & office 2016

UNIT- 8

INTRODUCTION TO MS POWER POINT- I

8.1   INTRODUCTION

PowerPoint is similar to a word processor such as Word except the fact that it's geared toward creating presentations rather than documents. A presentation is like those Kodak Carousel slide trays that your grandpa filled up with 35mm slides of the time he took the family to the Grand Canyon in 1965. The main difference is that with Microsoft PowerPoint 2019 you don't have to worry about dumping all the slides out of the tray and figuring out how to get them back into the right order.

A word document consists of one or more pages likewise, PowerPoint presentations consist one or more slides. Each slide contains text, graphics, animations, videos, and other information. You can easily rearrange the slides in a presentation, delete slides that you don't need, add new slides, or modify the contents of existing slides.

8.2   OBJECTIVES

After the successful completion of this unit, you will be able to-

- Work with MS PowerPoint e.g. design templates, insert charts, shapes, etc.

- Create your presentation.

- Apply custom animation and slide transition.

# 8.3   STARTING MS POWERPOINT

MS PowerPoint interface-

You can start Microsoft PowerPoint in just a few simple steps as follows:

Step 1 Click on the PowerPoint icon in the Taskbar. If you do not see the icon, go to the Start button, right-click, and choose Search. Type "PowerPoint" in the search field, and when PowerPoint appears, double-click it. (Windows 7: Go to the Start button, then All Programs and choose PowerPoint.)

Step 2 PowerPoint will open, prompting you to select a theme. Click on the Blank Presentation.

The MS PowerPoint interface's quick explanation-

- **Quick Access**- This button is positioned on the top left portion. This toolbar is customizable which can be moved into two possible locations. This toolbar consists of a set of commands that it is independent on the tab of the ribbon currently displayed
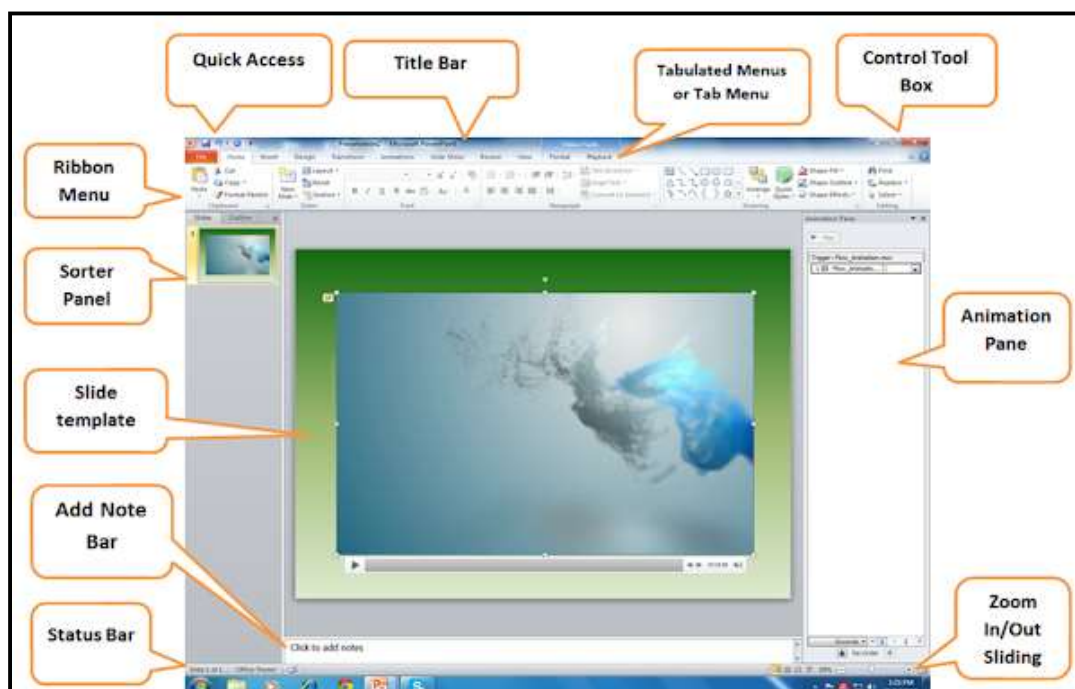
and you can add commands in this button.

- **Title Bar**- It is positioned at the top of the user interface where the file name is seen after saving a file. As default, once you open your MS-Office 2010 you will see it as

Presentation1 Microsoft PowerPoint.

- **Control Tool Box**- Located right top of the user interface where you can close, restore and maximize, and minimize the windows program.

- **Tab Menu or a tab of the ribbon**- Positioned below the title bar the Tab menu relates to the type of activity such as to relate a ribbon menu name. For example once you click the home it will open as home ribbon menu. The tab menus are FILE, HOME, INSERT, DESIGN, TRANSITIONS, ANIMATIONS, SLIDE SHOW, REVIEW, and VIEW.

- **Ribbon Menu**- Located under of the tab menu if you need to see it or control it, hold CTRL key and press F1. This menu contains all the commands and other menu items that help you find the command easily to finish your work.

- **Slide Sorter**- Positioned to the left side of your user interface. All the slides will arrange in vertical order from the top as first slides down to your last slides. You can drag to rearrange the slides, delete, and use other tools once you right click your mouse.

- **Slide Template**- This part is located at the center of your user interface, this is where you start and put your design in Presentation, animation, effects, and more.

- **Animation Pane**- It is a part and command of ANIMATION PANE. Once you click this button it will open in the right-side portion of your user interface. This pane or panel will display the animation functions you use in your slide template. Also, you can rearrange the animation and effects as desired.

- **Zoom In and Out Sliding Bar**- This part is located on the right side down and above of the taskbar. This is used to enlarge and decrease the view of your slide template at the center.

- **Add Note or Notes Pane**- This pane or panel is positioned at the bottom of your user interface. This is where you can type notes that accompany your slide. You can print these notes as notes pages or display it when you save a presentation as a web page.

- **Status Bar**- This part is located below the user interface and left side of the zoom in/out sliding bar and view buttons of the slide show. This is only to notify what slide number you use in your application.

Exiting MS PowerPoint-

After you have created a new presentation file and spent some time working on it, you will want to save it every so often so that when your system crashes, you can recover your work. And if you are like most folks you'll also want to save and close your presentation each time you wrap up a work session.

Saving and closing a PowerPoint presentation are both straightforward tasks. If you are familiar with any other Windows programs, then you will recognize most of the steps. To save a newly created presentation:

Step 1 Select Office button> Save. The Save As dialog box appears.

Most of the time, when you're ready to save your presentation, you'll choose the .pptx file type or .ppt (the old, pre-2007 PowerPoint format). But you have got about a dozen choices, including the template (.potx) and show (.ppsx) formats.

You can press Ctrl+S or click the Save button (the little diskette icon) that appears in the Quick Access toolbar.

Step 2 Click the Save in the drop-down box to choose a directory to store your file in. In the File name field, type a new name for your file.

Step 3 Click the Save as Type drop-down box to select a file format. Most of the time, you will choose the .pptx format and click Save. The Save As dialog box disappears and PowerPoint saves the file in the format you specified.

Step 4 To close a presentation, simply select Office Close. When you do, PowerPoint closes your presentation with no fanfare. If you have never saved this particular file, however, a dialog box pops up asking you if you want to save the changes you made. Click 'Yes' to display the Save As dialog box and proceed as described above.

8.4   DIFFERENT TYPES OF VIEWS

PowerPoint supports multiple views to allow users to gain the maximum from the features available in the program. Each view supports a different set of functions and is designed accordingly. PowerPoint views can be accessed from two locations.
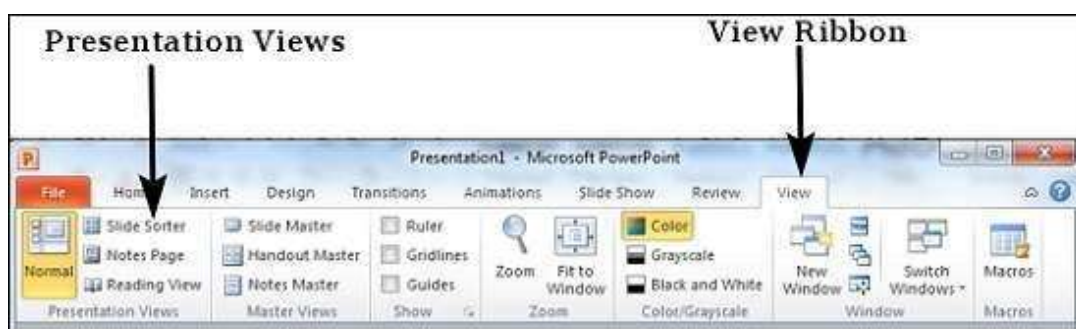
[1] Views can be accessed quickly from the bottom bar just to the left of the zoom settings.

[2] Views can also be accessed from the Presentation Views section in the View ribbon

Here is a short description of the various views and their features.

a)   **Normal View**- This is the default view in PowerPoint and is primarily used to create and edit slides. You can create/ delete/ edit/ rearrange slides, add/ remove/ modify

content and manipulate sections from this view.

b) **Slide Sorter View**- This view is primarily used to sort slides and rearrange them. This view is ideal to add or remove sections as it presents the slides in a more compact

Slide Sorter View icon
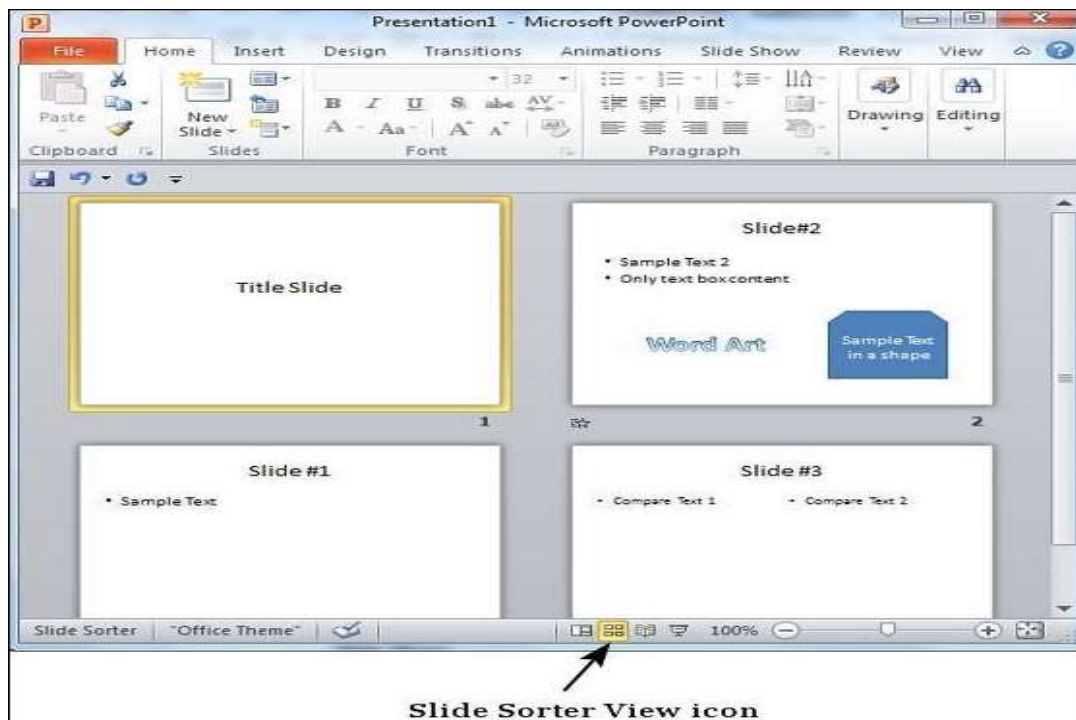
manner making it easier to rearrange them.

c) **Reading View-** This view is new to PowerPoint 2010 and it was created mainly to review the slideshow without losing access to the rest of the Windows applications. Typically, when you run the slideshow, the presentation takes up the entire screen so other applications cannot be accessed from the taskbar. In the reading view, the taskbar is still available while viewing the slideshow which is convenient. You cannot make any modifications on this view.

Slides Show- This is the traditional slideshow view available in all the earlier versions of PowerPoint. This view is used to run the slideshow during the presentation.

8.5   CREATING PRESENTATION

In Microsoft PowerPoint, a presentation is made up of multiple slides. There are several ways to create or add a slide in a PowerPoint presentation. After adding slides, you can move the slides around and also delete slides.

[1] Working with Slides

Insert new slide-

To insert a new slide into a presentation, follow the steps below.

• In the slide preview pane on the left, left-click with your mouse in-between two slides

where you want to insert a slide.

- In the PowerPoint ribbon, on the Home or Insert tab, click the New Slide option.

- In the drop-down menu that opens, select the type of slide to insert. The new slide will be inserted into the presentation where you clicked in step 1 above.

Copy and paste an existing slide-

To add a copy of an existing slide to a presentation, follow the steps below.

- In the slide preview pane on the left, find the existing slide you want to copy.

- Using your mouse, right-click on that slide and select Copy in the pop-up menu.

- Determine where you want to add the copied slide. Right-click on the slide above where you want to paste the copied slide.

- In the pop-up menu that appears in the Paste Options section, click the middle paste option icon to paste the slide. The middle paste option will paste the slide using the same formatting as the slide you copied.

Insert slide from another presentation-

To add a slide from another presentation, follow the steps below:

- In the slide preview pane on the left, left-click with your mouse in-between two slides where you want to insert a slide.

- In the PowerPoint ribbon, on the Home or Insert tab, click the New Slide option.

- In the drop-down menu that opens, click the Reuse Slides option at the bottom.

- In the Reuse Slides pane that opens on the right, click the Browse button and select Browse File.

- Find the PowerPoint presentation file that contains the slide you want to add to the currently open presentation and click the Open button.

- A preview of the slides is displayed below the Browse option. Left-click on the slide you want to insert into the currently open presentation. A new slide will be inserted with text from the selected slide included in the new slide.

- To also apply the formatting of the selected slide to the newly inserted slide, right-click on the selected slide and select Apply Theme to Selected Slides.

Move a slide-

To move a slide to another location in a PowerPoint presentation, follow the steps below:

- Open the PowerPoint presentation.

- In the left preview pane, find the slide you want to move.

- Press and hold the left mouse button on the slide, then drag the slide up or down to where you want to move it.

- Release the left mouse button when you have dragged the slide to its new location.

Delete a slide-

To delete a slide in a PowerPoint presentation, follow the steps below.

- Open the PowerPoint presentation.

- In the left preview pane, click on the slide you want to delete.

- Press the delete key to delete the slide.

[2] Working with new presentation-

- Create presentations from scratch or a template.

- Add text, images, art, and videos.

- Select a professional design with a PowerPoint Designer.

- Add transitions, animations, and motion.

- Save to OneDrive to get to your presentations from your computer, tablet, or phone.

- Share and work with others, wherever they are.

Create a Presentation-

- Select Blank Presentation to create a presentation from scratch.

- Select one of the templates.
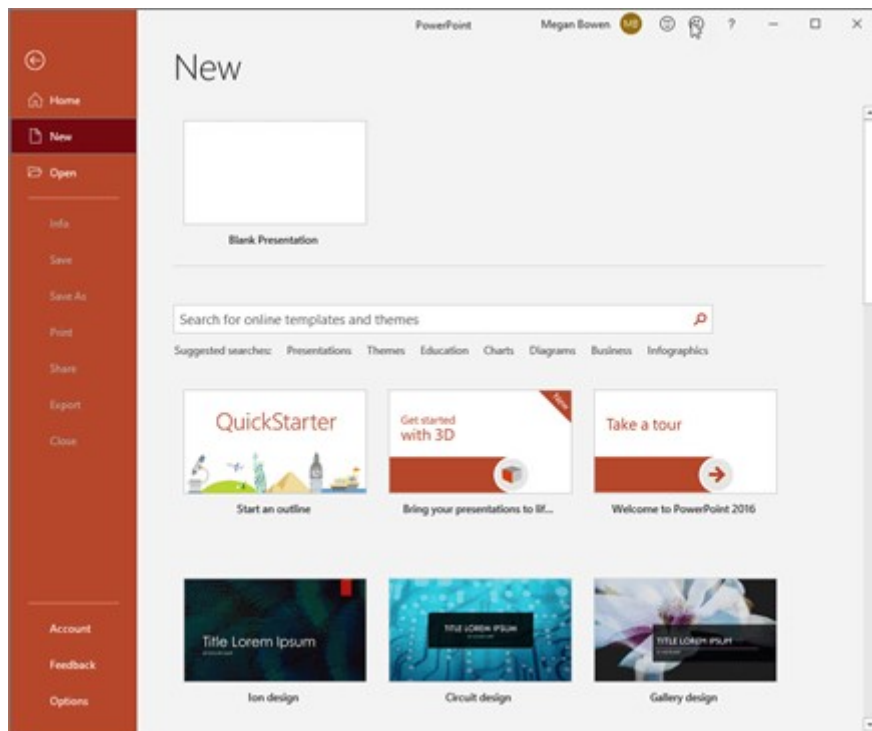
- Select Take a Tour, and then select Create, to see tips for using PowerPoint.

