

CONCEPTUAL QUESTIONS

Give a brief response to the following questions

1. What are free electrons?
2. What is the function of an accelerating anode in an electron gun?
3. If the electron beam in a television tube is striking just one point on the screen at a time, how can we get a full picture? Explain.
4. Why image is distorted when a magnet is brought close to old television screens or monitors with cathode ray tube (CRT) inside?
5. Assuming that cathode rays are a beam of charged particles, how could you demonstrate that these particles are negatively charged? Explain.
6. If there are 4 inputs in any logic gate, how many combinations are possible?
7. What conditions produce a high (1) output for an AND gate and NOR gate?
8. What are the algebraic Boolean expressions to represent the output of AND, OR, NOT, NAND and NOR gates?

COMPREHENSIVE QUESTIONS

Give an extended response to the following questions

1. Why electrons are emitted from an electrically heated metal filament?
2. What are cathode rays? How are cathode rays produced?
3. Describe the construction and working of electron gun?
4. What effect does an electric field and magnetic field have on the electron beam?
5. Describe the working principle of Cathode Ray Oscilloscope (CRO) and make list of its uses.
6. What is the difference between analogue and digital electronics?
7. Define logic gates. Describe the operation of AND, OR, NOT, NAND and NOR logic gates by drawing their symbols and truth tables.
8. Explain simple uses of logic gates in (a) automatic light bulb switching (b) textile coloring plant.

NOT FOR SALE

How ATM works?



Unit 17

INFORMATION AND COMMUNICATION TECHNOLOGY

After studying this chapter you should be able to

- ✓ describe the components of information technology.
- ✓ explain briefly the transmission of
 1. electric signals through wires
 2. radiowaves through air
 3. light signals through optical fibres
- ✓ describe function and use of a fax machine, cell phone, photo phone and computer.
- ✓ make a list of the use of E-mail and internet.
- ✓ describe the use of information storage devices such as audio cassettes, video cassettes, hard discs, floppy, compact discs and flash drives.
- ✓ identify the functions of word processing, data managing, monitoring and controlling.

STUDENT LEARNING OUTCOME

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- 17.1 Components of ICT
- 17.2 Flow of information
- 17.3 Telecommunication devices
- 17.4 Internet and email
- 17.5 Information Storage devices
- 17.6 Word processing
- 17.7 Handling information
- 17.8
- Key Points and Projects
- Exercise

This is the age of Information and Communication Technology (ICT). This field is constantly being developed, altered, and improved upon. It is evolving so rapidly that it is changing almost on a daily basis. The devices that were in use a decade ago are now outdated and some are partially replaced and some are totally replaced.

17.1 INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

Information and Communications Technology (or technologies) is the infrastructure and components that enable modern computing to create, access, analyze and communicate information. Human beings have always accessed information and communication, but what makes these present technologies special is that it has allowed more people to communicate faster and cheaper.

ICT system is made up of these components:

A. Data and information: Data is simply facts or figures – bits of information, but not information itself. When data is processed, interpreted, organized, structured or presented so as to make them meaningful or useful, they are called information. It may be in the form of text, sound, graphic or figure that has been processed in such a way as to be meaningful to the person who receives it.

B. Hardware: In information technology, hardware is the physical aspect of computers, telecommunications, and other devices. Hardware are the physical parts or machinery that we can touch. For example mouse, key board, printer, etc.

C. Software: A computer needs to be told what to do, software is the applications and programming instructions that tell your computer what to do. Software enable you to use a computer for things such as playing games, writing an essay or listening to music. These are machine-readable instructions that direct the circuitry within the hardware parts to store, process, transmit, receive and retrieve information in a specific manner.

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D. Procedures: These are set of instructions and rules to design and use information system. These are written in manuals and documents for use. These rules or methods may change from time to time. The Information System must be flexible to incorporate these changes.

E. Human resource: It is people who design and operate the software, they feed input data, build the hardware.

Figure 17.1 - Components of ICT



AUTOMATIC TELLER MACHINE (ATM)

Let us say you are withdrawing money from a nearby ATM (Automated Teller Machine). Can you make a list of all the things you need to do for that? You need your account number, ATM Card, your PIN and you need to enter the amount of money. When you put your card in the machine, it verifies your PIN, collects information about your bank account, the bank and the balance amount. The ATM machine does all of this, connects with you to the bank and allows you to withdraw the money.

