INTRODUCTION TO INFORMATION TECHNOLOGY

Information Technology (Jomo Kenyatta University of Agriculture and Technology)

INFORMATION AND COMMUNICATION TECHNOLOGY

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INTRODUCTION TO COMPUTERS

Definition of Terms

Computer is a machine that manipulates data according to a list of instructions.

- A computer can also be defined as an electronic machine that accepts input (data), processes it and gives out results(information)

Operating system (**OS**) is software, consisting of programs and data that runs on computers and manages the computer hardware and provides the user with an interface that he can easily work with.

Inputs are the signals or data received by the system.

Outputs are the signals or data sent from it.

Hardware is a general term for the physical components of a computer system, which are tangible and can be seen.

Software is the collection of computer programs and related data that provide the instructions telling a computer what to do.

Icon-this is a small pictogram which is graphical representation on programs or documents within the computer

Program is a sequence of instructions written to perform a specified task for a computer.

Interface is a point of interaction between two systems or work groups. In the manufacturing environment, the interaction and coordination between a number of work groups communicate plans and control production activity. This interaction can come in the forms of schedule, human interaction, computer systems, or any other medium of communication.

Historical Developments of Computers

Computers were initially large machines that could fill entire rooms. Some were operated using large vacuum tubes that formed the basis of today's transistors. In order to operate such machines, punch cards were used. One of the first such examples of this was the Jacquard Loom. In 1833 Charles Babbage invented his difference engine, an early calculator. Together with the punch card design, he created the analytical engine. Regrettably the engine never saw completion due to political issues.

Over time computers became more and more powerful, with the introduction of the ubiquitous microprocessor driving forward development. Gordon Moore, one of the co-founders of Intel, invented Moores law, which predicted that the number of transistors that could be placed on an integrated circuit inexpensively doubled every 2 years. This law has held true to a certain degree, and it can be seen in motion every day with the introduction of more and more powerful microprocessors and larger hard drives and memory modules.

Notable Computers

Here are some computers that came and went in the history of computing. Some modern examples are also shown here.

ENIAC

A behemoth of a machine weighing 27 tonnes, ENIAC stood for **E**lectrical **N**umerical **I**ntegrator **a**nd **C**omputer. The ENIAC used thousands of vacuum tubes and a punch card mechanism. It was originally used to perform calculations for the hydrogen bomb, and later saw use in calculating artillery firing tables. Working out the programming on paper took weeks, and performing the necessary wiring took days. The ENIAC saw service until October 2, 1955.

Altair 8800

A microcomputer design from 1975, the Altair is the computer that is believed to have started the personal computer revolution. It also formed the basis of Microsoft's first product: a programming language called Altair Basic. The computer was sold as a kit requiring assembly by the user, although pre-assembled kits could be bought for a higher price. The Altair defied sales forecasts by selling thousands instead of hundreds to computer hobbyists, accelerating a growing hacker culture.

Commodore 64

An 8 bit computer introduced in January 1982, the Commodore rose to become the best selling personal computer of all time. Utilizing the Commodore BASIC programming language licensed from Microsoft, the Commodore was able to host over 10,000 commercial programs. Aside from office productivity tools such as word processors and spreadsheets, the Commodore was also host to a number of games and even game development environments.

Due to its advanced graphics and audio systems, along with the inclusion of a cartridge slot, the Commodore was seen more as a gaming device than a productivity tool. Over 20,000 games were released for the Commodore, up to the video game crash of 1983. The sheer popularity of the Commodore 64 also saw the rise in prominence of software piracy.

Macintosh

First introduced by Apple in 1984, the Macintosh was the first computer to use a mouse and graphical user interface (GUI) rather than a command line interface. Until the dominance of the IBM PC, the Macintosh saw use primarily as a desktop publishing tool. However due to the immense cost of porting command line interface programs to the GUI, software development was initially slow. In this computer maintained as the basis level of the computer.

IBM PC

The granddaddy of all current personal computers, the IBM PC was introduced in 1981. It was capable of running 3 different operating systems at launch, the most popular being PC DOS. The IBM PC introduced the concept of the BIOS (Basic Input Output System), which was proprietary at the time, although it now has been reverse-engineered and is considered the de facto standard in firmware interfacing. Because of its success, many manufacturers were encouraged to create clones with the same feature set as the PC, which we use today as our computers.

Computer Classifications

Computer classifications can be in several categories which include:-

- Generations
- Size
- Purpose
- The data they process

According to Generations

First Generation - 1940-1956: Vacuum Tubes

- Characteristics of this generation include:
- Used vacuum tubes for circuitry and magnetic drums for memory
- They were often enormous, taking up entire rooms.
- Magnetic drums were once used as a primary storage device but have since been implemented as auxiliary storage devices.
- They were very expensive to operate
- They consumed a great deal of electricity

- Generated a lot of heat which was often the cause of malfunctions.

- First generation computers relied on machine language to perform operations, and they could only solve one problem at a time.

The UNIVAC and ENIAC computers are examples of first-generation computing devices. The UNIVAC was the first commercial computer delivered to a business client, the U.S. Census Bureau in 1951.

Second Generation - 1956-1963: Transistors

- Transistors replaced vacuum tubes and ushered in the second generation computer. Transistor is a device composed of semiconductor material that amplifies a signal or opens or closes a circuit.
- They were much larger

- Required less energy as compared to first generation

- Dissipated more heat and were more prone to failures.

- The transistor was far superior to the vacuum tube, allowing computers to become smaller, faster, cheaper, more energy-efficient and more reliable than their first-generation predecessors. Though the transistor still generated a great deal of heat that subjected the computer to damage, it was a vast improvement over the vacuum tube.

- Second-generation computers still relied on punched cards for input and printouts for output.