Adding slide-

- Select the slide you want your new slide to follow.

- Select Home > New Slide.

- Select Layout and then you type want from the drop-down.
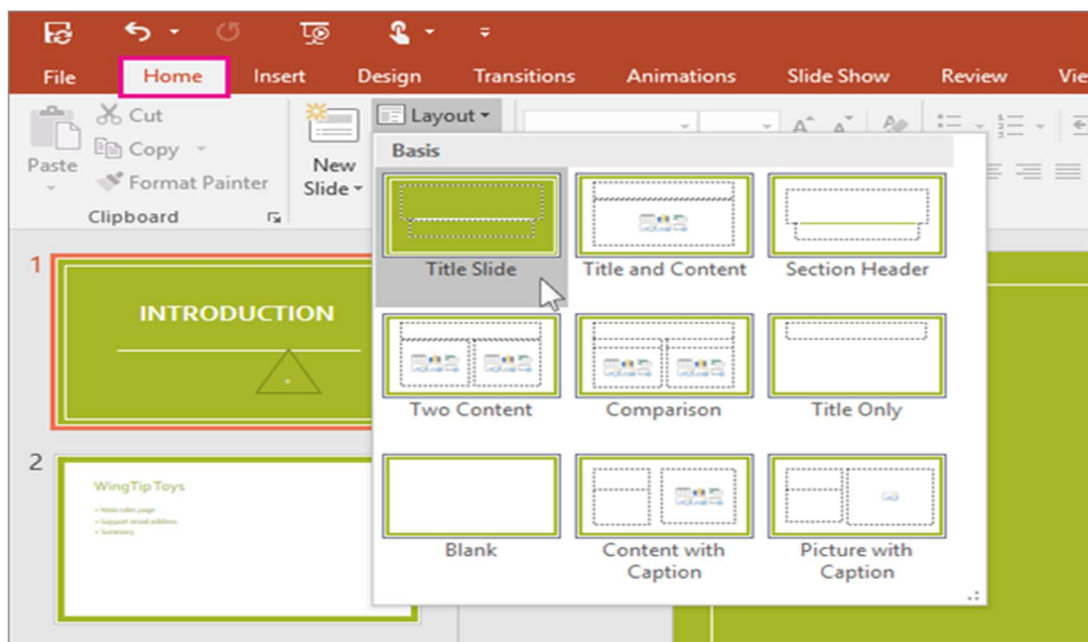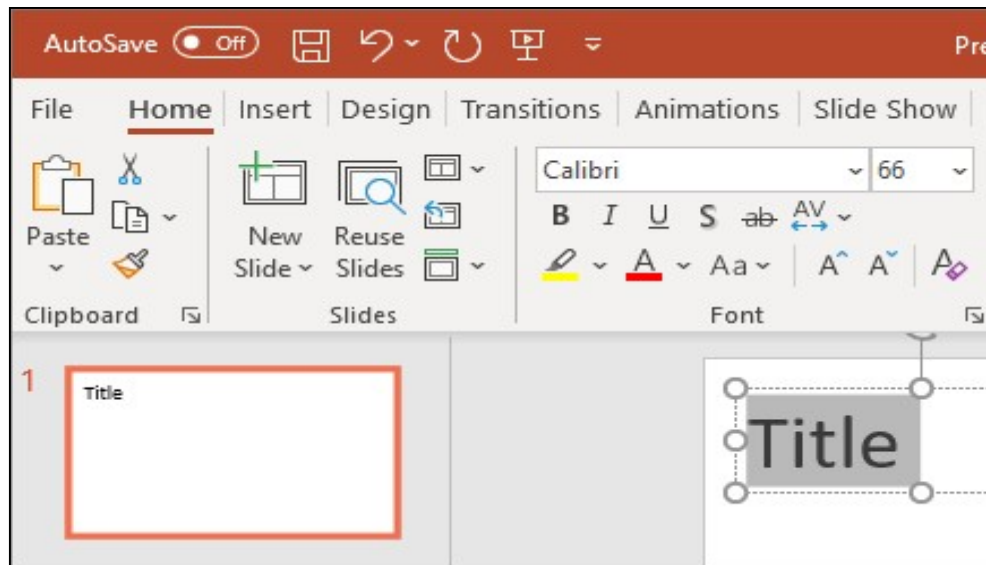
Add text and format text-

*   Place the cursor where you want, and type.

*   Select the text, and then select an option on the Home tab: Font, Font size, Bold, Italic, Underline, etc.

*   To create bulleted or numbered lists, select the text, and then select Bullets or

Numbering.

Adding a picture, shape, or chart-

*   Select Insert tab, then to add a picture- Select Picture or Browse for the picture you want and select Insert.

*   To add a shape, art, or chart- Select Shapes, Icons, SmartArt, or Chart

8.6   DESIGN TEMPLATES

PowerPoint offers design templates to make it easy to create an attractive presentation. These templates come in a variety of colors and styles. You can apply a design to existing slides or begin a new presentation with a template. To begin a new presentation with a design template:

*   In the task pane under New, click Design Template.

*   A list of templates appears.

*   Move your mouse pointer through the different designs or use the scroll bar.

*   Click the down-pointing arrow in the gray box next to the template you like.

*   Choose Apply to All Slides.

Adding a design to an existing presentation-

Do you have an existing presentation you want to add a design to? PowerPoint makes it easy to enhance existing slides with a design template. To apply a design to an existing presentation:

- In the task pane, under Open a presentation, click the presentation you want.

- Click the down-pointing arrow in the New Presentation pane and choose Slide Design - Design Templates.

- A list of templates appears.

- Move your mouse pointer through the different designs or use the scroll bar.

- Click the down-pointing arrow in the gray box next to the template you like.

- Choose Apply to All Slides.

Applying a design template to selected slides-

As you are working on your presentation, you can choose to apply a particular design template to selected Slides if you want one or more slides to have a different look.
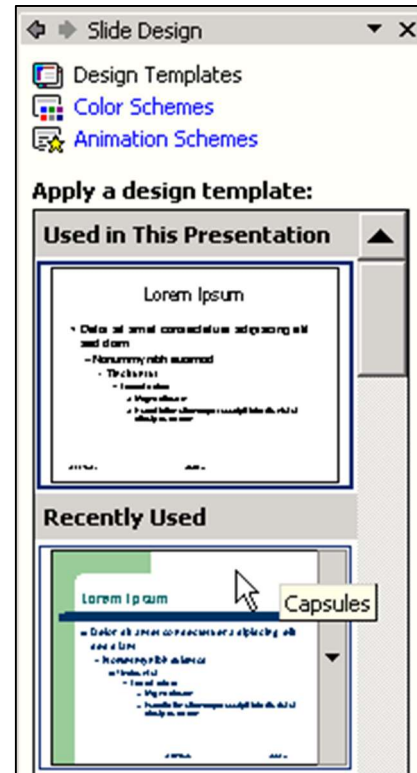
8.7   *APPLYING CUSTOM ANIMATION AND SLIDE TRANSITION*

Custom Animation-

We can apply the custom animation with the certain steps given below:

- Select the text or object.

- Select the Animation tab.
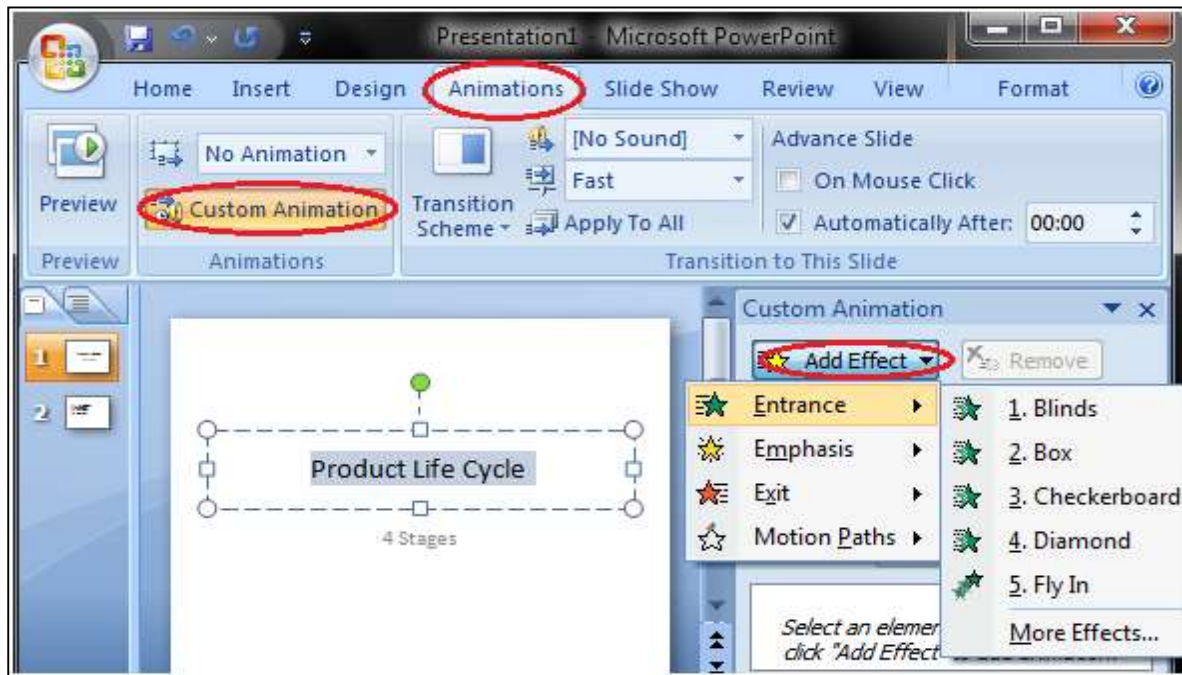
- In the Animation group, click the Custom Animation.

- Custom Animation task pane appears on the right.

- Click the Add Effect. It will display four options that are further divided into different options.

- Select the desired effect.

Slide Transition-

Transition effects appear, when one slide changes into the next slide in a slide show.

- Select the slide to which you want to apply the effect.

- Select the Animation tab.

- In Transition to This Slide group, you will see the transition effects.
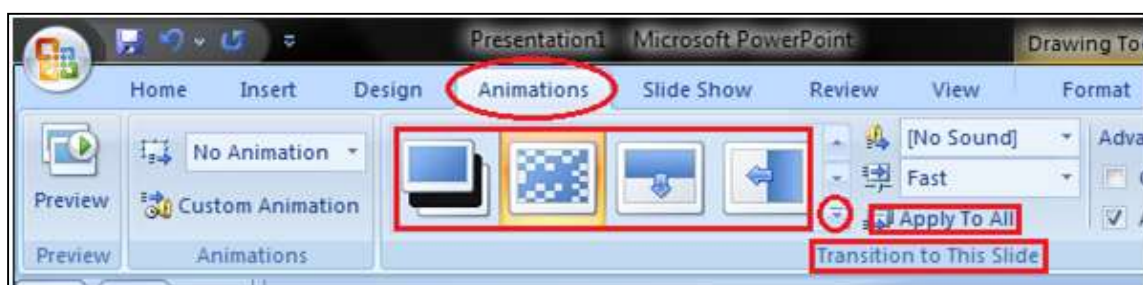
- Click the drop-down arrow to see the menu of transition effects.

- Select the desired transition effect.

- Click 'Apply to All' to apply the effect to all slides.

8.8   MISCELLANEOUS POINTS- PRESENTATION

Saving a presentation-

PowerPoint offers two ways to save a file: Save and Save As. These options work in similar ways, with a few important differences.

- Save: When you create or edit a presentation, you'll use the Save command to save your changes. You'll use this command most of the time. When you save a file, you'll only need to choose a file name and location the first time. After that, you can just click the Save command to save it with the same name and location.

- Save As: You'll use this command to create a copy of a presentation while keeping the original. When you use Save As, you'll need to choose a different name and/or location for the copied version.

Note- Using "Save As" to make a copy-

If you want to save a different version of a presentation while keeping the original, you can create a copy. For example, if you have a file named Client Presentation you could save it as Client Presentation 2 so you'll be able to edit the new file and still refer back to the original version. To do this, you'll click the Save As command in the backstage view. Just like when saving a file for the first time, you'll need to choose where to save the file and give it a new file name.

Running a Presentation

Most PowerPoint presentations are created to run as a slideshow. Given all the advanced feature available in PowerPoint 2010 it is no surprise that there are many features related to running the slideshow that has been included in this program too. Most of these features are really to help you create a good slideshow without having to go through the entire

presentation over and over again after every minor change. Features related to running the slideshow are grouped under the Slideshow ribbon.

Closing a Presentation-

Closing a presentation is certainly easier than opening one. To close a presentation, save your file and use one of these techniques:

- Click the Office button and choose Close on the drop-down list. The PowerPoint program remains open although the presentation is closed.

- Click the Close button, the X in the upper-right corner of the PowerPoint window (or press Alt+F4). Clicking the Close button closes PowerPoint as well as your presentation.

Opening an Existing Presentation-

PowerPoint and Windows offer many shortcuts for opening an existing presentation. To open a presentation, click the Office button and choose Open - or take advantage of the numerous ways to open presentations quickly as followed-

- Click the Office button and choose Open on the drop-down list (or press Ctrl+ O). You see the Open dialog box.

- Locate and select the presentation you want to open and then click the Open button. You can also double-click a presentation name to open a presentation.

8.9   POINTS TO REMEMBER

- Microsoft PowerPoint is widely used for making professional quality presentations in a variety of formats, including onscreen computer slide shows, black-and-white or colour overheads, and 35 mm slides. You can also use it for notes and class presentations. Besides, PowerPoint can be used as a drawing package for preparing pictures, forms, posters, and leaflets.

- Presentation is a powerful managerial tool of communication through which you can compile and deliver your ideas, concepts, plans, and products to the audience in a structured, effective, and impressive manner.

- Slides and transparencies are used to projected in front of the audience using an overhead projector or otherwise. The operation of this equipment is mainly manual, semi-automated at the best.

8.10   GLOSSARY

- Title Bar: This is the top section of the window. It shows the name of the file followed by the name of the program which in this case is Microsoft PowerPoint.

- Slide Area: This is the area where the actual slide is created and edited. You can add, edit, and delete text, images, shapes and multimedia in this section.

- Normal Layout View: This displays page in normal view with the slide on the right and a list of thumbnails to the left. This view allows you to edit individual slides and also rearrange them.

- Slide Tab: This section is available only in the normal view. It displays all the slides in sequence. You can add, delete, and record slides from this section.

- Quick Access Toolbar: The Quick Access Toolbar is located just under the ribbon. This toolbar offers a convenient place to group the most commonly used commands in PowerPoint.

8.11   CHECK YOUR PROGRESS

Objective type questions-

a) Word documents consist of one or more pages, and PowerPoint presentations consist of one or more.....

b) ..... This part position right side down and above the task bar. This is use to enlarge and decrease the view of your slide template at the center.

c) ..... view is used to run the slideshow during a presentation.

d) PowerPoint offers two ways to save a file..... and.....

e) ..... View presentations you recently worked on in the dialog box.

f) Each slide is consisting of text, graphics, animations, videos, and other information.

g) reading view is the default view in PowerPoint and this is primarily used to create and edit slides

h) Click the Office button and choose Close on the drop-down list for closing the presentation

i) Broadcast slideshow Allows users to broadcast the slideshows using Microsoft's PowerPoint Broadcast Service

j) Presenter View is used to define the resolution in the slideshow view.