So many things we do now are based on information. Many devices such as mobile phones, television, computers, tablets, cameras, scanners, collectively called ICTs, have made this possible. How we collect information, how we analyze it, how we communicate the information and how we use the information to make decisions are all very important.

17.2 FLOW OF INFORMATION

Flow of information is a particular view that focuses on the path and means followed by information entities.

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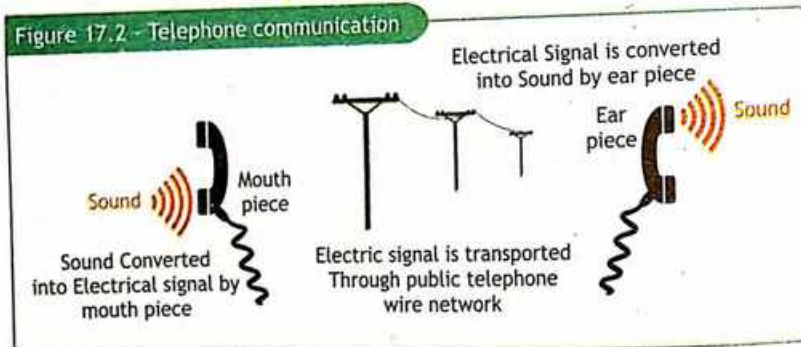
In telephone, information path is wires in which the information flows by means of electrical signals. In radio, television and cell phone, information path is either air, vacuum, and/or seawater in which the information travels in the form of electromagnetic waves or through optical fibres through which information travels in the form of light.

Signals are electric or electromagnetic representations of data or information. Transmission is the communication of data/information by the propagation and processing of signals.

17.2.1 Transmission of electrical signal through wire: Data or information can be transmitted and received over a wire-based communication technology. The information is converted to electrical signals at the transmitter, which is sent through wires (twisted pair, coaxial cable etc.), and information is converted back to original form at receiver's end. Examples include telephone networks, cable television and internet access.

For example in figure 17.2, a simple telephone model sound (voice) is converted into electrical signals through mouth piece and sent through electrical wires (twisted pair) and converted back to sound (voice) through ear piece at the receiver.

Figure 17.2 - Telephone communication

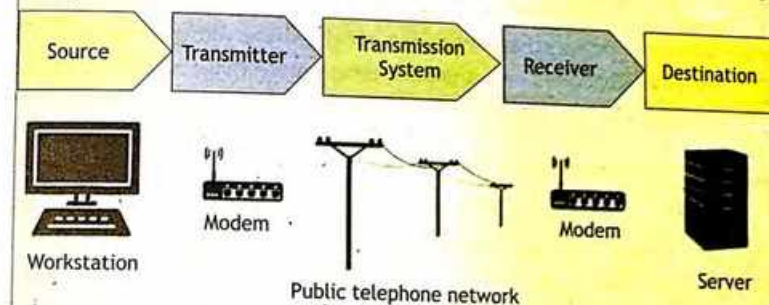


Electrical wire may be used to transmit both analog and digital transmission. For analog signals, amplifiers are required about every few kilometers and for digital transmission (using either analog or digital signals), repeaters are required every kilometer, depending upon the type of wire used.

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A COMMUNICATIONS MODEL

A simple model of communications is illustrated by the block diagram and example in figure below. The fundamental purpose of a communications system is the exchange of data between two parties. Figure below presents one particular example, which is communication between a workstation and a server over a public telephone network. Another example is the exchange of voice signals between two telephones over the same network.



The key elements of the model are as follows:

- A. Source:** This is the device that generates the data to be transmitted; examples are telephones and personal computers.
- B. Transmitter:** Usually, the data generated by a source system are not transmitted directly in the form in which they were generated. Rather, a transmitter transforms and encodes the information in such a way as to produce electromagnetic signals that can be transmitted across some sort of transmission system. For example, a modem takes a digital bit stream from an attached device such as a personal computer and transforms that bit stream into an analog signal that can be handled by the telephone network.
- C. Transmission system:** This can be a single transmission line or a complex network connecting source and destination.
- D. Receiver:** The receiver accepts the signal from the transmission system and converts it into a form that can be handled by the destination device. For example, a modem will accept an analog signal coming from a network or transmission line and convert it into a digital bit stream.
- E. Destination:** Takes the incoming data from the receiver.