- Second-generation computers moved from cryptic binary machine language to symbolic, or assembly languages which allowed programmers to specify instructions in words. High-level programming languages were also being developed at this time, such as early versions of COBOL and FORTRAN.

- These were also the first computers that stored their instructions in their memory, which moved from a magnetic drum to magnetic core technology.

Third Generation - 1964-1971: Integrated Circuits

- The development of the integrated circuit was the hallmark of the third generation of computers.
- Transistors were miniaturized and placed on silicon chips, called semiconductors, which drastically increased the speed and efficiency of computers.

- A chip is a small piece of semi conducting material (usually silicon) on which an integrated circuit is embedded. A typical chip is less than ¼-square inches and can

contain millions of electronic components (transistors). Computers consist of many chips placed on electronic boards called printed circuit boards. There are different types of chips. For example, CPU chips (also called microprocessors) contain an entire processing unit, whereas memory chips contain blank memory.

- Semiconductor is a material that is neither a good conductor of electricity (like copper) nor a good insulator (like rubber). The most common semiconductor materials are silicon and germanium. These materials are then doped to create an excess or lack of electrons.

- Computer chips, both for CPU and memory, are composed of semiconductor materials. Semiconductors make it possible to miniaturize electronic components, such as transistors.

- This meant that the components took up less space

- It also means that they are faster

- It requires less energy.

- Instead of punched cards and printouts, users interacted with third generation computers through keyboards and monitors and interfaced with an operating system

- This generation allowed many applications to run at the same time with a central program that monitored the memory.

- Computers for the first time became accessible to a mass audience because they were smaller and cheaper than their predecessors.

Fourth Generation - 1971-Present: Microprocessors

The microprocessor brought the fourth generation of computers, as thousands of integrated circuits we rebuilt onto a single silicon chip. In the world of personal computers, the terms microprocessor and CPU are used interchangeably. At the heart of all personal computers and most workstations sits a microprocessor. Microprocessors also control the logic of almost all digital devices, from clock, radios to fuel-injection systems for automobiles.

- Microprocessors also moved out of the realm of desktop computers and into many areas of life as more and more everyday products began to use microprocessors.
- As these small computers became more powerful,

- They could be linked together to form networks, which eventually led to the development of the Internet.

- Fourth generation computers also saw the development of GUI's, the mouse and handheld devices

Fifth Generation - Present and Beyond: Artificial Intelligence

Fifth generation computing devices, based on artificial intelligence, are still in development, though there are some applications, such as voice recognition, that are being used today.

Artificial Intelligence is the branch of computer science concerned with making computers behave like humans. Artificial intelligence includes:

- **Games Playing**: programming computers to play games such as chess and checkers.
- **Expert Systems**: programming computers to make decisions in real-life situations (for example, some expert systems help doctors diagnose diseases based on symptoms).
- **Natural Language**: programming computers to understand natural human languages.
- **Neural Networks**: Systems that simulate intelligence by attempting to reproduce the types of physical connections that occur in animal brains.
- **Robotics**: programming computers to see and hear and react to other sensory stimuli.

In the area of robotics, computers are now widely used in assembly plants, but they are capable only of very limited tasks. Robots have great difficulty identifying objects based on appearance or feel, and they still move and handle objects clumsily.

Natural-language processing offers the greatest potential rewards because it would allow people to interact with computers without needing any specialized knowledge.

There are also voice recognition systems that can convert spoken sounds into written words, but they do not understand what they are writing; they simply take dictation. Even these systems are quite limited -- you must speak slowly and distinctly.

Today, the hottest area of artificial intelligence is neural networks, which are proving successful in an umber of disciplines such as voice recognition and natural-language processing.

According to Size

Super computer

The biggest in size, the most expensive in price than any other is classified and known as super computer. It can process trillions of instructions in seconds.

Governments specially use this type of computer for their different calculations and heavy jobs. Different industries also use this huge computer for designing their products.

In most of the Hollywood's movies it is used for animation purposes. This kind of computer is also helpful for forecasting weather reports worldwide.

Mainframes

Another giant in computers after the super computer is Mainframe, which can also process millions of instruction per second and capable of accessing billions of data.

This computer is commonly used in big hospitals, air line reservations companies, and many other huge companies prefer mainframe because of its capability of retrieving data on a huge basis.

This is normally to expensive and out of reach from a salary-based person who wants a computer for his home.

This kind of computer can cost up to thousands of dollars.

Minicomputer

This computer is next in he line but less offers less than mainframe in work and performance. These are the computers, which are mostly preferred by the small type of business personals, colleges, etc.

Personal computers

Almost all the computer users are familiar with the personal computers. They normally know what the personal computer is and what its functions are.

This is the computer mostly preferred by the home users. These computers are lesser in cost than the computers given above and also, small in size; they are also called PCs in short for Personal computers.

This computer is small in size and you can easily arrange it to fit in your single bedroom with its all accommodation. Today this is thought to be the most popular computer in all.

Notebook computers

Having a small size and low weight the notebook is easy to carry to anywhere. A student can take it with him/her to his/her school in his/her bag with his/her book.

This is easy to carry around and preferred by students and business people to meet their assignments and other necessary tasks.

The approach of this computer is also the same as the Personal computer. It can store the same amount of data and having a memory of the same size as that of a personal computer. One can say that it is the replacement of personal desktop computer.

According to the Data they Process

In this category we have three types which are:

- Analog computers
- Digital computers

- Hybrid computers

Analog Computers

This is a form of computer that uses the continuously-changeable aspects of physical phenomena such as electrical, mechanical, or hydraulic quantities to model the problem being solved

Analog computers are extraordinarily fast

On the other hand, the precision of analog computers is not good; they are limited to three, or at most, four digits of precision.