Descriptive type questions-

a) What do you use MS PowerPoint for? Elaborate.

b) What is MS PowerPoint?

c) Explain the major functions used in MS PowerPoint.

d) Create a MS PowerPoint Presentation with animated slides.

e) What are the major features of MS PowerPoint?

Answers (Objective type questions)

[a] Slides [b] zoom in and out sliding bar [c] slideshow view [d] save and save as [e] My Recent Documents Button [f] True [g] False [h] True [i] True [j] False

8.12   BIBLIOGRAPHY/ REFERENCES

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- Joseph W. Habraken, Microsoft Office 2003 All-in-one, que Publishing

- Laurie Ann Ulrich, How to Do Everything with Microsoft Office 2007, McGraw-Hill Professional

8.13   SUGGESTED READINGS

- Holloway Kari, "Writer's Guide to Microsoft PowerPoint"

- Lambert Joan, "Microsoft PowerPoint 2019 Step by Step"

- Gookin Dan," PowerPoint 2019 For Dummies"

- Illustrated Computer Concepts and Microsoft office 365 & office 2016

UNIT- 9

FUNDAMENTALS OF INTERNET- I

9.1   INTRODUCTION

In today's world we do most of our work online, for example, booking of bus, railway, and flight tickets, depositing electricity, water, mobile bill, etc. Government is trying to provide all their services online so that individuals can get their work done from any place and at any time. This is all possible just because of internet. Internet has changed the way people live their life. WhatsApp and Facebook are an essential part of people's life. People share information from one corner of the world to another corner of the world within seconds. Today, we see the world as a global village internet is behind all these services. Thus, its really important for students to understand the basics of internet. Hopefully, this information will be quite helpful for them to go for further details in this field.

9.2   OBJECTIVES

After the successful completion of this unit, you will be able to-

- Define internet.

- Elaborate on various applications of the internet.

- Explain basic terms related to the internet.

- Describe the meaning of the URL.

- Elaborate the working of search engines.

- Explain the usage of the internet in education.

9.3   CONCEPT OF INTERNET

In simple words, we can define internet as a way of connecting any number of computers situated at any place in the world. In other words, it is a global network of computers all over the world. Internet is a global network of a number of private, public, business, academic, government, and other networks connected by various technologies. Internet can be used to send and receive different kinds of information such as text, graphics, voice, video, etc. Different users may have different platforms, and other issues related to intersystem communication in the internet. Thus, Transmission control protocol/Internet protocols (TCP/IP) are used to define the rules for communication on the internet so that these issues can be resolved. We need access to the internet service provider (ISP) to connect to internet. ISP works as a mediator between a user and the internet.

9.4   APPLICATIONS OF INTERNET

There are various applications of internet. It is the most useful technology of modern life which helps us not only in our daily life but also in personal and professional life. Some important applications of the Internet are as follows:

[1] E-Mail

Electronic mail (e-mail) is one of the important and frequently used applications of the internet. This provides a way of communication and sharing of information. With e-mail, one can send and receive information instantly. There are numbers of internet service providers that offer the service further nowadays there are many physical devices that support e-mail like mobile phones.

[2] Web browsing

Web browsing is another important application of internet. It is a software application used to access information on the World Wide Web. A browser is used to display the information contained in a website. Google Chrome, Firefox, Internet Explorer, etc are some examples of web browsers. Google Chrome is the most popular browser.

[3] Education

Internet is one of the main sources of getting information about a topic. Thus, it is quite useful for students, teachers, and researchers. Nowadays, online education has grown rapidly many are providing education through online video lectures and earning as well. Massive online open courses (MOOCs) have opened a new way of education worldwide. There are a number of courses of different subjects available through MOOCs. A student can do a course of any university from any place along with his usual work.

[4] Video Conferencing

Internet is also used for video conferencing. Whenever it is not possible to arrange a physical meeting in one place due to shortage of time, video conferencing is the best alternative. Many government and private sectors are using internet for video conferencing for their day to day work. It is a brilliant way of saving time and money.

[5] E Commerce

Internet has become a major platform for conducting commercial activities. Nowadays, most of the big companies rely on online business. With the help of internet anyone can shop online. Online stores and sites are used to purchase all the needed products.

[6] Entertainment

Internet has changed dramatically the scenario of entertainment methods. There are many videos and movies available in the web. Internet provides the facility to access wide range of audio and video songs, movies, and other television programs. Many websites provide the facility to upload videos. YouTube is the leading website for such purposes. Now, people are making entertainment videos and uploading them into the web. This becomes a means of earning as well.

[7] Communities

Social media allows people across the world to connect with each other via internet. A person can share text, photos, videos, etc through social media and may connect with the people sitting at any place in the world. Social media has a great impact on people's life. Social media has the power of campaigning in favour or against any particular thing, thus this application of internet should be used carefully.

[8] Services

We use internet for many services like banking, online submission of bills, online purchasing tickets of train, aeroplane, movie and hotel reservation, etc. Thus, internet has made these tasks time and money-saving.

9.5   CONNECTING TO THE INTERNET

There are many ways to connect to the internet. They all use different hardware and each has a different range of connection speed. As technology changes, faster internet connections are needed to handle things, following are some main services to connect to the internet:

[1] Dial Up

This is low-cost but the slowest type of internet connection. A modem is required to connect to the internet for this type of connection. It requires a wired phone line to make internet connection. The phone lines regularly experience disturbance which affects the speed of the internet due to poor connection. In this connection, one cannot use land line phone and internet service simultaneously.

[2] Digital subscriber line (DSL)

The digital subscriber line uses a broadband connection, thus, it is faster than dial up connections. It uses two lines one for internet and one for phone calls as a result both using internet and making calls can be done simultaneously. The speed of connection depends on the service offered.

[3] Cable

Cable service provides an internet connection through cable TV lines. The speed of internet connection may be different for upload or download transmission of data. It may have a faster connection in comparison to dial up and DSL services.

[4] Wireless

Wireless or Wi-Fi uses radio frequency and it does not require use telephone lines or cables for connection to the internet. Through a wireless network, internet can be accessed at any point within the coverage of the network. Thus, there is no need to fix at a point to access internet.

[5] Satellite

Satellite internet connection uses satellites that are moving and working in the orbit of the earth. Thus, in this type of connection we need not cable or phone line. It can be used anywhere in the world. However, weather may play some role in the connection. In general, this type of connection is slow in comparison to DSL or cable.

[6] Cellular

These services are used with mobile phones. It provides a wireless internet connection. The speed of the connection may vary and depends on the service provider. The most common are 3G (3rd generation cellular network) and 4G (4th generation cellular network).

9.6   BASICS OF COMPUTER NETWORKS

A computer network is a set of computers connected to each other in different ways. Connections may be through wires, optical fibers, wireless etc. The purpose of a computer network is to make interaction possible among different computers. When we interact or communicate, we share information. We frequently use the term 'data', which refers to the information shared and it may be in any form as decided by the communicator. Data may be a piece of text, numbers, images, audio, or video. First, we understand data communication which has five components: message, sender, receiver, transmission medium, and protocol. We can understand these in simple words as follows:

Message is the data communicated between two devices.

Sender is the device sending the data.

Receiver is the device receiving the data.

Transmission medium is the physical medium over which the data travels.

Protocols are a set of rules to make communication possible.

Modes of data communication-

Now, we discuss the different modes of data communication. There are three modes of data communication: simplex, half-duplex, and full-duplex.

Simplex

In simplex mode, the communication takes place in one direction only. If the communication is taking place between A and B, then only one can transmit the information and the other can receive the information, i.e., if A transmits the information then B receives the information. We can say that, it is a unidirectional mode.
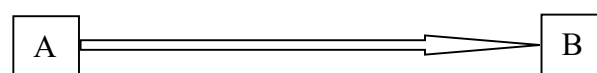
Figure 9.1 Simplex Mode of Communication.

Half-duplex-

In half-duplex mode, both the devices can transmit as well as receive the information but at a time, communication will take place in one direction only, i.e., A and B both can transmit and receive the information but at a time. Either A can transmit information to B or B can transmit information to A only. We can say that, it is a restrictive bi-directional mode.
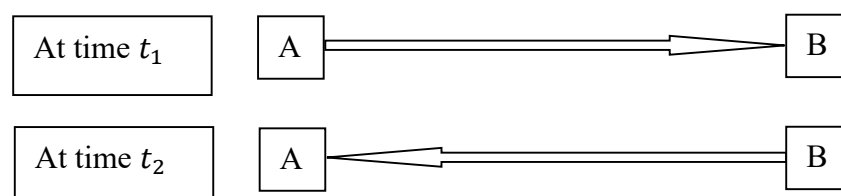
Figure 9.2 Half-duplex Mode of Communication.

Duplex or Full-duplex-

In full-duplex mode, both the devices can simultaneously transmit and receive the information. We can say that, it is bidirectional mode.
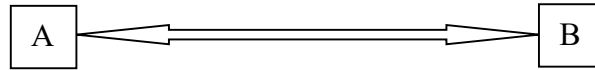
Figure 9.3 Duplex or Full duplex Mode of Communication.

Physical Structure of network

Now, we discuss the physical structures of a network. In a network devices are connected through links. Link is nothing but a medium of transferring data between devices. There are two possible connections: point-to-point and multipoint.

Point-to-Point-

In a point-to-point connection, there is a dedicated link between two devices. The whole capacity of the link is used to transmit data between the two devices.
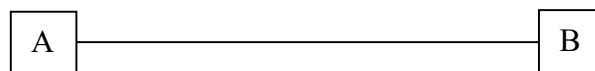
Figure 9.4 Point-to point connection.

Multipoint connection-

In a multipoint connection, two or more devices share a link. The capacity of the link is

shared by different devices.

Figure 9.5 Multipoint connection.

Topology of a network

The geometrical representation of the links and their relationship is known as the topology of a network. To discuss the topology of a network, we can assume a device as a vertex (nodes) and a link as an edge between to vertices. There are four basic topologies:

Mesh Topology- In a mesh topology, there is a point to point link between every two
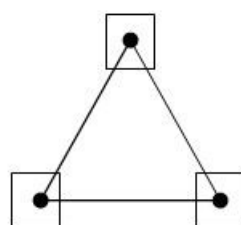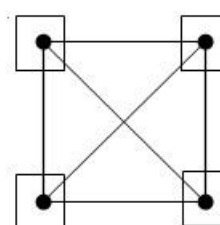
(i) 3 vertices   (ii) 4 vertices

devices. If there are n nodes in the network, every node will be joined through every other $n - 1$ node. Thus, there will be $n(n - 1)$ links. In this number, every link is counted twice as a link between A and B is the same as the link between B and A, thus there will be $\frac{n(n-1)}{2}$ links. For example, mesh topologies of three and four nodes are given in the following figures:

Figure 9.6 Mesh topology.

Star Topology-

In a star topology, there is a central device and all other devices have a point to point link to the central device. The central device is usually known as a hub and will be discussed later on. In a star topology two devices cannot make communication directly but through a central
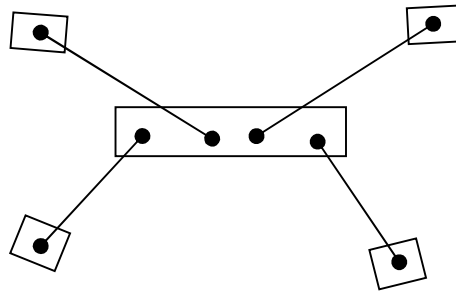
device.

Figure 9.7 Star topology.

Bus Topology-

In a bus topology, all the devices are connected through a cable and this cable act as a backbone to all the links.
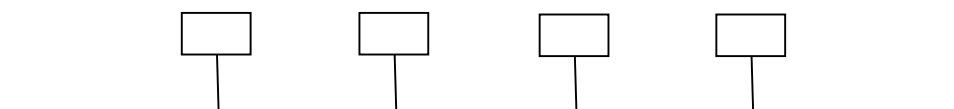
Figure 9.8 Bus topology.

Ring Topology-

In a ring topology, devices are connected in a ring, i.e., each device has a point to point
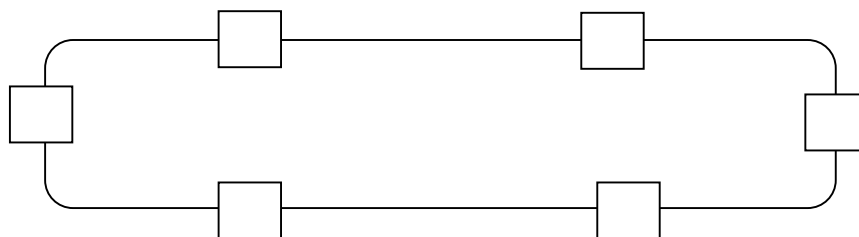
connection to two devices only, one in one side of it and second on the other side of it.

Figure 9.9 Ring topology.

Note- A hybrid topology can be formed by using one or two above topologies.

Components of Computer Network

Here, we discuss the different components of a computer network. Before describing the different components, the various major components can be seen in the Figure 9.10, as-
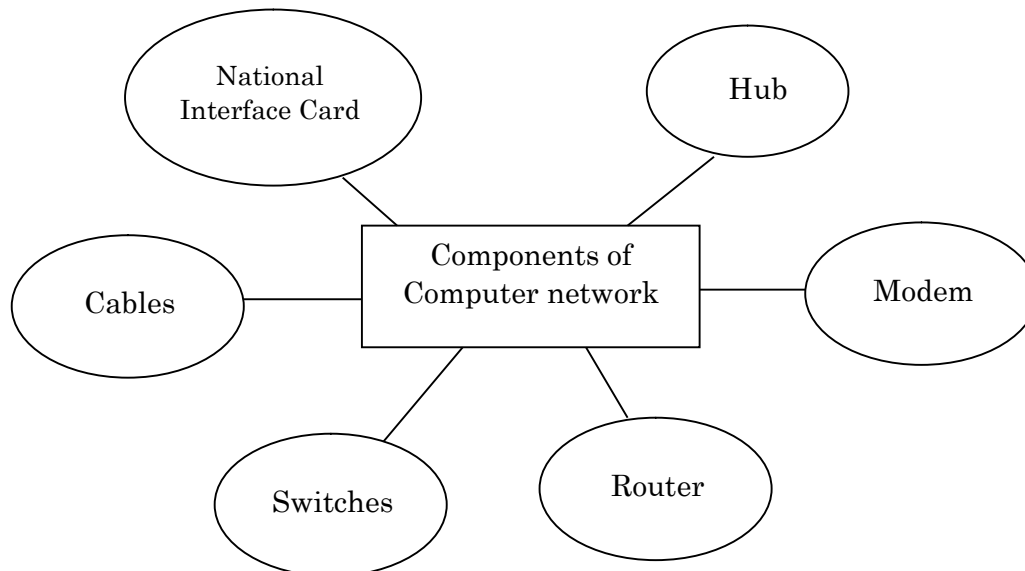
Figure 9.10 Components of Computer Networks.

Network interface card (NIC)-

Network interface card is a device that helps the computers to communicate with each other. It contains the hardware address which is used by the data-link layer protocol to identify the system on the network so that the data can be transferred to the correct destination. NIC has two types; wireless NIC and wired NIC. In a wireless NIC, connection is made using an antenna and the radio wave technology. Wireless NIC is used in all modern laptops. In wired NIC cables are used to transfer the data over the medium.

Hub-

A Hub is a device used to divide a network connection among multiple computers. A request from a computer in the network first goes to the hub through cable and then the hub broadcasts this request to the entire network. The request is checked by all the computers in the network for the belongingness of the request with them. The request is dropped in case it does not belong to any computer.

Switches-

A switch is an advanced version of a hub. In place of broadcasting the message to the entire network like a hub, it contains an updated table to decide the destination of the data. Using the information from the table, a direct connection between the source and destination is

created. This helps to increase the speed of the network. A switch works as a controller. It connects various devices like, computers, printers to a network in a premise.

Routers-

A router is a device that can connect multiple networks. It is used to forward data packets among multiple networks. It regenerates the signals it receives, checks the physical addresses of the source and destination and forwards the signal to its destination through the best possible route.

Modem-

A modem is known as a modulator/ demodulator. It converts the digital data into an analog signal and vice versa. It is used to make a connection between the computer and the internet over the telephone lines.