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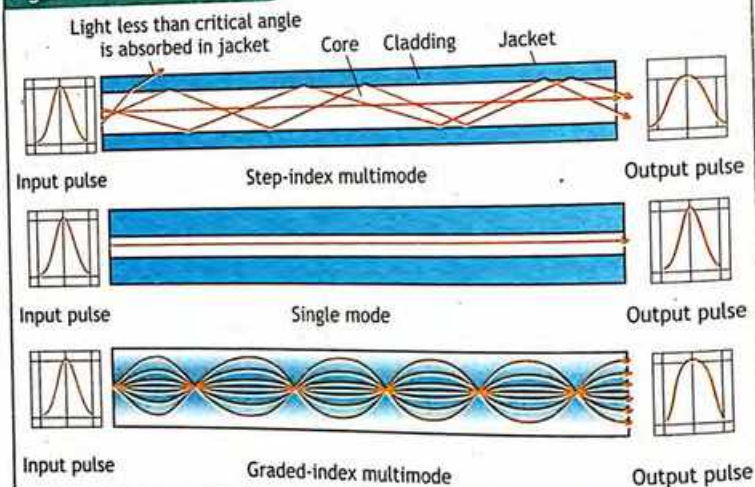
17.2.2 Transmission of electrical signal through optical fibers:

An optical fiber (discussed in chapter 12, geometrical optics) transmits a signal-encoded beam of light by means of total internal reflection. Total internal reflection can occur in any transparent medium that has a higher index of refraction than the surrounding medium.

The information is converted into electrical voltage signals, this varying voltage is used to produce light. Two different types of light source are used in fiber optic systems: the light emitting diode (LED) and the injection laser diode (ILD). Both are semiconductor devices that emit a beam of light when a voltage is applied. The LED is less costly, operates over a greater temperature range and has a longer operational life. The ILD, which operates on the laser principle, is more efficient and can sustain greater data rates. Figure 17.3 shows the principle of optical fiber transmission.

A. Step-index multimode: Light from a source enters the cylindrical glass or plastic core. Rays at low angles are reflected due to total internal reflection and travel along the fiber; other rays are absorbed by the surrounding material. This form of propagation is called step-index multimode. This type of fiber is best suited for transmission over very short distances.

Figure 17.3 - Optical Fibers



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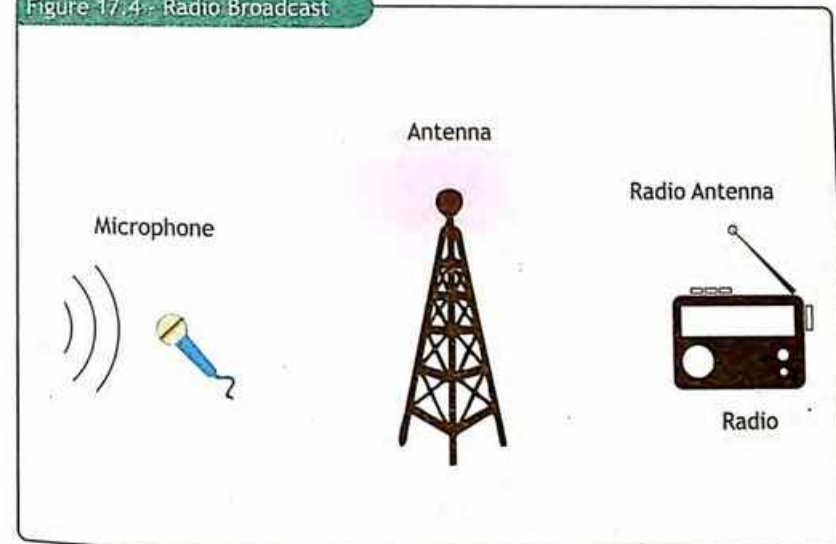
B. Single-mode: When the fiber core radius is reduced to the order of a wavelength, only a single angle or mode can pass. Single-mode is typically used for long distance applications, including telephone and cable television.