Digital Computer

This is a computer that stores data in terms of digits (numbers) and proceeds in discrete steps from one state to the next. The states of a digital computer typically involve binary digits which may take the form of the presence or absence of magnetic markers in a storage medium, on-off switches or relays. In digital computers, even letters, words and whole texts are represented digitally.

Hybrid Computers

These are computers that exhibit features of analog computers and digital computers. The digital component normally serves as the controller and provides logical operations, while the analog component normally serves as a solver of differential equations.

Hybrid computers can be used to obtain a very good but relatively result, using an analog computer front-end, which is then fed into a digital computer iterative process to achieve the final desired degree of precision.

According to their Purpose

There can three types of computes under this category i.e.:

- Special purpose computers
- General purpose computers
- Dedicated computers

Special Purpose Computers

as suggested by the name, these computers are designed for a particular work or job only i.e. to solve problems of a restricted nature.

Mostly they have their internal circuit changed to suit the application they are adapted for.

They are found in operating theatres in hospitals, defense, air traffic control, or weapons guidance system.

General Purpose Computers

These are computers designed to solve a wide range of problems. Within the limitation imposed by their particular design capabilities they can be adopted to perform particular tasks or solve problem by means of special written programs.

Dedicated Computers

These are general purpose computers but have been adapted to perform specific tasks. They can perform all the functions that are performed by other general purpose computers but the main difference is that they are assigned a certain area of production.

ROLE OF ICT IN BUSINESS

The use of ICT and technology has affected every aspect of business, transforming not only the way that business is conducted but also creating new business sectors and jobs. The creation of companies like Google and e-Bay which did not exist 10 years ago, was only made possible by advances in technology and the changes that this has created in the way that people behave.

The major roles played by ICT in enhancing business environment include:

> **Marketing:** The use of websites has allowed companies to develop new and cheaper ways of reaching new markets, offering customers the opportunity of buying goods and services whenever they want and often at reduced cost, whilst also enhancing the level of customer service.

This has been coupled with the expansion and use of e-mails which again has been used by business to market their goods and services directly to potential customers, as well as communicating with existing customers and suppliers.

Increasingly the marketing campaigns of businesses include the use of technologies such as Contact Management Systems that allows them to co-ordinate, monitor and report on various aspects of their marketing campaigns in new ways making these campaigns more targeted and effective.

Finance: Practically all companies now use software programs e.g. Sage or Excel to manage their accounts. This has allowed them to look at financial information when required, monitor and respond to their customers purchasing patterns by e.g. offering discounts and overall improve the management of their finances. The result of this has been for many companies a reduction in their accountancy fees.

Out of office working: For many businesses the need for staff to be away from the office attending meetings etc. or to be based in another geographical location has grown alongside employee demands for more flexible working patterns. However effective communication and ability to access information etc. remains critical to the productivity of these staff members. Therefore through the use of technology many companies now use a range of technologies to enable this. These include mobile phones, e-mail, broadband, laptops, etc. Thus ensuring that companies are able to be flexible and adaptive depending on their business needs.

Networks: Virtually all businesses now have or have access to a computer. The existence of two or more computers in an office almost always leads to the creation of a network. The main advantage of doing so is that resources can be shared e.g. printers, internet access, files/information can be managed and shared amongst workstations and the security of information can be better managed through a network. Increasingly networks are not just confined to the office but are being adopted so that they allow home/remote working that supports changing business needs.

In Administration: much of the work is done through the factory's networked PCs. A range of office software programmes are utilized for this purpose - word processing packages, databases to hold HR records, stock details and so on and the use of spreadsheet packages for statistical record keeping and analysis. The finance director has access to accounts software that monitors revenue and costs and generates reports on the current financial status as well as historical data to enhance data analysis and inform decision making.

Improve efficiency in Production: ICT is used to inform decision making and its role in that is to provide accurate data to ensure that the resources used are combined in the most efficient way possible to maximize output at lowest possible cost.

ROLE OF COMPUTER

Main uses of a computer in any business set-up include:

i. **Preparation of payroll**: the computer calculates gross pay, P.A.Y.E., social contributions like N.S.S.F, N.H.I.F etc and after these deductions the net pay of employees is determined. The payroll prepared by the computer gives all relevant details.

ii. **Stock control**: the records of the stock in respect of goods purchased and sold are maintained by the computer. The computer contains the information regarding the items purchased, sold, price, stock reference and the r-order level. When the stock of an item falls to re-order level the computer will print out a requisition to the purchasing department.

iii. **Records of debtors**: the computers maintain the records of debtors. These records help to ensure that debtors pay in time. Any overdue debtors are pin-pointed by the computer.

iv. **Budgetary controls:** computers are sued to prepare the budgets and ensure the proper implementation of these budgets. The computer can alert the management when the actual performance of the organization varies from the planned program.

v. **Production control**: the computers are used to control the production level. If due to any interruption the production is discontinued for a specific period of time then re-scheduling of the work becomes essential. In such cases, a computer will help the management to make correct decisions.

Revision Questions

a) Give two main application areas of the following types of computer:
   - Analog Computer
   - Digital Computer
   - Dedicated computer

b) Identify the challenges that the business environment is facing as a result of ICT penetration.

c) With reasons explain why a computer classification is necessary.

d) What would be the demerits of automating the operations in all government offices?

e) Research on the new trends of computer development and identify what is influencing this rapid development of computers.

COMPUTER SYSTEM COMPONENTS

A basic computer consists of three major components: CPU (Central Processing Unit), I/O (Input/Output), and Memory as illustrated below.