Cables-

Cables are used for transmitting a signal. Cables work as a carrier to interconnect computers in a network.

9.7   UNDERSTANDING URL

URL stands for 'Uniform Resource Locator'. It is the address of a document on the web and it is unique for every document. A URL has several parts; each part provides some information to the web browser that helps to find the page. Look at the following address-

http://www.uou.ac.in/school/school-computer-sciences-information-technology

We can break the address into three parts- (i) http:// (ii) www.uou.ac.in (iii) /school/ school-computer-sciences-information-technology.

The scheme

The first part of the URL is 'http://'. This string is the scheme that identifies the protocol to be used to access the page on the Internet. The most commonly used protocols are http (Hyper Text Transfer Protocol) and https (Secure Hyper Text Transfer Protocol). Sometimes ftp (to handle a basic file transfer) and mail to (to open a mail client) are also used. After the string, colon ':' is used as URL scheme separator and the paired slashes '//' indicates the beginning of the local hostname.

Domain name

The second part is 'www.uou.ac.in'. It identifies the hostname where the resource is located. We can further categorise it into three parts, (i) www (ii) uou (iii) ac.in. The first part 'www' is the sub-domain that defines the hosts; here it is World Wide Web. It may be changed like support.uou.ac.in to access the internal support page of the website. The second part is the address of the web server that serves the website. The third part gives the general information

about the website, for example '.gov' shows a government website, '.ac' shows website related to academics etc. The extension '.in' shows the region, here it is for India. The domain name is basically an IP address of the web server but as it is not easy to remember an IP address, a simple text is used.

File-path

The third part is the path of the page that needs to be loaded. If we do not use the file path, then the home page will be loaded from where we navigate for the required page.

9.8   SEARCH ENGINE

A web search engine is software designed to carry out web search on the internet to provide a user the relevant information in response to his query. A search engine extracts requested information from the huge database web pages available on the internet. The search is based on matching the user's query with the available pages. There is a mathematical procedure for matching the query with the documents available on the internet. After matching the documents, search engines return a list of documents in descending order of their matching score. Nowadays, there are many different search engines available on the internet, with each search engine having its own ability and feature. Google is the most popular search engine. Some other search engines are Bing, Yahoo, Ask, etc. Let us understand the architecture of a web search engine. It has the following modules:

[1] Crawler Module

In the World Wide Web, web pages are stored in a decentralized way in computers across the world. Thus, a search engine has to collect information from these documents. This task is performed by the crawler module. This module consists of a specialized computer program that runs uninterruptedly. Virtual robots, we call them spiders walk through the web, visit pages on the web, download them, and send them to repository.

[2] Repository

Repository indicates the computer disks on the computers of the company that runs a search engine. Repository stores the web pages downloaded by the spider. The pages stored in the repository are sent to the indexing module for further processing.

[3] Indexing Module

The indexing module consists of a computer program to extract important information from the web pages. The basic work of this module is to prepare a compressed representation (index) of the web pages stored in the repository.

[4] Query Module

The query module reads the query written by a user. It analyses and converts it into a specific format so that it can be matched with index to find the related web pages. The retrieved web pages are then sent to the ranking module.

[5] Ranking Module

Ranking module provides ranking a similarity score to the web pages sent by query module and sort them in descending order of their ranking (highest ranking to lowest ranking). The list known as the hit list is returned to the user against his query on the computer screen that contains the URLs together with the excerpt from the pages called a snippet. The similarity score is based on some mathematical concepts and web-specific factors.

9.9   *INTERNET AS AN EDUCATIONAL TOOL*

Internet has a tremendous power to disseminate information worldwide within a short period. Thus, it has emerged as an important tool for education. For every level of education whether child education, school level, or college level, internet plays a vital role. For you any query, you can ask to Google search engine, you get some answer to your query. Children can easily learn their subjects by visualizing it. With the incorporation of the visualization effect learning becomes more effective. There are many websites available that assist in learning particularly for children.

In remote areas where faculty members are not available for students, internet is like a gift to the education system that can be used to fill the gaps between the knowledge seekers and providers. Nowadays, video lectures of renowned professors in almost every field are available on the internet. A person sitting in one corner of the world can watch and learn from another sitting in another corner of the world. A number of lectures for a single topic by different experts are available on the internet that provides us the freedom of choosing the best lecture. Massive online open courses (MOOCs) are growing rapidly worldwide. One can learn and earn a certificate or degree from home by choosing a MOOC. There are different platforms that are providing MOOCs, like SWYAM, NPTEL, COURSERA, etc. MOOCs are not only useful for students but also for persons those who are in jobs and wish to enhance their carrier in a particular field. We can summarize the advantages of online education as follows:

[1] Access to cost-effective education

Due to the availability of online courses, students can get a certificate from a reputed institution with minimum cost that has made education accessible to everyone.

[2] Effective teaching and learning

Due to the advancement of technology, a lecture can be made very effective by introducing audio, video, and other advance tools.

[3] Updated information

With the help of internet, one can get the latest information on any field as internet is the major source of information, and every minute huge data is uploaded to the internet.

[4] Learning freedom

The most important thing about online education is the freedom of learning. One can choose one's own time and place to study the online material. Whether you are working, non-working, or you have any profession, you can manage your own time to complete a course.

9.10   POINTS TO REMEMBER

- We have learned the basic concepts of internet and its applications to various fields.

- We knew the various services to connect internet and basics terms of a computer network.

- We also learned the meaning of different parts of URL.

- We got the knowledge of the working of search engines

- We saw that Internet is a powerful tool for education as well.

9.11   GLOSSARY

- MOOC- Massive online open courses.

- URL- Uniform Resource Locator.

- NIC- Network interface card.

- 4G- 4thh generation cellular network.

- DSL- Digital subscriber line.

- TCP/IP- Transmission control protocol/Internet protocol.

9.12   CHECK YOUR PROGRESS

Descriptive type questions-

a)   Explain the concept of internet. Describe various applications of internet.

b)   Describe various services that are used to connect to the internet.

c)   Describe various modes of data communication.

d)   Describe the meaning of the physical structure of a network.

e)   What do you mean by the topology of a network? Discuss various network topologies.

f)   Describe various components of a computer network.

g)   Explain the meaning of URL.

h)   What do you mean by search engines? Explain its various modules.

i)   Discuss the usage of internet in education.

Objective type questions-

a)   Internet is a global network of computers. (True/False)

b)   Commercial activities are not possible through internet. (True/False)

c)   A modem is required to connect to the internet for the dial up connection. (True/False)

d)   In DSL use of internet and making calls, cannot be done simultaneously. (True/False)

e)   Wi-Fi uses radio frequency. (True/False)

f)   In simplex-mode the communication takes place in one direction only. (True/False)

g)   In full-duplex mode both the devices can simultaneously transmit and receive the information. (True/False)

h)   In a star topology with n points, there will be $(n(n-1))/2$ links. (True/False)

i)   In a ring topology, each device has a point to point connection to two devices only. (True/False)

j)   Hub is a device used to divide a network connection among multiple computers. (True/False)

k)   A router converts the digital data into an analog signal and vice versa. (True/False)

l)   In URL the string 'https' represents secure hypertext transfer protocol. (True/False)

m)   The work of Crawler is matching a page on the internet with the query. (True/False)

n)   MOOCs stand for massive open organised courses. (True/False)

Answer (Objective type questions)-

[a] True   [b] False   [c] True   [d] False   [e] True   [f] True

[g] True   [h] False   [i] True   [j] True   [k] False   [l] True

[m] False   [n] False

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UNIT- 10

LAYERED ARCHITECTURE OF INTERNET AND PROTOCOLS- I

10.1   INTRODUCTION

Communication is a process of sharing the information and ideas from one place or person to another. A network is required for proper communication. A network consists of multiple devices that communicate with one another. A computer network is an interconnection of computers and computer resources for sharing of data and resources. The devices connected in the network are called nodes. Nodes may be a computer, printer, or any other device capable of sending or receiving data. Computer networks can be classified on the basis of their size and purpose. The computer networks are of three types Local Area Network (LAN), Metropolitan Area Network (MAN), and Wide Area Network (WAN).

The Internet is the global 'network of networks' that connects millions of computers all over the world. The computers and computer networks interchange information using TCP/IP (Transmission Control Protocol/Internet Protocol). The computers are connected through the telecommunication networks and Internet is used for various purposes like e-mailing, sharing files and gathering information, etc over World Wide Web (WWW).

10.2   OBJECTIVES

After the successful completion of this unit, you will be able to-

- Define data communication and computer network.

- Define the types of networks and their characteristics.

- Define the Internet and its services.

- Explain the concept of TCP/IP suite.

- Describe the OSI reference model.

10.3   COMPUTER NETWORKS

A computer network is a collection of several computers and other devices which are interconnected in such a manner that allow easy exchange of data and resources. Main objectives of the computer network are exchange of data or information, sharing software and hardware resources like printer, and distribution of the processing load.

Advantages of a computer network-

The main advantages of a computer network are:

- Central storage of data: A computer network allows storing of data files in a central computer of a network shared by all the nodes of a network.

- Resource Sharing: A computer Network enables us to share resources such as storage space, processing units, and peripherals like printers, scanners fax, etc.

- Sharing of software: A user in a network can use the software installed in any of the computer or file servers in the network.

- Communication: Different users connected through the network can communicate with each other through voicemail, e-mail, messaging, video conferencing, etc.

- Electronic Commerce: Computer networking (Internet) provides the facility of electronic commerce.

Types of networks

There are mainly three types of computer networks based on their size: (i) Local Area Network (ii) Metropolitan Area Network, (iii) Wide area network (WAN).

[i] Local Area Network

A Local Area Network (LAN) is a group of computer and peripheral devices that are connected in a small limited geographical area such as school, laboratory, home, and office building. A LAN is used to connect computers and other network devices so that the devices

can communicate with each other to share the resources. The resources to be shared can be a hardware device like printer and software like an application program or data. The size of a LAN is usually small. The various devices in LAN are connected to central devices called hub or switch using a cable.

Characteristics of LAN:

• LAN is used for connecting two or more personal computers through a communication medium such as twisted pair, coaxial cable, etc.

• It is cheaper as it is built with inexpensive hardware such as hubs, network adapters, and Ethernet cables.

• The resources to be shared can include hardware (e.g. printers), software (e.g. an application program), or data.

• LAN enables the sharing of resources such as files or hardware devices needed by multiple users.

• Is limited in size, typically spanning a few hundred meters, and no more than a mile.

• LAN due to its small size is faster than the other networks.

• Local Area Network provides higher security.

• LAN can be either wired or wireless.

• Different devices (nodes) in a LAN can be connected with certain topologies like BUS, RING and STAR.

[ii] Metropolitan Area Network

A metropolitan area network is designed to extend the network over an entire city. Metropolitan area network (MAN) is a computer network that spans over larger geographical region than LAN. It covers several buildings or an entire city. This network is used to share regional resources among network users. It may be a single network such as a cable television network or connecting a number of LANs into a larger network so that resources are shared from LAN-to-LAN as well as device-to-device.

Characteristics of MAN:

• MAN covers a larger geographical region than LAN usually covering a city or several buildings.

• It is a high-speed network than WAN.

• Users can share regional resources through MAN.

• MAN normally covers an area ranging 5 to 50 km in diameter.

- Less expensive than WAN.

- Composition of various small Local Area Networks.

[iii] Wide Area Network

Wide Area Network is the largest computer network that covers a large geographical area such as different countries or even whole world. Generally, WAN is an interconnection of several LANs and MANs distributed all over the world. A WAN provides long-distance transmission of data, voice, image, or other information over large geographical areas that may cover a country. Several local networks can be connected using network devices like routers, gateways, bridge, etc. to form a WAN. Computers are connected to a wide area network through leased lines or satellites. Internet is the most popular wide area network.

Characteristics of WAN:

- A wide area network (WAN) is a computer network that spans over a wide geographical region.

- WAN is an interconnection of several LANs and MANs.

- The data through the WAN can be transmitted over high speed leased phone lines or wireless links such as satellites.

- WAN provides various network services used by a variety of protocols.

- Through a wide area network, different computers are linked to a remote central database managed by a system server.

10.4 HISTORY OF INTERNET

Internet is the interconnection of computer networks. It is a very large hardware combination of millions of personal, business, and government computers. Internet is the major technical infrastructure that allows millions of users throughout the world to get connected with people, product, and services at various parts of the globe.

Evolution of Internet-

In the late 1960s, US department of Defence became interested in computer networking and formed a research agency known as the Advanced Research Project Agency (ARPA) to research on networking. ARPA projects included a wide area network called ARPANET- Ist version of the internet. ARPANET was used to connect computer at different geographical locations and move data among those locations.

Robert Kahn and Vinton Cerf in 1973, worked together to develop a protocol for connecting several networks together. These protocols are Transmission Control Protocol/Internet Protocol (TCP/IP). Over the next few years, Robert Metcalfe developed a system allowing data transmission over a network through cables called Ethernet.

In 1982, the first commercial network was developed and allowed for email communication. In 1983, Domain name system was introduced to allow domain names to automatically assign an IP number. In 1990s, the Hypertext Markup Language (HTML) and the Uniform Resource Locator (URL) was developed by Tim Berners and his team.

10.5   THE OSI MODEL

The Open System Interconnection (OSI) model is a layered framework for the design of network systems that allows for communication across all types of computer systems. This model describes how information from a software application in one computer moves through a physical medium to the software application in another computer. This model was introduced by ISO (International Organization for Standardization). The OSI model includes seven different layers and each layer performs a well-defined function.

APPLICATION LAYER
PRESENTATION LAYER
SESSION LAYER
TRANSPORT LAYER
NETWORK LAYER
DATA LINK LAYER
PHYSICAL LAYER
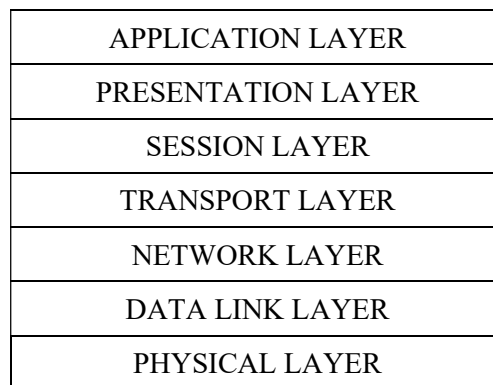
Figure 10.1 The OSI model.