C. Graded-index multimode: When the index of refraction at the centre of the core is made higher and reduced gradually, light in the core curves helically due to variation in the index of refraction. The shortened path and higher speed allows light at the periphery to arrive at a receiver at about the same time as the straight rays in the core axis. Graded-index fibers are often used in Local Area Networks (LAN).

C. 17.2.3 Transmission of radio-waves through air or space: Electrical signals representing information from a microphone, a TV camera, or a computer (transmitters) can be sent from one place to another place using radiowaves.

For transmission of a signal, radio-frequency electrical energy from the transmitter is converted into electromagnetic energy by the antenna and radiated into the surrounding environment (atmosphere, space, water). For reception of a signal, electromagnetic energy falling on the antenna is converted into radio-frequency electrical energy and fed into the receiver.

Figure 17.4 - Radio Broadcast



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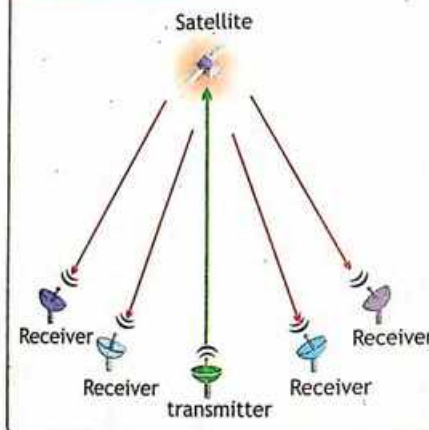
In two-way communication, the same antenna can be used for both transmission and reception.

An antenna can be defined as an electrical conductor or system of conductors used either for radiating electromagnetic energy or for collecting electromagnetic energy.

For example sound waves produced at the radio station as shown in Figure 17.4 are changed into electrical signals through microphone. These electric signals are then fed into the transmission antenna which superimposes these electric signals on electromagnetic waves and emits them, in form of radio-waves. At the receiving end, the receiver selects and amplifies this radio-wave signal. The receiver extracts the information and converts it to sound with the help of a speaker.

A communication satellite is in fact a microwave relay station. It is used to link two or more ground-based microwave transmitter/ receivers, known as earth stations, or ground stations. The satellite receives transmissions on one frequency band (uplink), amplifies or repeats the signal, and transmits it on another frequency (downlink). Figure 17.5 depicts in a general way communications between one ground-based transmitter and a number of ground-based receivers.

Figure 17.5 - Satellite Broadcast



17.3 TELECOMMUNICATION DEVICES

The machines or devices used to carry information to far off places is called telecommunication. Fax machine, cell phone, photo phone and computer are few examples of telecommunication devices.

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A. Fax machine: A fax machine (figure 17.6) is designed to send as well as receive documents so it has a sending part and a receiving part. The sending part is a bit like a computer scanner, that scans only one line of a document at a time, and only in black and white. A fax machine transmits one kind of electric pulse down the phone line to represent black and another to represent white.

Figure 17.6 - Fax Machine



The phone line transmits this information almost instantly to a fax machine at the other end. It receives the electrical pulses and uses them to control a printer. It takes about a minute or so to transmit a single page of writing (or a complex drawing) in very systematic way.

B. Cell phone: Wireless phones which receive their signals from towers. A cell is typically the area (several miles) around a tower in which a signal can be received.

Cell phones provide an incredible array of functions. Depending on the cell-phone model, you can:

- Store contact information
- Make task or to-do lists
- Send text messages
- Keep track of appointments and set reminders
- Use the built-in calculator for simple math
- Get information (news, entertainment, stock quotes) from the internet
- Send or receive e-mail

Figure 17.7 - Cell Phone



• Customizable Operating Systems (Oss - software that allows users to interact with the computer system) - enable the user to download apps (computer program designed to run a mobile device such as phone/tablet or watch) like games, GPS, watching TV, utilities, and other tools. Android, a mobile OS developed by Google, is the first completely open-source mobile OS, meaning that any cell phone manufacturer can use it in their phones for free.