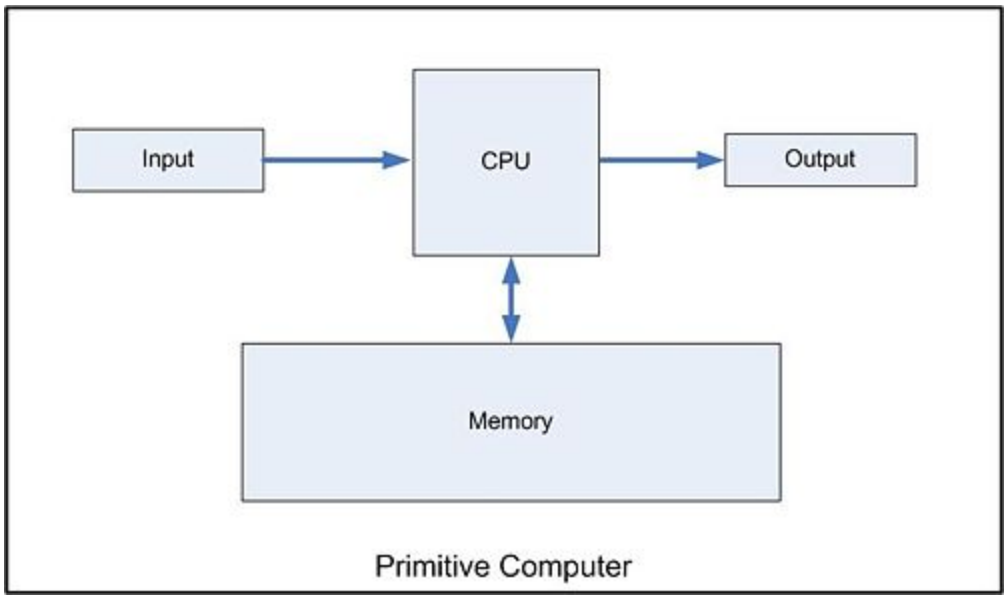


Figure 1

Data comes through Input and the CPU processes the data based on a program which is in Memory. The result is returned to Memory or is presented to the user through output devices.

Hardware*:* The physical equipment required to create, use, manipulate and store electronic data. The main hardware components are:

- **Central processing unit (CPU):** The chip or chips at the heart of a computer that enable it to process data. Also known as a processor.
- **Memory:** An area within a computer system that holds data waiting to be processed.
- **Storage device:** The place where a computer puts data.
- **Input devices:** the devices that allow data and instructions to enter a computer (such as a keyboard, mouse, scanner)

  Input**:** Any resource required for the functioning of a process, in the course of which it will be transformed into one or more outputs.
- **Output devices:** the devices that allow information to be represented (that is, given out) to the user, such as a display screen or printer)

  Output**:** The product of the transformation of inputs by a process.

We will consider them each at time:

Central Processing Unit

The **central processing unit** (**CPU**) or the **processor** is the portion of a computer system that carries out the instructions of a computer program, and is the primary element carrying out the computer's functions. It is the unit that reads and executes program instructions. The data in the instruction tells the processor what to do. The instructions are very basic things like reading data from memory or sending data to the user display, but they are processed so rapidly that we experience the results as the smooth operation of a program.

The CPU is composed of several units...

CONTROL UNIT	ARITHMETIC AND LOGIC UNIT
REGISTERS	

Figure1. A simplified diagram of the CPU

The **control unit** directs and controls the activities of the internal and external devices. It interprets the instructions fetched into the computer, determines what data, if any, are

needed, where it is stored, where to store the results of the operation, and sends the control signals to the devices involved in the execution of the instructions.

The **arithmetic and logic unit (ALU)** is the part where actual computations take place. It consists of circuits which perform arithmetic operations (e.g. addition, subtraction, multiplication, division) over data received from memory and capable to compare numbers.

The ALU is divided in two categories i.e. Arithmetic Unit which is used to perform arithmetic operations (e.g. addition, subtraction, multiplication, division) and Logic Unit is the section that is used to perform logical operations such as comparisons.

While performing these operations the ALU takes data from the temporary storage area inside the CPU named **registers**.

Registers are a group of cells used for memory addressing, data manipulation and processing. Some of the registers are general purpose and some are reserved for certain functions. It is a high-speed memory which holds only data for immediate processing and results of this processing. If these results are not needed for the next instruction, they are sent back to the main memory and registers are occupied by the new data used in the next instruction. RAM (Random Access Memory) and ROM (Read Only Memory) are the CPUs memory cache.

Process cycle that is followed in execution of instructions

There are a series of steps that a CPU performs to execute a command. Each command is handled individually and a CPU can process multiple commands in a matter of seconds. The more powerful the CPU, the faster the commands are processed.
1. A command is issued by the system user using an input device such as a keyboard or mouse.
2. The command is sent to the prefetch unit. The unit accesses the preloaded CPU memory to identify the command and sends it to the command unit.
3. The command unit determines what steps come next. This data is passed on to the decode unit.
4. The decode unit transfer the data into binary code and sends it to the ALU.
5. The ALU changes the raw data into an actual command.
6. The ALU sends a copy of the command to the RAM or ROM before sending it back to the command unit.
7. The command unit sends the code to the part of the system that will actual perform the action.
8. The action is executed and the result is sent back to the user.

Input Devices
these are the devices that an user makes use of to enter data and instructions into the computer.

They include:

Mouse

The mouse allows an individual to control a pointer in a graphical user interface (GUI). Utilizing a mouse a user has the ability to perform various functions such as opening a program or file and does not require the user to memorize commands, like those used in a text-based command line environment such as MS-DOS

Keyboard

The Keyboard is the standard data input and operator control device for a computer.

A standard QUERTY keyboard

It consists of the standard QWERTY layout with a numeric keypad and additional function keys for control purposes.

Joystick

An input device that looks similar to a control device you would find on an arcade game at your local arcades. A joystick allows an individual to easily move an object in a game such as navigating a plane in a flight simulator.