[1] Physical Layer-

A physical interface between the network devices is provided by the physical layer. This layer is responsible for transmitting row bit streams over a communication channel between two nodes. It converts streams of binary bits into electrical or electromagnetic signals. Functions of the physical layer are-

- Representation of bits
- Determine physical topology
- Physical characteristics of interface and transmission channel
- Transmission mode

[2] Data Link Layer-

The error-free communication path between nodes over the physical channel is established by the data link layer i.e. the error detection and correction in the transmitted data is performed by the data link layer. The data link layer splits the bit streams into data frames that are transmitted sequentially. Functions of a data link layer are-

- Data framing

- Error control

- Flow control

- Access control

- Physical addressing

[3] Network Layer-

A network layer builds the logical path between the source and the destination nodes of the network. In the network layer first, the transmitted message is fragmented into packets. Then, sequencing and error control of these packets is performed. Thus, the routing decisions are taken at the network layer. The main network layer protocol is the Internet Protocol (IP). Functions of a network layer are-

- Routing

- Translation of logical network address into a physical address

- Packet switching and sequence control

- Network layer flow control

- Network layer error control

[4] Transport Layer-

Once a path is established between the sending and receiving stations, the transport layer provides control standards for a communication session for enabling processes to exchange data reliably and sequentially. The transport layer accepts data from the above session layer, splits it into smaller units, and pass the data units to the lower layer (network layer). Transport layer protocols are Transport Control Protocol (TCP) and User Datagram Protocol (UDP). Functions of the transport layer are-

- Service point addressing

- Segmentation and reassembly

- Connection control

- Flow and error control

[5] Session Layer-

A session between two end users is established, maintained and terminated by the session layer. It manages and synchronizes the conversation between two different applications. Functions of the session layer are-

- Dialog Control

- Synchronization

[6] Presentation Layer-

A presentation layer is responsible for converting the message data in a form easily recognized by the receiver. For this, it may perform code conversion, compression & decompression, encryption & decryption on message data depending on the requirement of the applications. Functions of the presentation layer are-

- Data encoding and decoding
- Compression and decompression
- Encryption and decryption

[7] Application Layer-

Various network services that support the user of the network are provided by the application layer. The most common services provided by this layer include e-mail, transfer of files, directory services, remote login, network resources, etc. Some application layer protocols are FTP (File Transfer Protocol), HTTP (Hypertext Transfer Protocol), SMTP (Simple Mail Transfer Protocol), TELNET, etc. Functions of the application layer are-

- File transfer
- Mailing service
- Directory service
- Remote login

10.6   TCP/IP PROTOCOL SUITE

Network protocols are the set of rules, procedures, and standards to determine the way systems communicate and data is transferred from one system to another. The collection of
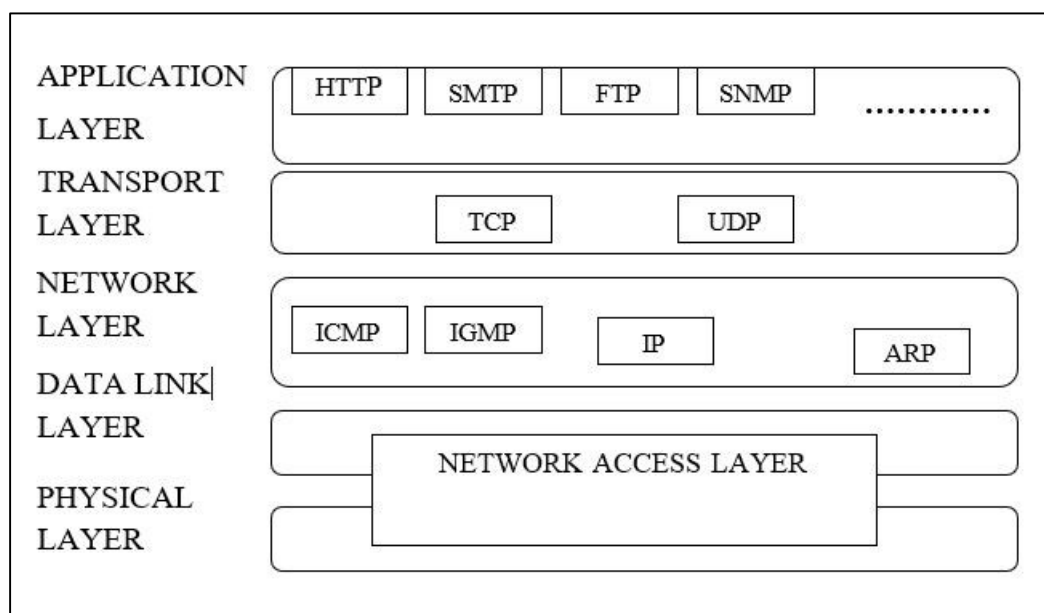
protocols that are designed to work together is called a protocol suite. The TCP/IP is a protocol model defined with four layers. Each layer of the TCP/IP suite contains relatively independent protocols.

Figure 10.2 The TCP/IP Suite

[1] Network Access Layer (Physical and Data Link Layers)-

This is the lowest layer of the TCP/IP model. The physical and data link layers together is called network access layer in TCP/IP suite. This layer is responsible to determine the transmission of data between the two devices on the same network. This layer receives the data packets from the network layer (Internet Layer) and sends it to the destination over a physical media.

[2] Network Layer (Internet Layer)-

Internet or Network layer form the data packets called IP datagrams that include source and destination address (IP address). Network layer protocols are:

- Internet Protocol (IP) - IP defines the host's logical address called IP address. This address is used by the network to identify the device. This protocol is responsible to route the data packet to its respective destination.

- Address Resolution Protocol (ARP) - This protocol links logical address (IP address) to physical address.

- Internet Control Message Protocol (ICMP) - ICMP is used to send notification of datagram problems back to the sender. It is responsible to send the query and error reporting messages.

- Internet Group Message Protocol (IGMP) - IGMP is a group management protocol that manages group membership in a multicast network.

[3] Transport Layer-

The transport layer is responsible to form end-to-end connections between the source and the destination. The protocols of the transport layer are:

- Transmission Control Protocol (TCP) - TCP is a connection based and reliable protocol. It provides full transport layer services to the application. It provides host-to-host communication.

- User Datagram Protocol (UDP) - UDP is a connectionless unreliable protocol. It provides the procedure to process communication.

[4] Application Layer

In a TCP/IP model the application layer is equivalent to the combinations of session, presentation and application layers of the OSI model. It performs all the responsibilities of sessions, presentation, and application layers. The main protocols of the application layer are:

- Hypertext Transfer Protocol (HTTP) - It is a communication protocol that is used to transmit the contents of web pages called hypertext from web servers to web browsers.

- Simple Mail Transfer Protocol (SMTP) - It is a communication protocol for electronic mail. SMTP is used to send messages from one server to another.
- Domain Name System (DNS) - The main function of DNS is to translate the domain names into IP addresses on the internet.
- File Transfer Protocol (FTP) - FTP allows the users to move files from one computer to another on the internet. FTP provides the facility of uploading and downloading.
- Terminal Network (TELNET) - Telnet service allows the user to log in to a remote computer from a local machine on the internet.

10.7 POINTS TO REMEMBER

- Data communication is the process of transferring data and information from one computer to another.
- The main components of a communication system are the source, medium, and receiver.
- A computer network is a collection of computers and other devices which are linked together for data communication.
- The main objective of a computer network is sharing of information, resources, and distribution of the processing load.
- Networks are of three types: Local Area Network (LAN), Metropolitan Area Network (MAN) and Wide Area Network (WAN)
- LAN is a computer network within a campus, building, and group of buildings in a limited geographical area.
- A metropolitan area network (MAN) is similar to a local area network (LAN) but spans an entire city or campus. MANs are formed by connecting multiple LANs.
- A wide area network (WAN) is a computer network spanning over states, countries, or all over the world.
- The arrangement of computers and other devices in a network is called topology.
- Some common network topologies are BUS, STAR, RING, MESH, TREE, etc.
- Internet is an interconnected network of computers and other resources all over the world. It is a collection of many separate networks.
- Internet has its root in the US army. Internet started in 1960s, under the original name ARPA (Advances Research Project Agency).
- In 1973, Robert Kahn and Vinton Cerf developed Transmission Control Protocol/Internet Protocol (TCP/IP) for connecting several networks together.
- In 1990s the Hypertext Markup Language (HTML) and the Uniform Resource Locator (URL) was developed by Tim Berners and his team.

- The Open System Interconnection (OSI) model provides a standard for layered protocols for a computer network. This model is created by the International Standards Organization (IOS).

- The seven layers of OSI model are physical, data link, network, transport, session, presentation, and application. Each layer has some specific functionality.

- The bottom three layers of OSI model (physical, data link, and network) are network support layers.

- The top three layers of OSI model (session, presentation, and application) are the user support layers.

- The network support layers and user support layers are linked by the transport layer.

- The physical layer is responsible for the movement of individual bits from one node to the other.

- The data link layer splits the bits stream received from the network layer into data units called frames and responsible for moving these frames from one node to the next without error.

- The network layer is responsible for the delivery of individual packets from source host to the destination host.

- The main function of the transport layer is the delivery of the message from process to process.

- The session layer establishes, maintains, and synchronizes the interactions between communicating devices. It allows a process to add checkpoints.

- The main functions of the presentation layer are data translation, compression, and encryption.

- The application layer enables users to access the network. It provides network services such as e-mail, file transfer, remote login, etc.

- TCP/IP reference model is a four layered protocol suite developed by the department of US defence in 1960s.

- The four layers of TCP/IP model are the Host-to-Network layer, Internet/Network layer, Transport layer, and Application layer.

- The lowest layer of TCP/IP is the Host-to-Network layer which combined the physical and data link layers of the OSI model. This layer is concerned with the physical transmission of data.

- Internet or Network layer defines protocols for logical transmission of data. Internet Protocol (IP) is the main protocol in this layer.

- Transport layer defines Transport Control Protocol (TCP) and User Datagram Protocol (UDP) for end-to-end error free delivery of data.

- The application layer in a TCP/IP model combines the functionalities of the session, presentation, and application layers of the OSI model. This layer includes several

protocols like HTTP, FTP, SMTP, TELNET, etc to allow access to network resources and services.

10.8   GLOSSARY

- Peripheral Devices- Peripheral devices are the internal or external devices that connect to the computer to perform computer's primary functions such as input, output, and storage. Some common peripheral devices are keyboard, mouse, printer, CD-ROM and DVD drives, flash memory drives, etc.

- Electronic Commerce- Electronic commerce or E-commerce is defined as the trading of goods, services, information, or anything else of value between two entities over the internet.

- Topology- The physical and logical arrangement of computers and other resources in the network is called a network topology. Some basic topologies are bus, ring, star, tree, mesh, etc.

- Uniform Resource Locator (URL) - A URL is the address of a specific webpage or file on the internet. It is a reference to a web resource that specifies its location on the computer network. An example of URL is https://www.Myweb.com

- Data Transmission Modes- The direction of the flow of information between two communicating devices can be determined by the data transmission modes. Data transmission modes are simplex, half-duplex and full-duplex. In simplex mode, data can flow only in one direction. In half-duplex mode, data can flow in both directions but in one direction at a time. In full-duplex mode, data can flow in both the directions at the same time.

- Synchronization- To transmit a long file, the session layer allows a process to add checkpoints. So, if a crash encounters during data transmission, the transmission of the file resets from the last checkpoint. This process is called data synchronization.

- Encryption and Decryption- The network layer adopts a privacy policy to transmit sensitive information. Encryption is the process of converting the original message in some other meaningless form called ciphertext. Decryption is the process of converting the meaningless message (ciphertext) into its original form at the receiver end.

- Data Compression- Compression is the process of reducing the number of bits contained in the message to be transmitted.

10.9   CHECK YOUR PROGRESS

Objective type questions-

a)   An interconnected network of networks is known as..... ....

b)   IP stands for ....

c)   A .... is a collection of local area networks within a city.

d)   The internet is an example of a .... network.

e)   .... layer of TCP/IP model deals with TCP and UDP protocols.

f)   A single computer on a network is known as a ....

g)   Bits are packaged into frames at .... layer of OSI model.

h)   The physical layer is concerned with the movement of .... over the physical medium.

i)   The .... layer of OSI model is responsible for encryption and decryption.

j)   ARPA stands for ....

Descriptive type questions-

a)   What is a computer network? Describe the types of computer networks?

b)   Explain the brief history of Internet?

c)   Describe the OSI model with the functionality of each layer?

d)   List the services of internet?

e)   What protocols are parts of different layers of TCP/IP suite?

Answer (Objective type questions)-

[a] Internet   [b] Internet Protocol   [c] MAN   [d] Wide Area   [e] Transport

[f] Node   [g] Data Link   [h] Bits   [i] Presentation

[j] Advanced Research Project Agency

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UNIT- 11

E-CONTENT DEVELOPMENT

11.1   INTRODUCTION

Knowledge and information can be sourced by utilizing e-content technology. E-Content is a web-based blended interactive way of digital content that is electronically delivered. For electronic learning, it becomes essential to develop e-content with the varieties of tools available. There exist many e-content delivery platforms to exhibit our content. Some of the basic tools for developing interactive e-content, simple delivery platforms, and grading tools are explained in this unit. In a developing country like India e-learning can raise the level of education, literacy, and economic development. Learning anything, anywhere, at any time is the current scenario.

E-Contents provided through e-learning are the future content system for school education to higher education and even for faculty members. Currently, e-contents are available for

school education, diploma, degree, postgraduates, research scholars, and faculty members. There is an enormous growth rate in the tools used for designing a learning management system. The actual challenge here is the need to develop interactive courses that are both rich in content and interesting to the viewer. Many tools such as e-content generators, screen casting tools, audio and video creator, animations, simulators, grading tools, content management tools, survey tools, editorial calendars, and many more are available to create a rich and powerful delivery platform. The e-content growth rate in India is less compared to other developing countries.

11.2   OBJECTIVES

After the successful completion of this unit, you will be able to-

- Know the basic tools and techniques of e-content development.
- Define the benefits and importance of e-content development.
- Understand the basic concepts of HTML.
- Understand the basic concepts of website planning for e-content/e-tutorials.

11.3   E-CONTENT

The rapid development in computer technology, together with the use of computers by the teachers paved the way for the introduction of computers in teaching and learning. With the advancement of technology, the computer has become more user-friendly so teachers can develop e-content easily. E-content is a very powerful tool of education. E-content is valuable to the learners and also helpful to teachers of all individual instruction systems. E-content is the latest method of instruction that has attracted more attention to gather with the concept of models.

E-content can be defined as the digital content (electronic-content) that can be transmitted over a computer network such as the Internet. (Source- Wikipedia)

Types of E-content-

E-content is termed as electronic content including text, image, graphics, animation, audio, and video. Sometimes, e-content can be carrying any one of the above elements or all of the above together to display offline or online web-pages and also to be transferable to computer to another computer and internet.

Electronic content (e-Content) or digital content is defined by those involved in creating, providing, and distributing information 4 as the digitized content, which is viewed on screen and not on paper. Contents that are produced and stored electronically rather than in print are the result of electronic publishing (e-publishing). The contents can be in any of the following forms:

[i] Any one information type (for example fully textual, only graphics content, or only audio content)

[ii] Multimedia or hypermedia (i.e. mixing more than two information type)

E-Resources-

Pictures, photos, audios, videos, demonstrations, animations, graphics, etc can be included based on the interest of the investigator or producer. The most important aspect is that the material should be accessible and knowledge based and also help induce individual's interest to learn. These things must be kept in mind while preparing a perfect content based on the learner's level of understanding.

Text format-

Text font selection is the main area of concern regarding the e-content presentation while developing a package. The preferred font may be taken as Times new roman, Bookman Old style, San serif, Serif, etc. The font visionary and style can also form an important aspect during development.

Video-

Avoid ambiguity while preparation, casual, providing enough spacing between words and sentences, correct pronunciation for the words, relevance, modulation, voice pitch corrections, clarity in visual presentation mode, etc should be done for perfection.

Image, photo, and picture-

Quality items should be selected while downloading. High-resolution formats are fairly preferred and pixels should be high rated so that magnification or zooming done during learning leads to usefulness for learners.

Script writing-

It's an art. The script writing reveals the interest of the investigator and helps the developer as well in the successful development of a package. Relevant sentences with simple meaning are usually accepted. Being a writer, one should not include his/her higher level language to complete the work. The script should be easy to read and the learner should not have difficulty in understanding its meaning. A higher level of language style or tough words should not be used anywhere. Most important is the script should be written according to the level of the learner's class. Precision is another equally important attribute. It should be like an actual classroom practice environment.

11.4 BENEFITS AND IMPORTANCE OF E-CONTENT DEVELOPMENT

Advantages of E-Content-

Many institutions publish books, research reports, lecture modules, and other information for academic purposes. All these publications are usually in-print form and stored in the library for fellow lecturers, researchers and students use. Are there compelling reasons why these in-print publications should be in electronic form? To answer this, it is necessary to identify the advantages and disadvantages of printed content (p-content) and e-content. According to Bonime and Pohlmann, (1998) e-contents benefit from-

- Hyper linking - contents can be linked to other pages inside and outside the book.
- Non-linearity - the order of access can be determined by users.
- Addition of multimedia - content presentation is enhanced by mixing information type (i.e. sound, video and so on) data density - storage capacity is decreased increasing portability simultaneously.
- Searching - the usefulness of the content is enhanced by the ability of the users to locate any piece of information or to access any section instantly.

Importance of E-Content

- E-content is user friendly and one can download and use text materials on any computer independently.
- E-content being learner friendly is easy to navigate.
- Another important feature of e-content is that being learner-centric it proves quite useful in the self-instructional model.
- E-content is also teacher's friendly and can used in various teaching- learning methods such as classroom, lecturing to a group, lab session.