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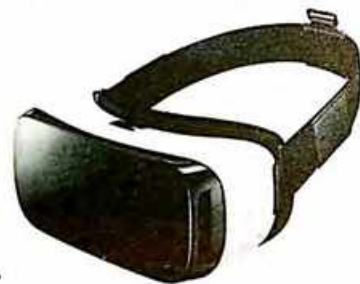
C. Photo phone: The photophone is a telecommunications device that allows transmission of speech (sound) on a beam of light. This means that the light we use will not only provide light but also act as a means of communication. Until the late 1960s, radio and radar communications were more successful than optical communications (OC). OC started to get real attention with the invention of the light amplification by stimulated emission of radiation (laser) and the laser diode (LD) in the 1960s, followed in the 1970s by the development of low-loss optical fibres (OFs) as a medium for transmitting information using light.

D. Computer: A computer is a device that can be instructed to carry out sequences of arithmetic or logical operations automatically via computer programming. Modern computers have the ability to follow generalized sets of operations, called programs. These programs enable computers to perform an extremely wide range of tasks. There are many different kinds of computer systems. Some computer systems are very big because they are used to carry out large and complex tasks. Others are small and portable - small enough to put in your pocket - even to wear around your wrist or as a pair of glasses. The table 17.1 looks at the ways in which various types of computer are used, as well as their characteristics.

POINT
TO
Ponder

Virtual reality (VR) is an artificial environment that is created with a software and presented to the user in such a way that the user accepts it as a real environment. The most important piece of a virtual reality kit these days is the headset, a device like a thick pair of goggles. VR devices have their own app stores, similar to smartphone app stores, where games and apps can be downloaded.

VR products are also used by many companies, often to test product designs and simulate user interaction, e.g. flight simulators and medical training.



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Table 17.1 TYPES OF COMPUTERS

Type of computer	Description	Advantages	Disadvantages
Mainframe computer 	These are extremely large computers used in organisations (such as banks and government departments) where very large amounts of data are processed.	- Capable of processing very big jobs, which make use of their large memories and fast processor speeds. - Capable of complex problem-solving that would take smaller computers much longer to do.	- Mainframes are so large that they take up almost a whole room. - Complex to set up. - Expensive to operate and maintain and they require specialist staff to operate.
Desktop or Personal computer (PC) 	This is a general purpose computer made up of separate components: - monitor - keyboard - mouse - processor and storage.	- Spare parts are often cheap because they are standardised. - They often have faster processors than laptop computers for the same price. - There are fewer problems with overheating than laptops because of their larger size.	- Lack of portability - heavy and separate components are connected by wires. - Files have to be copied and stored on portable disks, especially if you need to take them with you.
Laptop or notebook 	This is a computer where all the components are together in a single unit. This means that they are portable; unlike desktop computers, they can be moved from one work area to another.	- Portability. - Users can work anywhere, especially if they can access Wi-Fi and link to other media.	- Loss and theft - Limited Battery life - Keyboards and pointing devices are not as flexible as those on a desktop. - Laptops are more compact, so overheating can be a problem.

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Table 17.1 TYPES OF COMPUTERS

Type of computer	Description	Advantages	Disadvantages
Tablet 	Like a laptop this is a small portable computer but the biggest difference is that its user interface is all through touch.	• Portable and easy to use. • Quick to switch on. • Thousands of downloadable applications available.	• Not all have 3G/4G access. • Touch-screen typing can be difficult. • Cannot make phone calls.
Smartphones 	This is an advanced mobile phone with, features such as: web browsers, high-resolution touch screens, GPS navigation and Wi-Fi access. Smartphones are often used as media players and cameras.	• Online access to data. • Better web browsing capability than a more simple mobile phone. • Just one device can accomplish many tasks at work or at home. • Contacts' details and phone numbers can be integrated.	• Screen sizes make it difficult to read long documents and makes it difficult to enter text and numbers quickly. • Costs can be high as most providers want the user to commit to a long-term contract with internet access. • Some webpages may not display or function entirely as the web designer expected.

17.4 INTERNET AND EMAIL

The Internet is a worldwide system of computer networks - a network of networks in which users at any one computer can, if they have permission, get information from any other computer (and sometimes connect directly to users at other computers).