Scanner

This is a hardware input device that allows a user to take an image or text and convert it into a digital file, allowing the computer to read or display the scanned object. A **scanner** is commonly connected to a computer USB, Firewire, Parallel or SCSI port.

Webcam

A camera connected to a computer that allows anyone connected to the Internet to view either a still pictures or motion video of a user or other object. Today, most webcams are either embedded into the display with laptop computers or connected to the USB or Firewire port on the computer.

Barcode

Lines of different widths and sizes representing data that, when read, will determine what the scanned object is. Bar codes are often used to help organize and be able to index information or prices about an object. Another example of how barcodes are used are the barcodes used by the US postal service that helps speed the delivery of mail. Below is an example of what a barcode for an address may look like.

Voice Data Entry

This system accepts the spoken word as input data or commands.

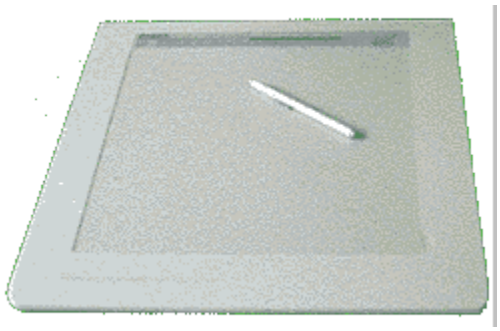
Human speech is very complex, involving emphasis and facial expressions, so complete voice recognition will not be developed for some time.

A microphone used for data input

However, simple commands from one user can be used to control machines.
In this way a paralyzed person can operate a wheelchair or control heating and lighting.

Digitizer

A Digitizing Tablet is a pointing device that facilitates the accurate input of drawings and designs.



A digitizing tablet with pen

A drawing can be placed directly on the tablet, and the user traces outlines or inputs coordinate positions with a hand-held stylus.

Touch Sensitive Screen

A Touch Sensitive Screen is a pointing device that enables the user to interact with the computer by touching the screen.

A touch sensitive monitor

There are three forms of touch screen: pressure-sensitive, capacitive surface and light beam.

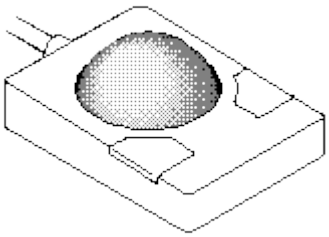
Light Pen

A Light Pen is a pointing device shaped like a pen and is connected to a VDU.
The tip of the light pen contains a light-sensitive element which, when placed against the screen, detects the light from the screen enabling the computer to identify the location of the pen on the screen.

A light pen

Light pens have the advantage of 'drawing' directly onto the screen, but this can become uncomfortable, and they are not as accurate as digitizing tablets.

Trackball



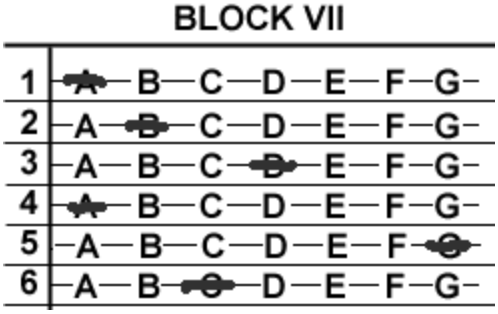
It's a pointing device. To move the pointer, you rotate the ball with your thumb, your fingers, or the palm of your hand. There are usually one to three buttons next to the ball, which you use just like mouse buttons.

The advantage of trackballs over mice is that the trackball is stationary so it does not require much space to use it. In addition, you can place a trackball on any type of surface, including your lap. For both these reasons, trackballs are popular pointing devices for portable computers.

Optical Mark Reader (OMR

The Optical Mark Reader (OMR) can read information in the form of numbers or letters and put it into the computer.

The marks have to be precisely located as in multiple choice test papers.



A sample multiple choice answer paper

Magnetic Ink Character Recognition

A computer can read numbers and letters printed with ink containing magnetic material.

A cheque detailing the MICR number

MICR is used by banks to process cheques. The account details at the bottom of the cheque can be accurately read in this manner since MICR is not affected by dirt.

Magnetic Reader
This input device reads a magnetic strip on a card. Handy for security reasons, it provides quick identification of the card's owner.

A Credit card showing the magnetic strip

This method is used to run bank cash points or to provide quick identification of people entering buildings.

OUTPUT DEVICES

Visual Display Units (VDU)
Visual Display Units (VDU) or monitors are used to visually interface with the computer and are similar in appearance to a television.

Visual Display Units display images and text which are made up of small blocks of colored light called pixels. The resolution of the screen improves as the number of pixels is increased. Most monitors have a 4:3 width to height ratio.

Printers

You can print out information that is in the computer onto paper. By printing you create what is known as a 'hard copy'.
There are different kinds of printers which vary in their speed and print quality.

The two main types of printer are impact and non-impact.

Major types of printer

Printers can be divided into two main groups, **impact printer** and **non-impact printer**. Impact printer produces text and images when tiny wire pins on print head strike the ink ribbon by physically contacting the paper. Non-impact printer produces text and graphics on paper without actually striking the paper.

Printers can also be classified according to the speed of printing. in this category there are two classes i.e. high-speed printers and low-speed printers. High-speed printers include page printers (prints a whole page at ago) and line printers (prints a whole line at ago). Low speed printers include character printers which prints a single character at a time hence being very slow.