11.5 *TOOLS AND TECHNIQUES OF E-CONTENT DEVELOPMENT*

Nowadays, a wide range of tools are present to help create e-content from simple PowerPoint presentations to 3D animations. The E-content is actually a virtual teacher which provides us high-quality digital content that is well designed, developed, and validated. Various factors like the subject, its complexity, learner, and nature of the content influence the design. Several models and design strategies are available to develop the e-content. The general steps that are mostly followed are analysis, design, development, implementation, and evaluation.

Articulate Storyline is easy to use software that helps create virtually powerful content that is both interactive and easily accessible to mobile users. An optimal view is automatically provided to mobile users. The triggers are used to create effective interactivity in storyline. We can decide when an action should take place, where should it take place (like in the same layer or other layers) and what should be the action that is possible only with triggers. It is also possible to create a questionnaire that may include true/false, MCQs, match the following, image matching, etc. Simple animations can be created here as well. The tables are
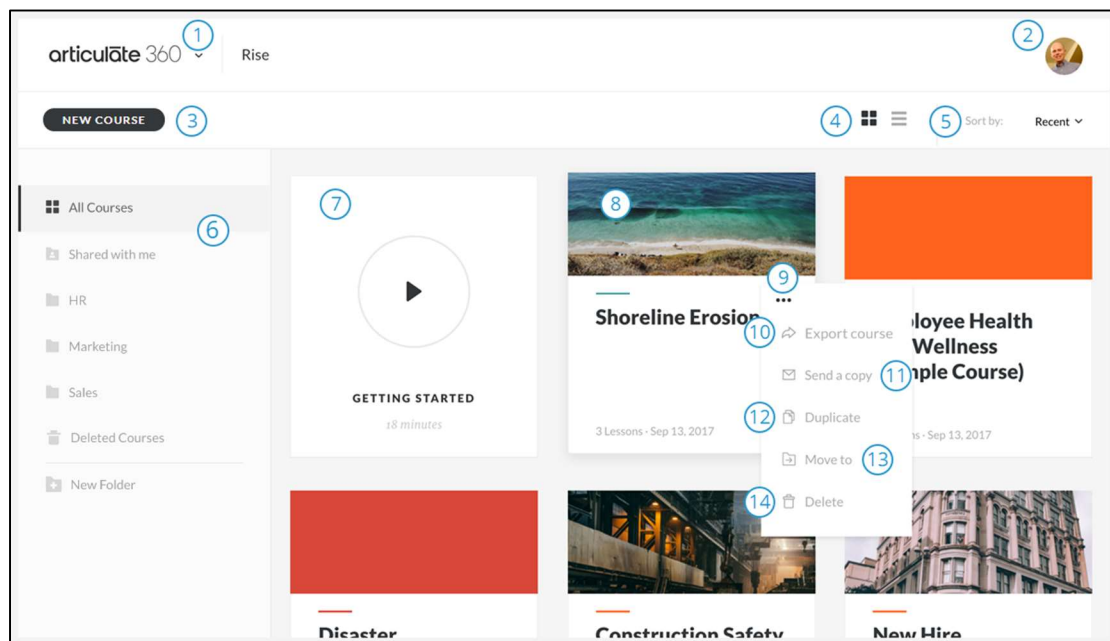
used here to organize the content and present them neatly to the user.

Figure 11.1 Articulate Storyline Screen Shots

[1] Screen Casting Tools

The screen output is the video screen capture along with the audio that can be digitally recorded. This is known as screen casting. Many softwares are available for screen casting some of them include CamStudio, Screencast-O-Matic, Screenr, and Jing which are available free. Some are free web-based software. The Screencast-O-Matic is easy to use free web-based casting tool. By simply clicking the 'Start Recording' one can activate the online recorder. The user can choose the recording mode. They can record only the screen, webcam, or both and can select the region for recording on the screen. This can be saved on their computer or can be directly uploaded. Wevideo, Magisto, Videopad, Openshot are some video creators and editors.

[2] Audio Generators

The presentation will be powerful when we have audio accompanied with it. Many free software such as Free Sound Recorder, Audacity, and WavePad are available to record our

audio. Audacity is open source software that allows us to record live audio and comes with several features. The recorded audio can be cut, copied, and mixed with other sound effects. We can also change the speed or pitch of a recording. It is also possible to convert old recordings into digital form and edit any type of sound file formats.

[3] Animations

A picture is worth a thousand words similarly, an animation can make us understand even a complex system. Simulations or movement can be created by generating a chain of pictures and giving effects that create an optical illusion of movement. The common methods of presenting animations include video programs, motion picture, and various other forms are available. We can have a 2D or 3D animation in our presentation. A 2D animation creates movement in a two-dimensional space and allows us to create characters, storyboards, and backgrounds. In 2D animation the objects can move up, down, left, and right. 2D animation uses bitmap and vector graphics to create and edit animated images. Some of the popular software available are: Adobe Photoshop, Flash, Synfig, and Encore. 2D animations are easy to generate whereas 3D animation requires deep knowledge and skill in modelling 3D objects. Modelling, animation, and rendering form the basics of 3D animations.

There are many 2D to 3D open source converter software available. The convertor tool adds depth information to the 2D image. Different algorithms and techniques are used by different converters to convert a given 2D image into a 3D image. Some of the popular software available are: Blender, Make3D, 3DShade, Recap pro, Insight3D, ConvertImage, etc. Some of them are fully automatic and automatically estimates depth for an image. Most of the convertors get 2D images captured from a normal camera and store them in PC in standard image formats as input while adding depth using various techniques. Others are semi-automatic; we have to assign depth to various parts of the image. We need to define a few parameters like width, depth and the position of object explicitly.

[4] Grading Tools

To know the real outcome and to evaluate the student performance, grading becomes essential. It is a prime concern in deciding student success. Grading gives feedback to students on their performance and helps them know their strengths and weaknesses. Some of the tools available for grading are: ActiveGrade, LearnBoost, JumpRope, Answer pad, and FreshGrade. Rubric is a popular grading tool used for marking assignments, class participation, or overall grades. There are two types of rubrics namely holistic rubric and analytical rubric. They help us decide what criteria or essential elements must be present in the student's work to ensure that it is high in quality. A rubric allows us to the decide number of levels of achievement, components at each level, and their relation to the grading scheme. We can also add comments.

11.6   E-CONTENT DELIVERY PLATFORMS/TOOLS

The E-content delivery platform known as LMS (Learning Management System) is a server-based or cloud-based software program. LMS has information about courses, users, and course content. A learning management system provides a platform to teach and learn without depending on the time and space boundaries. Anybody can take any course in they are interested in. Learning Management System is a software application that manages various functions like administration of classrooms online, documentation of various courses, tracking the progress of the user, reporting of training programs, online events, and grading the users. Most of the LMS has the following features: Registration and Enrolment options to teachers and students, adding and deleting courses by Universities and other educational bodies, set different roles for users and managing user account, setting the course calendar, uploading and retrieving assignment, and resources. LMS is used by students, teachers, and administrators. LMS can be used by anyone interested in conducting online classes and storing or retrieving student's documents. The modules can be grouped under the following categories:

- Content Manager
- Course Manager
- Catalogue Manager
- User Profile Manager
- University Consortium Manager
- Learning Planner and Calendar

Some popular LMS software available in the market are: Canvas, MindFlash, LearnUpon, Moodle, Blackboard, Talentless, and BridgeLMS. One of the easy to work with and free online software available is the Canvas. Canvas upon simple registration allows us to create our own course in teacher's mode and as a student we can join n number of courses. It supports content in various formats, e.g. multimedia, video, and text. Users can have any number of modules and pages inserted into it. The option provides a way to insert any number of files uploaded to the Canvas which can be viewed by the student. Animations, simulations, interactive contents, audio files, and screen casting can be added to our course. This paves the way for the learner to properly understand the concept and have a clear idea. It also offers assignments to the students in order to evaluate and grade them easily. Teachers can modify information according to the need of the student.

Using the proper learning strategies, LMS can increase the motivation of learners, promote learning, encourage interaction, provide feedback and support during the learning process. However, improvement in teaching methodology and the outcomes of the learning are not guaranteed through the learning management system. This kind of teaching involves reuse of

the content and thus saves cost, effort, and time. Various innovative activities are offered to the learners to make learning active and interesting.
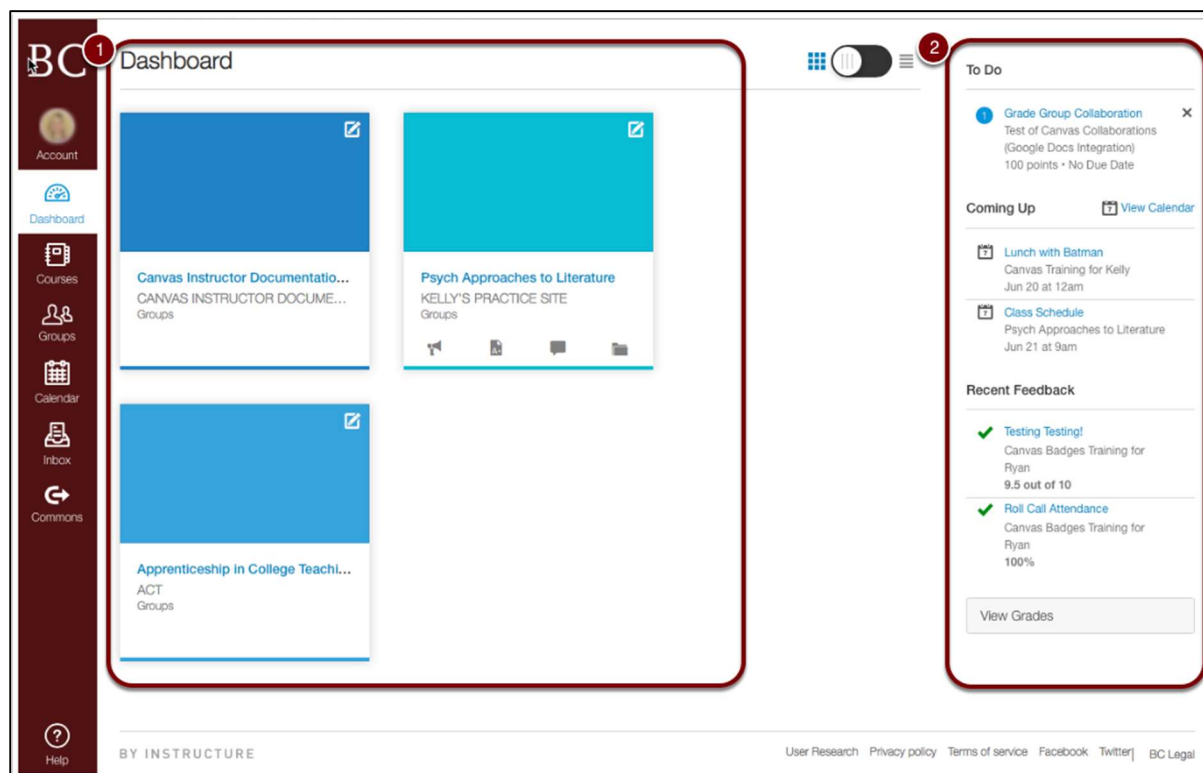

Figure 11.2 Canvas Instructure Screen Shots

11.7   OPEN SOURCE E-CONTENT DEVELOPMENT TOOLS

The e-learning community has several sets of technology standards and is currently developing additional standards. The ultimate vision is to have interoperability throughout the entire e-learning market. Until then, the e-learning community is fragmented into different systems adhering to various standards. The four most common standards are Aviation Industry Computer-based Training Committee (AICC), Sharable Content Object Reference Model (SCORM), IMS Global Learning Consortium, and Microsoft LRN. Many of the products offered in today's e-content marketplace are shifting from proprietary apps to open standards like HTML5. Open-standard products and software offer many of the same features as closed applications but provide the additional benefit of working across the most common device platforms. Open-standard products and software also allow for greater longevity, since the e-content can continue to be accessed through various devices even as technologies develop further

[1] eXe

eXe stands for e-learning xhtml editor, an authoring application to assist teachers and academics in the publishing of web content without the need to become proficient in HTML or XML markup languages. eXe grew out of the New Zealand Government Tertiary

Education Commission's e-collaboration fund led by the University of Auckland, Auckland University of Technology, and Tairawhiti Polytechnic. It was later supported by CORE Education, a New Zealand-based not-for-profit educational research and development organisation. It has also been greatly assisted by a global group of participants and contributors.

[2] Xerte

Xerte is an open-source content creation tool that allows non-technical staff to quickly and easily create built-in rich, interactive, and engaging resources with high levels of accessibility. Xerte was developed by the University of Nottingham supported by JISC Techdis.

[3] GLO Maker

GLO Maker is an authoring tool for creating rich, interactive learning resources. It builds on the extensive experience of the Centre for Excellence in Teaching and Learning (CETL) in Reusable Learning Objects. It is an open source and free for educational use. GLO Maker authoring tool is based on the new concept. Generative Learning Objects (GLO) approach inverts the traditional approach for reusability. The traditional approach to the reuse of learning objects has been to separate content from the context to make the content reusable. However, in GLO, it extracts successful pedagogical designs and makes these the basis for reuse (GLO Maker 2009). In this design-based approach for learning objects, designs have to be rendered explicit in two distinct ways. The first form relates to human understanding which is pedagogical design. Then, the design should be rendered to produce a learning object based on that design. GLO Maker was developed by London Metropolitan University.

[4] Course Lab

Course Lab is a powerful, easy-to-use, e-learning authoring tool that offers programming-free and WYSIWYG environment for creating high-quality interactive e-learning content. Features:

- Publish to HTML package.
- Publish to CD-ROM.
- Publish to SCORM 1.2 and SCORM 2004 package for import to any LMS supporting this standard.

[5] LAMS

LAMS, the Learning Activity Management System, is an open source Learning Design system for designing, managing, and delivering online collaborative learning activities. It provides teachers with an intuitive visual authoring environment for creating sequences of learning activities. These activities can include a range of individual tasks, small group work,

and whole class activities based on both content and collaboration. LAMS is inspired by the concept and principles of IMS Learning Design. LAMS was developed in collaboration with the LAMS Foundation, LAMS International, and the Macquarie E-learning Centre of Excellence (MELCOE), all based in Sydney, Australia, in affiliation with Macquarie University. LAMS have been developed since 2003.

11.8   INTRODUCTION TO HTML

Hypertext Markup Language (HTML) is the standard markup language for creating Web pages. HTML can be described as follows-

- HTML stands for Hypertext Markup Language.

- HTML describes the structure of a Web page.

- HTML consists of a series of elements.

- HTML elements tell the browser how to display the content.

- HTML elements are represented by tags.

- HTML tags label pieces of content such as "heading", "paragraph", "table", and so on.

- Browsers do not display the HTML tags but use them to render the content of the page.

The HTML Documents- We can use any text editor to write HTML over it, and save the document with dot html (.html) file extension. All HTML documents must start with a document type declaration: <!DOCTYPE html>. The HTML document itself begins with <html> and ends with </html>. The visible part of the HTML document is between <body> and </body>. Example-

<!DOCTYPE html>

<html>

<body>

<h1>My First Heading</h1>

<p>My first paragraph</p>

</body>

</html>

Html Elements and Attributes

An HTML element usually consists of a start tag and an end tag, with the content inserted in between- <tagname> Content goes here...</tagname>

The HTML element is everything from the start tag to the end tag:

<p>My first paragraph. </p>

HTML elements with no content are called empty elements. Empty elements do not have an end tag, such as the <br> element (which indicates a line break).

Nested HTML Elements- HTML elements can be nested (elements can contain elements). All HTML documents consist of nested HTML elements.

HTML Attributes- HTML attributes can be described as follows-

All HTML elements can have attributes

Attributes provide additional information about an element

Attributes are always specified in the start tag

Attributes usually come in name/value pairs like: name="value"

Commonly used attributes in html are as follows-

[1] The href Attribute

HTML links are defined with the <a> tag. The link address is specified in the href attribute:

Example

This is a link

[2] The src Attribute

HTML images are defined with the <img> tag.

The filename of the image source is specified in the src attribute:

Example

<imgsrc="img_girl.jpg">

[3] The width and height Attributes

HTML images also have width and height attributes, which specifies the width and height of the image:

Example

<imgsrc="img_girl.jpg" width="500" height="600">

[4] The alt Attribute

The alt attribute specifies an alternative text to be used if an image cannot be displayed.