Electronic mail (email or e-mail) is a method of exchanging messages ("mail") between people using electronic devices.

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Email has practically replaced the postal service for short written transactions. Email operates across computer networks, which today is primarily the Internet.

Table 17.2: USES OF INTERNET

Communication	• Email • Social media (face book, twitter, Instagram, etc) • Read or write blogs. • Chat-room • Forums • Internet Telephone (VOIP)
Exploring the world	• Exploring through satellite mapping applications (google earth) • Travel sites providing details of places with pictures and videos • Almanacs and encyclopedias
Keeping up with events	• Keeping up to date with news and sports events. Read newspapers and watch news channels • Watching catchup television shows from main channels
Managing your life	• Online banking (make deposits and withdrawals, order checks) • Online shopping (buying and selling) • Pay utility bills. • Investing money. • Keeping a calendar. • Finding a new job
Study and Research Information	• Find research papers and articles • Find professional services. • Take classes.
Entertaining Yourself	• Watch television and movies. • Watching online video (youtube) • Play games. • Listen to music. • Look for holidays and tickets (sports, concerts etc.)

17.5 INFORMATION STORAGE DEVICES

Information can be stored by virtually any form of energy. Handwriting (paper documents), phonographic recording, magnetic tape, DNA and RNA and optical discs are all examples of storage media. Electronic data storage requires electrical power to store and retrieve data.

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Computer data storage is one of the core functions of a general purpose computer. Electronic documents can be stored in much less space than paper documents. There are two different types of electronic data storage devices:

A. **Primary storage devices:** Generally smaller in size, these are designed to hold data temporarily and are internal to the computer. They have the fastest data access speed, and include RAM and cache memory.

B. **Secondary storage devices:** These usually have large storage capacity, and they store data permanently. They can be either internal or external to the computer, and they include the hard disk, optical disk drive and USB storage device. Some secondary storage devices are explained below.

A. **Audio and Video cassettes:** A magnetic tape, in computer terminology, is a storage medium that allows for data archiving, collection, and backup. At first, the tapes were wound in wheel-like reels but then cassettes and cartridges came along, which offered more protection for the tape inside.

One side of the tape is coated with a magnetic material. Data on the tape is written and read sequentially. Finding a specific record takes time because the machine has to read every record in front of it. Most tapes are used for archival purposes rather than ad-hoc writing/reading.

Figure 17.8 Audio and video cassettes



An audio cassette can store music and sounds. A video cassette on the other hand is magnetic tape used for storing video and usually sounds in addition. Audio and video cassettes are shown in the figure 17.8. Audio and video cassettes require special devices to be played and recorded.

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B. **Hard Disk:** A hard disk drive (sometimes abbreviated as Hard drive, HD, or HDD) is a device that permanently stores and retrieves data on a computer. A hard drive is a secondary storage device that consists of one or more platters to which data is written using a magnetic head, all inside of an air-sealed casing. A typical hard disk drive is shown in figure 17.9.

Figure 17.9 Hard Disk



TiBTS

Helium Hard drives

In an attempt to build higher-capacity, energy-efficient hard drives, a few manufacturers have come up with a novel solution: filling the hard drive case with helium. Because helium is one-seventh as dense as air, the spinning platters in a helium drive encounter less resistance and experience almost no turbulence. As a result, manufacturers can put more platters into a drive and track data on those platters more precisely, greatly increasing drive density. It also decreases energy use, makes the drive quieter and improves reliability.

It took some time for helium drives to move from concept to reality because it was difficult to prevent the helium from leaking out of the drives. Now, HGST and Seagate both have helium drives currently on the market, and HGST reports that of the one million helium drives it shipped in the first year of production, none experienced seal failure in the field.

C. **Floppy:** A floppy disk is a magnetic storage medium for computer systems. The floppy disk is composed of a thin, flexible magnetic disk sealed in a square plastic carrier. In order to read and write data from a floppy disk, a computer system must have a floppy disk drive (FDD).

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A floppy disk is also referred to simply as a floppy. Since the early days of personal computing, floppy disks were widely used to distribute software, transfer files, and create back-up copies of data. Because hard drives were very expensive, floppy disks were also used to store the operating system of a computer. The picture shown in figure 17.10 is an example of a 3.5" floppy diskette, which was one of the most commonly used floppy diskettes, capable of storing 1.44 MB of data.