Plotter

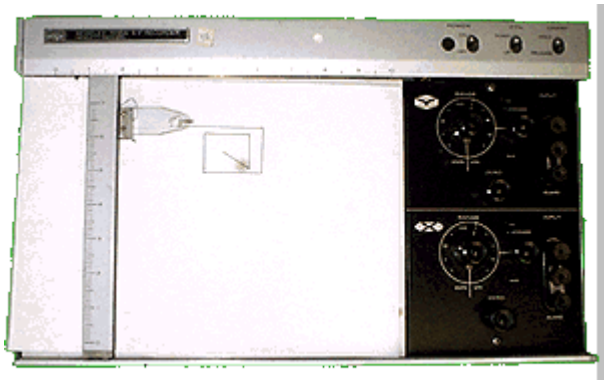
Plotters are used to produce graphs or diagrams.
Plotters can be of two types:

- Pen plotters
- Electrostatic plotters

Pen plotters have an ink pen attached to draw the images, and electrostatic plotters work similarly to a laser printer.

This is a plotter where the paper is fixed on a flat surface and pens are moved to draw the image. This plotter can use several different colour pens to draw with.

The size of the plot is limited only by the size of the plotter's bed.



COMPUTER STORAGE

I can broadly be classified in to three categories i.e.

- ✓ Registers
- ✓ Main memory
- ✓ Secondary memory

Registers are the temporally storage locations within the computer which are used to hold data for a short period of time especially during data communication and execution.

Main memory is the memory found permanently in the computer and its used for execution purposes. Its closest to the CPU and hence it is also known as immediate storage space. It also operates very fast as compared to secondary memory.

It can be divided in two categories i.e**. Random Access Memory (RAM)** and **Read Only Memory (ROM)**. RAM is the part of main memory used to hold instructions that are awaiting execution and the data to be recently executed.

RAM is in two classes i.e. **Static RAM** which keeps information as lng as the power is on and **Dynamic RAM** which keeps information for only a few milliseconds hence the data must be frequently refreshed. ROM is the part of main memory which is not writable (not erasable). It can be divided into several classes which include **Masked ROM**, **PROM (Programmable ROM), and EPROM (Erasable Programmable ROM).**

Secondary storage (also known as external memory or auxiliary storage), differs from primary storage in that it is not directly accessible by the CPU. The computer usually uses its input/output channels to access secondary storage and transfers the desired data using intermediate area in primary storage. Secondary storage does not lose the data when the device is powered down—it is non-volatile.

Examples of secondary storage devices are hard disk drives, The other ones include the floppy disk drives, CD ROM, DVD ROM, flash memory, USB data card, Optical data storage memory, Magnetic media storage and the Mechanical storage media etc.

Revision Questions

i. Find out the factors to consider while procuring hardware. Briefly explain each.
ii. Identify at least three characteristics that differentiate between main memory and secondary memory.
iii. Write short notes on the difference between Masked ROM and EPROM.

APPLICATION SOFTWARE AND OPERATING SYSTEM

SOFTWARE

Software is the collection of computer programs that provide the instructions telling a computer what to do.

Software is differentiated from hardware in that it is not tangible but rather it is the one that helps the hardware to function accordingly. There can be different types of software i.e.

- application software
- System software

- Programming languages

Application software is computer software designed to help the user to perform singular or multiple related specific tasks. It helps to solve problems that the user may be experiencing. Examples include enterprise software, accounting software, office suites, graphics software, and media players. The application software can also be divided in two classes i.e. user software and application package. User software is developed following the specific instructions of the user and it is used to solve a given problem while application package is off-shelf software developed to solve a variety of problems.

Systems software is a program which helps in the running of a computer system. If a system software is used to partly manage the computer system e.g. memory, processor then it is referred to as utility while a system software used to manage the whole computer is referred to as control software. A good example of utility software is linker while a good example of control software is operating system.

If system software is stored on non-volatile memory such as integrated circuits, it is usually termed firmware.

Programming language is a set of grammatical rules for instructing a computer to perform specific tasks. It is used to develop computer programs. Programming languages can be divided into several classes depending on how easy they are to work with.

These classes are: - **Machine language** which accepts only numbers i.e. 1^s or 0^s.

Assembly languages are similar to machine languages, but they are much easier to program in because they allow a programmer to substitute names for numbers.

High level language is a machine-independent programming language, such as FORTRAN, COBOL, BASIC, Pascal and C/C++. It lets the programmer concentrate on the logic of the problem to be solved rather than the intricacies of the machine architecture such as is required with low-level assembly languages.

Fourth Generation Languages often abbreviated *4GL,* are programming languages closer to human languages than typical high-level programming languages.

Functions of various system software today:

Loader-this is a program that places programs into memory and prepares them for execution.

Linker-a linker is a program that takes one or more objects generated by a compiler and combines them into a single executable program.

Utility software-this is a kind of system software designed to help analyze, configure, optimize and maintain the computer.

Shell is a piece of software that provides an interface for users of an operating system and enables them to easily interact with it.

Editor- this is software used for creation and manipulation of text files.

Database Management System (**DBMS**) is a set of computer programs that controls the creation, maintenance, and the use of a database.

Compiler-it's a computer program that converts statements written in high level language into machine code the whole program at ago.

Translator- this is a program that converts statements written in one language to statements in another language.

Interpreter- computer software that translates programs that re written in high level language into machine code one instruction after another.

Assembler- A program that translates low level language statements into machine code

Debugger- this is a special systems program used for detection and correction of errors that may be in a program.

Emulator- this is a systems program that helps a given computer obey instructions set-up by another computer.

Simulator- this is a systems program that is used to help anew computer adapt a program which was being used by an old machine.

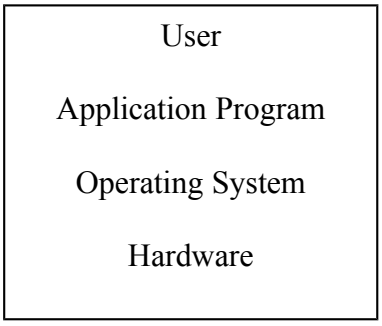
Monitor-this is a control program found in micro computers and can accept commands typed in by the user.