The value of the alt attribute can be read by screen readers. This way, someone "listening" to the webpage, e.g. a visually-impaired person can hear the element.

Example

<imgsrc="img_girl.jpg" alt="Girl with a jacket">

[5] The style Attribute

The style attribute is used to specify the styling of an element, like color, font, size, etc.

Example

<p style="color:red">This is a red paragraph.</p>

HTML Tags- Some commonly used html tags are as follows-

Tag	Description
<!--...-->	Defines a comment
<!DOCTYPE>	Defines the document type
<a>	Defines a hyperlink
<area>	Defines an area inside an image-map
<b>	Defines bold text
<body>	Defines the document's body
 	Defines a single line break
<button>	Defines a clickable button
<center>	Defines cantered text
<figure>	Specifies self-contained content
<font>	Defines font, colour, and size for text
<footer>	Defines a footer for a document or section
<form>	Defines an HTML form for user input
<h1> to <h6>	Defines HTML headings
<head>	Defines information about the document
<header>	Defines a header for a document or section
<html>	Defines the root of an HTML document
<i>	Defines a part of text in an alternate voice or mood
<img>	Defines an image
<link>	Create link between a document and an external resource
<p>	Defines a paragraph
<table>	Defines a table
<title>	Defines a title for the document

11.9 *WEBSITE PLANNING AND STRUCTURE FOR E-CONTENT/E-TUTORIALS*

Guideline for Website Planning-

Basically, it's how your website is connected. How your main pages lead to deeper pages on your website. You can see it as how your navigation and sitemap are built.

Why Plan a Website Structure?

Well, you wouldn't build a house without a plan, so why would you want to build your business website without it. It can help to improve your user experience, your SEO, your internal linking and the simplicity of usage. You should understand that planning a structure isn't just about the main website it's also about the blog and internal linking.

Creating a website is a complex endeavour to embark on. Every change, every added functions, every addition of content increases the workload, time, and expense of a website, but all of that can be managed with a website plan. Creating a website plan saves you countless headaches down the road.

Steps for Creating Website Structure-

The essential steps for creating website structure are-

- Start by getting the basic insights to your business/applications- This means getting to know your own business. It's not just important when you talk to a designer or whoever will create your website. This is important when for you too.

- Start doing your keyword research- Next step would be to dive into the keyword research. Paid tools have even more data to give a bigger edge when researching for your business keywords.

- Competition research- In this step, we are technically still at keywords research, but we are going to go further into the competition of your website.

- Create your website's URL structure- Most common URL structure looks like this. You have a homepage, services, about us, references/work, blog, and contact. This will represent your hierarchy, URL structure, and the main navigation. You get something like this, a simple website diagram.
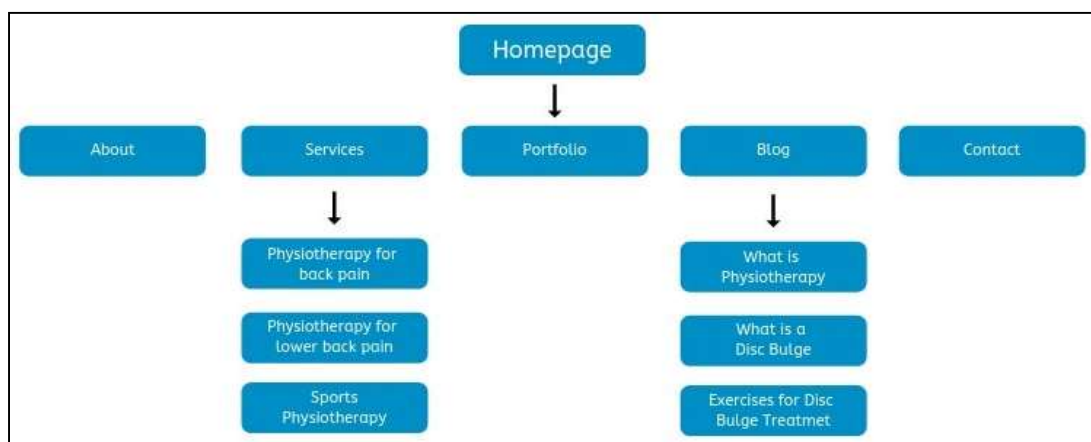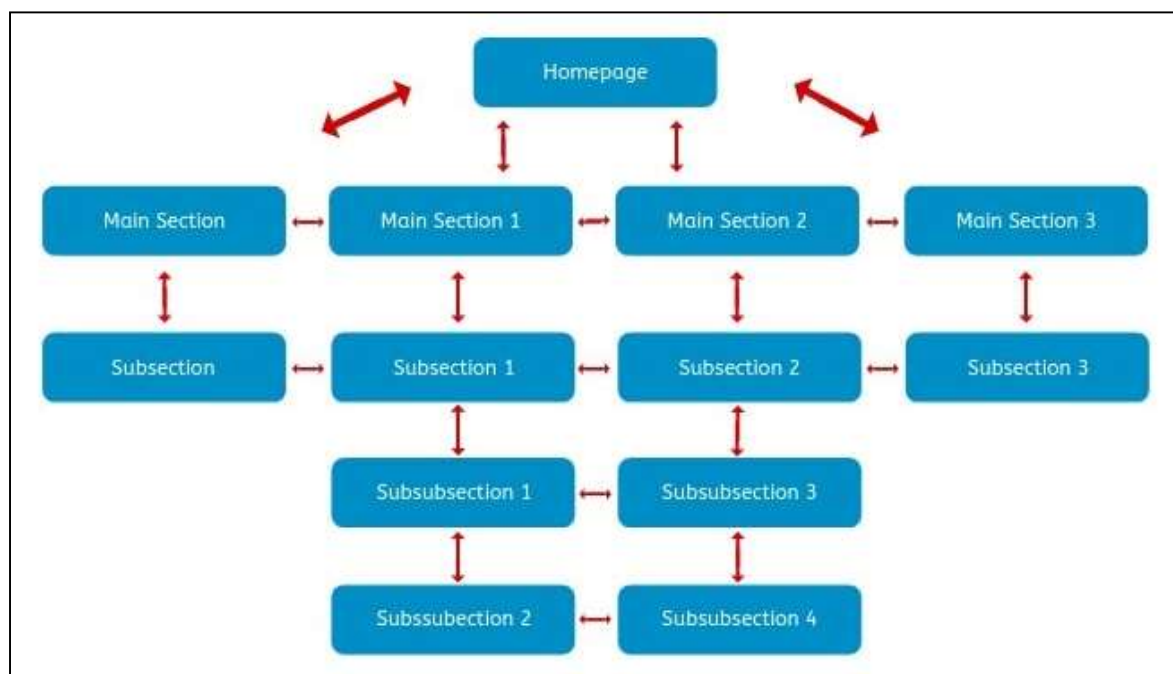

Figure 11.3 Sample website planning diagram

- Create a Simple and Logical Navigation- If you plan your website structure as shown above you shouldn't have any trouble creating the navigation for your website.

- Create Your Navigation with HTML and CSS- The safest way for crawlers to be able to read your navigation is to create your navigation with HTML and CSS.

- Create an Internal Linking Strategy- Internal linking is what makes your website structure to work for your website.

- It helps the structure to be logical, helps users navigate your website and establishes your shared information's hierarchy.

- Create a Sitemap for Your Website- The thing is that most search engines use sitemaps to find out about your new pages. It also helps search engines to index your pages faster

than if you don't have one. There are many tools (Sitemap Generator) to do that.

Figure 11.4 Website information hierarchy.

11.10 POINTS TO REMEMBER

- E-Content is a web-based blended interactive way of digital content that is electronically delivered.

- E-content technical definition: (Electronic-content) Digital content that can be transmitted over a computer network such as the Internet.

- E-content is termed as Electronic content that includes text, image, graphics, animation, audio, and video.

- There exit wide varieties of tools to create e-content from simple PowerPoint presentations to 3D animations which create virtual reality of the object under study.

- Some of the tools available for grading are: ActiveGrade, LearnBoost, JumpRope, Answer pad, and FreshGrade.

- The E-content delivery platforms like LMS (Learning Management System) are a server-based or cloud-based software programs.

- Open source software is a software with free to access to the public and lots of people in the world.

- HTML is the standard mark-up language for creating web pages.

- Creating a website is a complex endeavour to embark on. Every change, every added functions, every addition of content increases the workload, time, and expense of a website, but all of that can be managed with a website plan.

11.11 GLOSSARY

- CSS- Cascade Style Sheet.

- URL- Uniform Resource Locator.

- DOCTYPE- Document Type.

- LAMS- Learning Activity Management System.

- AICC- Aviation Industry Computer-based Training Committee.

- SCORM- Sharable Content Object Reference Model.

- LMS- Learning Management System.

- 2D- Two Dimensional.

- 3D- Three Dimensional.

11.12 CHECK YOUR PROGRESS

Objective type questions-

a) Electronic-content Digital content that can be transmitted over a computer network such as the Internet. (True/False)

b) E-content is termed as special content that include text and image only. (True/False)

c) The E-content delivery platform is known as FMS (File Management System). (True/False)

d) Open-source software is a software which codes are free – to – access to the public; and lots of people in the world. (True/False)

e)   HTML stands for Hyper Text Makeup Language. (True/False)

Descriptive type questions-

a)   What do you mean by E-Content? Why it is important for today's education system?

b)   What are the tools and techniques used for E-Content development?

c)   Describe Open Source E-Content development tools.

d)   What is HTML? What is the difference between html element and html attribute?

e)   Why do we need to plan a website before design it? Explain.

f)   What are the steps to design a website structure?

Answers (Objective type question)

[a] True   [b] False   [c] False   [d] True   [e] False

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UNIT- 12

E-GOVERNANCE

12.1 INTRODUCTION

E-governance because of its scope and aims is highly relevant in today's era. In simple terms, it is the use of information communication technologies (ICTs) to carry out public services, that is to say, the use of the internet to ensure that services are delivered in a much more convenient, customer-oriented, and cost-effective manner. In other words, the e-governance is the application of Information Technology to the processes of government functioning in order to achieve a Simple, Moral, Accountable, Responsive, and Transparent (SMART) Governance.

In the overall perspective, the e-governance is simply the use of ICTs in the operations of government businesses, put in another way, it is the shift from the traditional method of carrying out government activities which is mainly hierarchical, linear, and one-way to the use of internet which enables the public to seek information at their own convenience and not really having to visit the office in person or when government office is open.

The major objectives of e-governance are to improve government processes (e-administration), connect citizens (e-citizens and e-services), and build external interactions (e-society). Despite these objectives, making and implementing decisions, proper leadership, putting in place organizational arrangements, ensuring resources and funding, establishing accountability and measuring success, telecommunications network, internal agency systems, cross-government systems, service delivery network access points, internet access, and skilled staff, better delivery of government services to citizens, improved interactions with business and industry, citizen empowerment through access to information, and more efficient government management are the factors that must be taken into consideration for the success of e-governance implementation.

12.2   OBJECTIVES

After the successful completion of this unit, you will be able to-

*   Understand the role of e-governance for smart administration.

*   Define the importance of e-governance.

*   Explore e-governance projects in India.

*   Define the types and applications of e-governance.

*   Know the challenges of e-governance in India.

12.3   E-GOVERNANCE: AN OVERVIEW

The 'e' in e-Governance stands for 'electronic'. Thus, e-Governance is basically associated with carrying out the functions and achieving the results of governance through the utilization of Information and Communications Technology (ICT). Why countries around the world are increasingly opting for 'e-Governance'? In the last few decades, the expectations of citizens from the government have increased manifold. ICT facilitates efficient storing and retrieval of information, instantaneous transmission of information, processing information & data faster than the earlier manual systems, speeding up governmental processes, taking decisions expeditiously & judiciously, increasing transparency, and enforcing accountability.

The primary purpose of governance is the welfare of citizens. While one aspect of governance relates to safeguarding the legal rights of all citizens, an equally important aspect is concerned with ensuring equitable access to public services and the benefits of economic growth to all. It is expected that e-governance would enable the government to discharge its functions more effectively and can be able to work with more transparency.

In India, during the initial stage of introduction of ICT in governance there was some resistance. There were also serious doubts about whether government employees at all levels would be able to handle computers. As time passes, all goes beyond and fortunately all these misgivings have proved wrong.

Today, new technology makes the machine-human interface very user-friendly. The Information Technology (IT) and Information Technology Enabled Services (ITES) sectors have created millions of jobs besides improving vastly on the services provided by government undertakings like Banks, Airlines, Railways, etc.

As a country like India, with 1.3 billion population, more than 600,000 villages, growing economy coupled with increasing aspirations of the citizens for a better quality of life – use of Information Technology in improving government processes is not just become vital but essential and without which it would be extremely difficult, if not impossible, to serve its citizens efficiently and transparently and ensure participation of a larger number of people in decision making at all levels of government– Centre, State and local.

The National e-Governance Division (NeGD) is providing strategic direction in terms of framing policies and implementation strategy for the Digital India Programme in different domains of e-Governance. And also provides, proactive support to Central and State Governments for Mission Mode Projects (MMPs) and other e-Governance projects acting as a facilitator and catalyst for the implementation of the Digital India Program by various Ministries and State Governments.

The NeGD also ensures effective citizen engagement and communication with all stakeholders using offline and Social Media channels. The role of NeGD in training and development initiatives, including- development of competency frameworks, training guidelines, case studies, etc. and developing online and web-based training and setting up of Learning Management System, knowledge management and sharing through workshops, development of case studies, sharing best practises, creation of knowledge repositories, etc.

The e-governance is, in essence, the application of Information and Communications Technology to government functioning to create 'Simple, Moral, Accountable, Responsive, and Transparent (SMART) governance. The e-governance involves the use of ICTs by government agencies for any or all of the following reasons, as-

- Exchange of information with citizens, businesses, or other government departments.

- Speedier and more efficient delivery of public services.

- Improving internal efficiency.

- Reducing costs/increasing revenue.

- Re-structuring of administrative processes and improving the quality of services.

The e-governance aims to make the interaction between government and citizens (G2C), government and business enterprises (G2B), and inter-agency relationships (G2G) more friendly, convenient, transparent, and inexpensive. The goals of e-Governance are-

- Better service delivery to citizens.

- Ushering in transparency and accountability.

- Empowering people through information.

- Improved efficiency within Governments.

- Improve interface with business and industry.

12.4   IMPORTANCE AND BENEFITS OF E-GOVERNANCE

E-governance is about reforms in governance, facilitated by the creative use of Information and Communications Technology (ICT). The importance and benefits of e-governance are not limited in respect to good governance, and citizen empowerment, few of them are as follows-

- E-Governance brings governments closer to the citizens.

- Provide simplicity, efficiency, and accountability in the government- Applications of ICT to governance combined with detailed business process re-engineering would lead to simplification of complicated processes, weeding out of redundant processes, simplification in structures & changes in statutes, and regulations. The end result would be the simplification of the functioning of government, enhanced decision-making abilities, and increased efficiency across government– all contributing to an overall environment of more accountable government machinery. This, in turn, would result in enhanced productivity and efficiency in all sectors of government functioning.

- E-governance empowers people to gather information regarding any department of government and get involved in the process of government decision making.

- E-Governance strengthens democracy by ensuring greater citizen participation at all levels of governance.

- E-Governance leads to automation of services, ensuring that information regarding every work of public welfare is easily available to all citizens.

- E-Governance revolutionizes the way governments function, ensuring much more transparency in the functioning, thereby eliminating corruption.

- If the information regarding every activity of government is easily available, it would make every government department responsible as they know that every action of theirs is closely monitored.

- Expanded reach of governance- Rapid growth of communications technology and its adoption in governance would help in bringing government machinery to the doorsteps of the citizens. Expansion of telephone network, rapid strides in mobile telephony, the spread of internet, and strengthening of other communications infrastructure would facilitate the delivery of a large number of services provided by the government.

- Proper implementation of e-Governance practices makes it possible for people to get their work done online thereby sparing themselves of unnecessary hassles of travelling to the respective offices.

- Successful implementation of e-Governance practices offers better delivery of services to citizens, improved interactions with businesses, and industries.

- E-governance helps citizen empowerment through access to information, better management, greater convenience, revenue growth, cost reductions, etc.