Figure 17.10 - Floppy



D. CD and DVD: A Compact Disc (CD) is a portable storage medium that can be used to record, store and play back audio, video and other data in digital form.

A DVD (Digital Versatile Disc or Digital Video Disc) is an optical disc capable of storing up to 4.7 GB of data, more than six times what a CD can hold. CDs and DVDs are used to hold music, data or computer software. They have become the standard medium for distributing large quantities of information in a reliable package. If you have a computer and CD-R drive, you can create your own CDs, including any information you want. A typical 700 MB storage CD is shown in figure 17.11

Figure 17.11 - CD



E. Flash Drive: A flash drive is a small, ultra-portable storage device which, unlike an optical drive or a traditional hard drive, has no moving parts.

Flash drives connect to computers and other devices via a built-in USB (Universal Serial Bus) Type-A plug, making a flash drive a kind of combination USB device and cable.

Figure 17.12 - Flash Drive



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17.6 WORD PROCESSING

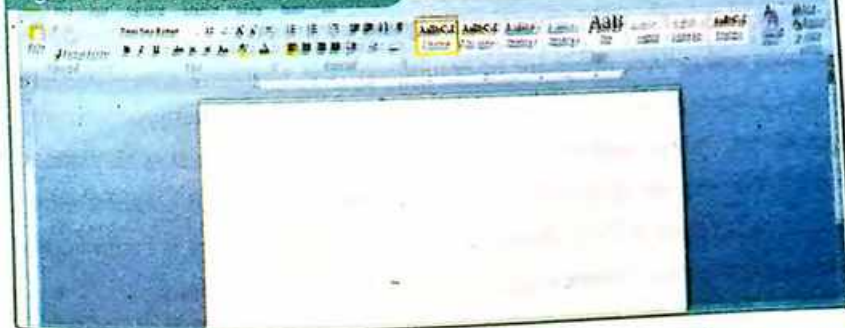
Every day we come into contact with documents, posters, letters, leaflets, books and other printed materials that were prepared using software that enables users to develop and edit text-based documents.

Word processing software is used to manipulate a text document, such as a resume or a report. We typically enter text by typing and the software provides tools for copying, deleting and various types of formatting. Some of the functions of word processing software include:

- Creating, editing, saving and printing documents.
- Copying, pasting, moving and deleting text within a document.
- Formatting text, such as font type, bolding, underlining or italicizing.
- Creating and editing tables.
- Inserting elements from other software, such as illustrations or photographs.
- Correcting spelling and grammar.

Word processing software typically also contains features to make it easier for us to perform repetitive tasks. For example, let's say we need to send a letter to all our customers regarding a new policy. The letter is the same for all customers except for the name and address at the top of the letter. Word processing software can take a database of customer information and use it to automatically create a letter for each customer.

Figure 17.13 - Microsoft (MS) Word



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17.7 HANDLING INFORMATION

Handling information is the ability to use ICT for gathering, organising, storing, retrieving, modifying, interpreting and presenting information. It involves categories such as databases, spreadsheets and Internet.

A. Data management: Data management is an administrative process that includes acquiring, validating, storing, protecting, and processing required data to ensure the accessibility, reliability, and timeliness of the data for its users. Designing effective data management solutions consists of three primary activities

- An assessment of supply chain information needs should be conducted, including who needs the information, how it will be used and the potential actions that may be taken in response to the data. Secondly, the platform best suited to supporting data collection should be selected. This may range from paper-based systems to mobile phones to sophisticated software programs.
- Standard Operating Procedures (SOPs) should be developed, with staff trained on how to adhere to the SOPs. Staff need to be trained on how to use the selected tool(s) and equally importantly on how to analyze and use the results.
- The collected data should be made available in a format that enables decision making. The format will depend on the resources available and the audience but the data should be accessible and easy to use to answer key supply chain performance questions.