Generator- these are programs which are used to create programs of a given specification.

OPERATING SYSTEM

Definition:

An **operating system** (**OS**) is software, consisting of programs and data, that runs on computers and manages computer hardware resources and provides common services for efficient execution of various application software. It provides an interface which the user can easily work with.



Operating system can either be resident or transient. Resident operating system is the part that is always running and it resides within the main memory. Transient operating system is called upon when there is need so for the majority of the time it is in the secondary storage until it can be called for any execution.

Examples of operating systems in the market today include Microsoft Windows, Disk Operating System (DOS), Linux, UNIX, Solaris etc.

Characteristics of a Good Operating System

Concurrency:

This is the existence of several simultaneous or parallel activities. It should be able to manage such operations.

Sharing:

Concurrent may be required to share resources or equipments. A good operating system should provide a good environment for such.

Efficiency

This is measured in terms of the way an operating system uses the available resources against its output.

Deterministic

A good operating system should be deterministic in the sense that the same program running at different times with the same data should produce the same results.

Reliability

A good operating system should be free of errors and be able to handle contingencies.

Maintainability

It should be possible to maintain with ease through enhancing it and correcting any errors.

Functions of Operating Systems

Resource Sharing

An Operating system must enable the sharing of computer resources among a number of simultaneous users in order to increase the availability of the computer to its users.

Provision of user interface

This enables the user to be able to easily interact with a computer which is a machine.

Job sequencing

The operating system schedules the jobs in the way in which they should be executed. In determines which job should be executed first and the one that should follow depending on the scheduling algorithm.

Error handling

Operating system detects errors in the computer and then reports them to the user while also tries to correct them. It communicates to the user mostly through error messages.

Input/Output handling

It manages all the input and output devices by enabling them t function as they should. It also enables them to be able to communicate with other parts of the computer.

Types of Operating Systems

Real-time Operating System:

It is a multitasking operating system that aims at executing real-time applications. The main object of real-time operating systems is their quick and predictable response to events.

Multi-user Operating Systems:

The operating systems of this type allow a multiple users to access a computer system concurrently. Time-sharing system can be classified as multi-user systems as they enable a multiple user access to a computer through the sharing of time.

Single-user Operating Systems:

Single-user operating systems, as opposed to a multi-user operating system, are usable by a single user at a time. Being able to have multiple accounts on a Windows operating system does not make it a multi-user system. Rather, only the network administrator is the real user.

Single-tasking Operating Systems:

When a single program is allowed to run at a time, the system is grouped under a single-tasking system.

Multi-tasking Operating Systems:

In case the operating system allows the execution of multiple tasks at one time, it is classified as a multi-tasking operating system.

Distributed Operating System:

An operating system that manages a group of independent computers and makes them appear to be a single computer is known as a distributed operating system. The development of networked computers that could be linked and communicate with each other, gave rise to distributed computing. Distributed computations are carried out on more than one machine. When computers in a group work in cooperation, they make a distributed system.

Revision Questions

i. Find out how the operating system is used to achieve the following functions:
   - Protection
   - Interrupt Handling
   - Multi-access

COMPUTER NETWORKS

A **computer network**, often simply referred to as a network, is a group of computers and devices interconnected by communications channels that facilitate communications among users and allows users to share resources.

Purpose

Computer networks can be used for several purposes:

- *Facilitating communications.* Using a network, people can communicate efficiently and easily via email, instant messaging, chat rooms, telephone, video telephone calls, and video conferencing.
- *Sharing hardware.* In a networked environment, each computer on a network may access and use hardware resources on the network, such as printing a document on a shared network printer.
- *Sharing files, data, and information.* In a network environment, authorized user may access data and information stored on other computers on the network. The capability of providing access to data and information on shared storage devices is an important feature of many networks.
- *Sharing software.* Users connected to a network may run application programs on remote computers.

- *Enhancing security.* Network administrators can use settings which will improve the security of all the computers connected to the network. For example by use of anti-virus software activated over the network.

Advantages of Networks:

- peripherals (e.g. printers) can be shared
- software can be shared
- data can be shared
- computers may communicate
- security - user access may be restricted if needed

Disadvantages of Networks:

- one server breaking down may affect a number of computers
- vulnerable to hackers and viruses
- cabling and installation may be expensive
- a network manager may need to be employed to run the network

All networks are made up of basic hardware building blocks to interconnect network nodes, such as Network Interface Cards (NICs), Bridges, Hubs, Switches, Cables, Servers and Routers.

Network interface cards

A network card, network adapter, or NIC (network interface card) is a piece of computer hardware designed to allow computers to communicate over a computer network. It provides physical access to a networking medium and often provides a low-level addressing system through the use of MAC addresses.

Repeaters

A repeater is an electronic device that receives a signal, cleans it of unnecessary noise, regenerates it, and retransmits it at a higher power level, or to the other side of an obstruction, so that the signal can cover longer distances without degradation. In most twisted pair Ethernet configurations, repeaters are required for cable that runs longer than 100 meters. Repeaters work on the Physical Layer of the OSI model.

Hubs

A network hub contains multiple ports. When a packet arrives at one port, it is copied unmodified to all ports of the hub for transmission. The destination address in the frame is not changed to a broadcast address. It works on the Physical Layer of the OSI model.

Bridges

Bridges do send broadcasts to all ports except the one on which the broadcast was received. However, bridges do not promiscuously copy traffic to all ports, as hubs do, but learn which MAC addresses are reachable through specific ports. Once the bridge associates a port and an address, it will send traffic for that address to that port only.

Bridges learn the association of ports and addresses by examining the source address of frames that it sees on various ports. Once a frame arrives through a port, its source address is stored and the bridge assumes that MAC address is associated with that port. The first time that a previously unknown destination address is seen, the bridge will forward the frame to all ports other than the one on which the frame arrived.