- Enabling Environment for Promoting Economic development- Technology enables governments to create positive business climates by simplifying relationships with businesses and reducing the administrative steps needed to comply with regulatory obligations. There is a direct impact on the economy, as e-procurement creates wider competition and more participants in the public sector marketplace.

12.5   TYPES OF INTERACTIONS IN E-GOVERNANCE

The e-governance facilitates interaction between different stakeholders in governance using ICT, such types of interactions are grouped into the following, as-

Government to Government Model (G2G)-

The G2G refers to the online communications between government organizations, departments, and agencies based on a super-government database. Moreover, it refers to the relationship between governments. G2G model of e-governance aims to enhance and improve inter-government organizational processes by streamlining cooperation and coordination among various government departments/organizations. The efficiency and efficacy of processes are enhanced by the use of online communication and cooperation which allows for the sharing of databases and resources and the fusion of skills and capabilities.

Government-to-Business (G2B)-

Government to business is another type of e-governance model which enables significant efficiencies to both governments and businesses. G2B includes various services exchanged between government and the business sector services. The business services offered include obtaining current business information, new regulations, downloading application forms, lodging taxes, renewing licenses, registering businesses, obtaining permits, and many more. Nowadays, the government-to-business (G2B) model has been receiving a significant amount of attention.

Government-to-Citizens (G2C)-

Government-to-Citizens (G2C) model of governance has been designed to facilitate citizen interaction with the government. It allows citizens to access government information and

services instantly, conveniently, from everywhere. The government-to-citizen model of governance focuses on customer-centric and integrated electronic services where public services can be provided based on a 'one-stop solution' concept. This implies that every citizen can get single window access to government services. G2C model of governance facilitates several services to the citizens, e.g. certifications, paying governmental fees, and applying for benefits schemes of government, etc.

Government-to-Employees (G2E)-

Government is by far the biggest employer and like any organization, it has to interact with its employees on a regular basis. This interaction is a two-way process between the organization and the employee. Use of ICT tools helps in making these interactions fast and efficient on the one hand and increase satisfaction levels of employees on the other so that the G2E model of governance is a valuable model of smart administration.

12.6   E-GOVERNANCE PROJECTS IN INDIA

The Government of India (GoI) established the Department of Electronics in 1970. The subsequent establishment of the National Informatics Centre (NIC) in the year 1977 was the first major step towards e-Governance in India. In the early 1980s, the use of computers was confined to very few organizations. The advent of personal computers brought the storage, retrieval, and processing capacities of computers to Government offices. By the late 1980s gradually, with the introduction of common use software such as word processing and other kinds of software, the computers were put to other uses like managing databases and processing information, etc.

Advances in communications technology further improved the versatility and reach of computers, and many government departments started using ICT for a number of applications like tracking movement of papers and files, monitoring of development programmes, processing of employees payrolls, generation of reports, etc.

The main thrust for e-governance was provided by the launching of the National Informatics Centre Network (NICNET) in 1987, the national satellite-based computer network. This was followed by the launch of the District Information System of the National Informatics Centre (DISNIC) programme to computerize all district offices in the country for which free hardware and software was offered to the State Governments.

A National Task Force on Information Technology and Software Development was constituted in May 1998, while recognizing Information Technology as a frontier area of knowledge per se, it focused on utilizing it as an enabling tool for assimilating and processing all other spheres of knowledge. It recommended the launching of an 'Operation Knowledge' aimed at universalizing computer literacy and spreading the use of computers and IT in education.

In the year 1999, the Union Ministry of Information Technology was created. By the year 2000, a 12-point minimum agenda for e-Governance was identified by the Government of India for implementation in all the Union Government Ministries/Departments. Some glimpse of the agenda-

- Each Ministry/Department must provide Personal Computers (PCs) with necessary software up to the Section Officer level. Besides, Local Area Network (LAN) must also be set up.

- It should be ensured that all staff with access and need to use computer for their office work are provided with adequate training. To facilitate this, inter alia, Ministries/Departments should set up their own or share other's Learning Centres for decentralized training in computers as per the guidelines issued by the ministry.

- Each Ministry/Department should start using the Office Procedure Automation software developed by NIC to keep a record of receipt of 'dak', issue of letters, as well as the movement of files in the department.

- Payroll accounting and other house-keeping software should be put to use in day-to-day operations.

Emergence of the National e-Governance Plan (NeGP)-

About the future of e-governance, the lighting words by the great visionary Dr. APJ Abdul Kalam, former President of India, in his inaugural address at IIT Delhi (India) during 2003 at International Conference on 'e-governance' can be summarized as- "E-governance has to be citizen-friendly. Delivery of services to citizens is considered a primary function of the government. In a democratic nation of over one billion people like India, e-governance should enable seamless access to information and seamless flow of information across the state and central government in the federal set up. No country has so far implemented an e-governance system for one billion people. It is a big challenge before us."

About National e-Governance Division (NeGD)-

In the year 2009, National e-Governance Division was established by the Ministry of Electronics & Information Technology (MeitY) as an Independent Business Division under the Digital India Corporation. NeGD has played a pivotal role in executing e-governance Projects and initiatives undertaken by Ministries/ Departments, both at Central and State levels. The roles and responsibilities of NeGD are-

a) Providing strategic direction in terms of framing policies and implementation strategy for the Digital India Programme in different domains of e-Governance.

b) Proactive support to Central and State Governments for Mission Mode Projects (MMPs) and other e-governance projects.

c) Acting as a facilitator and catalyst for the implementation of the Digital India Program by various Ministries and State Governments.

d) Providing technical assistance to Central Ministries/ State Line Departments in their e-governance projects either directly or in collaboration with professional consultants.

e) Undertaking technical appraisal of e-governance projects for examining issues like overall technology, architecture, framework standards, security policy, service delivery mechanism, sharing of common infrastructure, etc.

f) Developing generic / model Expression of Interest (EoI), Request for Proposal (RFP), Standard Contracts, PPP Models, and other related documents for various stages and requirements of projects for the use of States.

g) Ensuring effective citizen engagement and communication with all stakeholders using offline and Social Media channels

h) Impact assessment and e-Readiness measurement of e-Governance projects of all States / UTs.

i) Recruitment, deployment and HR management of specialised resources in the State e-Governance Mission Teams (SeMTs) in all States and UTs

j) Training and development initiatives, including- (i) Development of competency frameworks, training guidelines, case studies, etc. (ii) Developing Online and Web-based Training and set up Learning Management System (iii) Knowledge management and sharing through workshops, development of case studies, sharing best practises and creation of knowledge repositories, etc

Implementation Strategy for E-governance-

The approach and methodology adopted for NeGP contains the following elements-

- Common Support Infrastructure.

- Governance- Suitable arrangements for monitoring and coordinating the implementation of NeGP under the direction of the competent authorities have been set up.

- Centralized Initiative, Decentralized Implementation.

- Public-Private Partnerships (PPP) model is to be adopted wherever feasible to enlarge the resource pool without compromising on the security aspects.

- Programme Approach at the National and State levels.

- Ownership of Ministries- Under the NeGP, various Mission Mode Projects (MMPs) are owned and spearheaded by the concerned line ministries.

Some Mission Mode Projects implemented by NeGD-

[1] Unified Mobile Application for New-age Governance (UMANG)-

UMANG is envisaged to make e-governance. It provides a single platform for all Indian citizens to access pan India e-Gov services ranging from central to local government bodies and other citizen-centric services. UMANG intends to provide major services offered by central and state government departments, local bodies, and other utility services from private organizations. It provides a unified approach where citizens can install one application to avail multiple government services. UMANG service has been made available on multiple channels like mobile application, web, IVR, and SMS which can be accessed through smartphones, feature phones, tablets, and desktops.

Note- Download UMANG App by giving us missed call on 97183-97183 or Visit- https://web.umang.gov.in/web/#/

[2] DigiLocker-

DigiLocker system is a flagship initiative of the Ministry of Electronics & IT under the Digital India Programme. Targeted at the idea of paperless governance, DigiLocker aims to provide a digital wallet to every citizen of the country so that all lifelong documents/certificates can be electronically held under a single secure digital wallet. DigiLocker is a platform for issuance and verification of documents & certificates digitally, eliminating the use of physical documents. Indian citizens who sign up for a DigiLocker account get a dedicated cloud storage space that is linked to their Aadhaar(UIDAI) number.

Note- To access Digilocker visit at- https://digilocker.gov.in

[3] National Centre of Geo-informatics (NCoG)-

NCoG is a single source Geographic Information System (GIS) platform for sharing, collaboration, location-based analytics, and decision support system, catering to central and state ministries/departments/agencies across the country. Under this project, location-based datasets such as data related to central government land banks, mining, forests, industrial parks, water resources, etc. are collated with attribute related data to bring out insights that are useful to support decision making. User departments can now pinpoint their operations, assets on a map, and plan better. NCoG has provided mobile applications for geo-tagging and creating evidence of completed operations under the Government schemes.

Note- To access NCoG visit at- https://ncog.gov.in/

[4]- Rapid Assessment System (RAS)

RAS is an online instant feedback for e-services (online as well as offline through counters) delivered by the Government of India and State Governments. The main objective of RAS is

to continuously assess the quality of e-Services, through feedback, under each e-governance project and realign processes to achieve targeted benefits. RAS interface prompts the citizens to provide feedback about the quality of service immediately after the citizen avails an e-service of the Government. The analytic features of RAS help integrated departments in system improvement and better delivery of services.

Note- To access RAS visit at- https://ras.gov.in/

[5]- Program Management Information System (PMIS)-

PMIS build using open source technologies is used to track and monitor project initiation, planning, execution, and management. It can be utilized for Central/State/Integrated MMPs, Departmental and Adhoc projects under the Digital India programme.

Note- To access PMIS visit at- https://pmis.negd.gov.in/

[6]- OpenForge platform-

The objective of the OpenForge platform is to promote sharing and reuse of e-governance application source code. In 2015, the Ministry of Electronics & IT, Government of India rolled out the 'Policy on Collaborative Application Development by Opening the Source Code of Government Applications', which provides a framework for archiving government custom-developed source code in repositories and opening these repositories for promoting reuse, sharing and remixing. By opening the source code, the Government wants to encourage collaborative development between Government departments/agencies and private organizations, citizens, and developers to spur the creation of innovative e-governance applications and services.

The scope of the project includes the development of a Collaboration Platform under the 'Source Open Policy'. Further, it includes the creation of a project team, development and maintenance of the platform, on-boarding of departments, promotion of the platform, and community management. The community to be created and managed through the platform will be a key driver in bringing agility and quality to the application development process. It will also lead to further reuse and value addition to the e-governance software landscape.

Note- To access OpenForge visit at- https://openforge.gov.in/

[7]- Learning Management System (LMS)-

LMS is a software application that automates the administration, tracking, and reporting of training events. LMS is a pioneer project under e-Kranti (an e-governance plan initiated by the Government of India). It is widely recognised that there is a tremendous need to enhance the skill sets and to develop an adequate number of appropriately trained resources for handling a variety of tasks including those who are expected to design and deliver Government services to the citizens.

Note- To access LMS visit at- https://lms.gov.in/

[8]- Miscellaneous e-governance Projects in India-

- Passport Seva Project.
- Immigration, Visa and Foreigners Registration & Tracking (IVFRT).
- Insurance (Department of Banking)
- Income Tax (Ministry of Finance/Central Board of Direct Taxes)
- National Citizen Database/UID (Ministry of Home Affairs/Registrar General of India (RGI)/ Planning Commission, Now NITI Aayog).
- Central Excise (Department of Revenue/Central Board of Excise & Customs)
- Pensions (Department of Pensions & Pensioners Welfare and Department of Expenditure)
- Banking (Department of Banking)
- Land Records (Ministry of Rural Development)
- Road Transport (Ministry of Road Transport & Highways)
- Treasuries (Ministry of Finance)
- E-District (Department of Information Technology)
- Common Services Centres (Department of Information Technology)
- e-Courts (Department of Justice, Ministry of Home Affairs)
- e-Procurement (Ministry of Commerce & Industry/ DGS&D)
- And many more.

12.7 CHALLENGES OF E-GOVERNANCE IN INDIA

- Lack of motivation and awareness towards the role and importance of e-governance.

- Lack of citizen-centric nature of applications and poor cooperation among bureaucrats and people at the local level of governance.

- Lack of trust, poor technical designs which leads to lack of interoperability among distinct e-governance applications, and underutilization of ICT infrastructure resources.

- One of the challenges to attain the ability of high level of data abstraction is to maintain the privacy of data in designing e-governance applications.

- Authentication is very important to know the right user of the services or it may be misused by private competitors. Meanwhile, the digital signature plays a major role in providing authenticity. In fact, it is expensive and causes for frequent maintenance.

- Maintenance should be given due importance because IT ministry has been continuously developing new software to fill the current needs of citizens.

- Digital divide- Even in the era of science and technology, a huge gap exists between users and non-users of e-governance services. In India, majority of the masses, living below poverty line are deprived of government services. This gap needs to be made narrow, and then only the benefits of e-governance would be utilized equally.

- Infrastructure is essentially required for the implementation of e-governance as much as possible in India. Electricity, Internet, and poor adaptability of technology will retard the progress of e-governance. In the context of developing countries, there should be enough basic facilities to give an impetus to e-governance.

12.8 POINTS TO REMEMBER

- E-governance is simply the use of information communication technologies (ICTs) to carry out public services, that is to say, the use of the internet to ensure that services are delivered in a much more convenient, customer-oriented, and cost-effective manner.

- E-governance is the application of Information Technology to the process of government functioning to achieve a Simple, Moral, Accountable, Responsive, and Transparent (SMART) Governance.

- The major objectives of e-governance are to improve government processes (e-administration), connect citizens (e-citizens and e-services), and build external interactions (e-society).

- It is expected that e-governance would enable government to discharge its functions more effectively and can be able to work with more transparency.

- The National e-Governance Division (NeGD) is providing strategic direction in terms of framing policies and implementation strategy for the Digital India Programme in different domains of e-Governance.

- E-governance strengthens the democracy by ensuring greater citizen participation at all levels of governance.

- E-governance revolutionizes the way governments function, ensuring much more transparency in the functioning thereby eliminating corruption.

- The rapid growth of communications technology and its adoption in governance would help in bringing government machinery to the doorsteps of the citizens.

- E-governance helps citizen empowerment through access to information, better management, greater convenience, revenue growth, cost reductions, etc.

12.9 GLOSSARY

- CSC- Common Service Center.

- ERP- Enterprise Resource Planning.

- G2B- Government to Business.

- G2C- Government to Citizen.

- G2E- Government to Employee.

- G2G- Government to Government.

- GPS- Global Positioning System.

- ITeS- Information Technology enabled Services.

- MCA- Ministry of Corporate Affairs.

- NeGD- National e-Governance Division.

- NeGP- National e-Governance Plan.

- NISG- National Institute for Smart Government.

- PPP- Public Private Partnership.

- SMART- Simple, Moral, Accountable, Responsive, Transparent.

- SWAN- State Wide Area Network.

12.10 CHECK YOUR PROGRESS

Descriptive type questions-

a)   What are the benefits of e-governance?

b)   Explain the summarized view of e-governance in India.

c)   List five major challenges of implementing e-governance in India.

d)   Define in short, the various e-governance models.

e)   Define briefly the role and responsibilities of the National e-Governance Division (NeGD).

f)   List the name of ten miscellaneous e-governance projects in India.

Objective type questions-

a)   Infrastructure is essentially required for the implementation of successful e-governance projects. (True/False)

b)   One of the major challenges in implementing successful e-governance projects is a lack of motivation and awareness. (True/False)

c)   The National e-Governance Division (NeGD) is providing strategic direction in terms of framing policies and implementation strategy for the Digital India Programme in different domains of e-Governance. (True/False)

d)   PMIS stands for Prime Minister Information System. (True/False)

e)   DigiLocker aims to provide a digital wallet to every citizen of the country where we can deposit the money. (True/False)

f)   National e-Governance Division was established by the Ministry of ....

g)   Government-to-Citizens (G2C) model of governance has been designed to facilitate citizen interaction with ....

Answer (objective type question)-

[a] True   [b] True   [c] True   [d] False   [e] False

[f] Electronics & Information Technology   [g] Government

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12.12 SUGGESTED READINGS

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