B. Monitoring and control: The Monitoring and Controlling process oversees all the tasks and metrics necessary to ensure that the approved and authorized project is within scope, on time and on budget so that the project proceeds with minimal risk. This process involves comparing actual performance with planned performance and taking corrective actions to yield the desired outcome when significant differences exist. Monitoring and Controlling process is continuously performed throughout the life of a project.

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Information technology: The scientific method used to store information, to arrange it for proper use and to communicate it to others

Information and Communication Technology: The infrastructure and components that enable modern computing

Components of Information and Communication Technology: Five parts that must come together in order to produce an Information and Communication Technology System. These are: data and information, hardware, software, procedures and people.

Flow of information: The transfer of information from one place to another through different electronic and optical equipments

In telephone, information is transferred in the form of electrical signals. In radio, television and cell phone information can be sent either through space in the form of electromagnetic waves or it can be sent through optical fibres in the form of light signals.

Telecommunication: The methods and means that are used to communicate information to distant places instantly

Information storage devices: Store the information for later use and benefits. These include audio - video cassettes, compact discs, floppy disks and hard disks.

Computer: A multipurpose electronic computing machine.

Word Processing: Software used to manipulate a text document

Data managing: To collect information for a special purpose and to store it in a computer in a file form which may help at times when needed

KEY POINTS

PROJECTS

GROUP A 'RISKS AND BENEFITS OF ICT': Assess the risks and benefits to society and the environment of introducing ICT (e.g. effects on personal privacy, criminal activities, health and transfer of information). Write an essay to be published in school magazine.

GROUP B 'ADVANTAGES OF HIGH TECH COMMUNICATION DEVICES': Compare the advantages of high-tech communication devices with the traditional system through library or internet search. Prepare a chart and give a brief presentation to your class fellows.

GROUP C 'CHART MAKING': Prepare a chart listing the use of computer technology in various fields of daily life, to be displayed in your class room.

GROUP D 'MAKING NEWSLETTER': Newsletters are usually produced for a specific audience, having words and images. Find a computer and by using a word processing software (Like Microsoft word) make a news letter including last year events of your school, make a hard copy (printed document) available for school library.

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GROUP E 'VIRTUAL REALITY (VR)': Research the current state of VR technology, including virtual immersion and think about how this technology could be used, for example, in tourism. Write a research article for the school magazine.

EXERCISE

- MULTIPLE CHOICE QUESTIONS**
- The components of information and communication systems are humans, hardware, software, procedures and _____.
A. computers B. files C. data/information D. signals
 - Electric or electromagnetic representations of data or information is termed as
A. computer B. signal C. transmission D. software
 - The phenomenon of total internal reflection is used in transmission of signal through
A. electric wires B. optical fibers C. electromagnetic waves D. radio
 - Electrical conductor or system of conductors used either for radiating electromagnetic energy or for collecting electromagnetic energy is
A. antenna B. satellite C. repeater D. signal
 - Software that allows users to interact with the computer system is
A. hardware B. application C. operating system D. program
 - Which of the following information storage device has no moving parts to store and retrieve information
A. CD/DVD B. Hard Drive C. Flash drive D. Floppy
 - Which of the following information storage device is least used these days
A. CD/DVD B. Hard Drive C. Flash drive D. Floppy
 - Telephone communication is the example of transmission of signals through
A. electric wires B. optical fibres C. electromagnetic waves D. All

CONCEPTUAL QUESTIONS

Give a brief response to the following questions

- Identify the most reliable means of storing information?

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- How information is different from data?
- Why frequency band for uplink and downlink is different in transmission of microwaves through space?
- What does 'cell' in 'cell phone' refers to?
- Can internet be used for shopping? Give an example.
- How a flash drive is different from other storage devices?

COMPREHENSIVE QUESTIONS

Give an extended response to the following questions

- What is Information and Communication Technology (ICT)? Explain briefly its components.
- Explain the flow of information. Describe how information is transmitted as electric signal through wires, light signals through optical fibres and radio waves through air/vacuum?
- Describe function and use of fax machine, cell phone, photo phone and computer.
- What is email and internet? List few uses of internet in daily life.
- What are information storage devices? Describe the use of information storage devices such as audio cassettes, video cassettes, hard discs, floppy, compact discs and flash drive.
- What are the functions of word processing?
- How information is handled? Describe data management and its monitoring and control.

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