Switches

A network switch is a device that forwards and filters chunk of data communication between ports (connected cables) based on the MAC addresses in the packets. It is distinct from a hub in that it only forwards the frames to the ports involved in the communication rather than all ports connected. A switch breaks the collision domain but represents itself as a broadcast domain. Switches make forwarding decisions of frames on the basis of MAC addresses. A switch normally has numerous ports, facilitating a star topology for devices, and cascading additional switches.

Routers

A router is an internetworking device that forwards packets between networks by processing information found in the datagram or packet. In many situations, this information is processed in conjunction with the routing table (also known as forwarding table). Routers use routing tables to determine what interface to forward packets.

Cables

A cable is two or more wires running side by side and bonded, twisted or braided together to form a single assembly. An optical cable contains one or more optical fibers in a protective jacket that supports the fibers.

Servers

Also known as host can host information resources as well as application software for providing network services. server is a computer program that provides services to other computer programs (and their users) in the same or other computers.

Firewall

A firewall is a part of a computer system or network that is designed to block unauthorized access while permitting authorized communications. It is a device or set of devices that is configured to permit or deny network transmissions based upon a set of rules and other criteria.

Firewalls can be implemented in either hardware or software, or a combination of both. Firewalls are frequently used to prevent unauthorized Internet users from accessing private networks connected to the Internet, especially intranets. All messages entering or leaving the intranet pass through the firewall, which inspects each message and blocks those that do not meet the specified security criteria.

TYPES OF NETWORKS

Networks can be classified in two major categories i.e. either in accordance to:

- relationship to one another,
- geographical area they cover.

Under relationship we have two types of networks i.e. **Client-Server Network** and **Peer-to-Peer Network.**

Peer-to-peer (P2P) computing or networking is a distributed application that partitions tasks or work loads between peers. Peers are computers which have the same authorities and privileges

Peers make a portion of their resources, such as processing power, disk storage or network bandwidth, directly available to other network participants, without the need for central coordination by servers or stable hosts. Peers are both suppliers and consumers of resources, in contrast to the traditional client-server model where only servers supply, and clients consume.

The **client–server type** of networking is a distributed application structure that partitions tasks or workloads between the providers of a resource or service, called servers, and service requesters, called clients. Often clients and servers communicate over a computer network on separate hardware, but both client and server may reside in the same system. A server machine is a host that is running one or more server programs which share their resources with clients. A client does not share any of its resources, but requests a server's content or service function. Clients therefore initiate communication sessions with servers which await (*listen* for) incoming requests.

In light of geographical area there exist the following types of networks:

➢ LAN - Local Area Network

A LAN connects network devices over a relatively short distance. A networked office building, school, or home usually contains a single LAN, though sometimes one building

will contain a few small LANs (perhaps one per room), and occasionally a LAN will span a group of nearby buildings.

In addition to operating in a limited space, LANs are also typically owned, controlled, and managed by a single person or organization. They also tend to use certain connectivity technologies, primarily Ethernet and Token Ring.

- **WAN - Wide Area Network**

As the term implies, a WAN spans a large physical distance. The Internet is the largest WAN, spanning the Earth.

A WAN is a geographically-dispersed collection of LANs. A network device called a router connects LANs to a WAN. In IP networking, the router maintains both a LAN address and a WAN address.

A WAN differs from a LAN in several important ways. Most WANs (like the Internet) are not owned by any one organization but rather exist under collective or distributed ownership and management. WANs tend to use technology like ATM, Frame Relay and X.25 for connectivity over the longer distances.

- **Campus Area Network-CAN**

A network spanning multiple LANs but smaller than a MAN, such as on a university or local business campus.

A campus area network (CAN) is a computer network interconnecting a few local area networks (LANs) within a university campus or corporate campus. Campus area network may link a variety of campus buildings including departments, the university library and student halls of residence. A campus area network is larger than a local area network but smaller than a metropolitan area network (MAN) or wide area network (WAN). CAN can also stand for corporate area network.

The networking equipments (switches, routers) and transmission media (e.g. optical fiber) are almost entirely owned (by the campus, university, or government).

Metropolitan Area Network (MAN)
The network size of MAN falls intermediate between LAN and WAN.

A MAN typically covers an area of between 5 and 50 km diameter.

Many MANs cover an area the size of a city, although in some cases MANs may be as small as a group of buildings or as large as the Nairobi City.

A MAN (like a WAN) is not generally owned by a single organisation. The MAN, its communications links and equipment are generally owned by either a consortium of users

or by a single network provider who sells the service to the users. This level of service provided to each user must therefore be negotiated with the MAN operator, and some performance guarantees are normally specified.

A MAN often acts as a high speed network to allow sharing of regional resources (similar to a large LAN).

It is also frequently used to provide a shared connection to other networks using a link to a WAN.

- **Virtual Area Network**

A virtual area network (VAN) is a network on which users are enabled to share a more visual sense of community through high band-width connections. A virtual area network is something like a metropolitan area network (MAN) or extended local area network (LAN) in which all users can meet over high-bandwidth connections, enabling online, remote medical diagnosis and legal consultation, and online corporate workgroups, focus groups, and conferences.

VANs are likely to be local or regional. However, a VAN can also be national or international in geographic scope, assuming all users share similar capabilities.

- **Virtual Private Network (VPN)**

This is a network that uses a public telecommunication infrastructure and their technology such as the Internet, to provide remote offices or individual users with secure access to their organization's network. It aims to avoid an expensive system of owned or leased lines that can be used by only one organization. The goal of a VPN is to provide the organization with the same secure capabilities but at a much lower cost.

It encapsulates data transfers between two or more networked devices not on the same private network so as to keep the transferred data private from other devices on one or more intervening local or wide area networks.

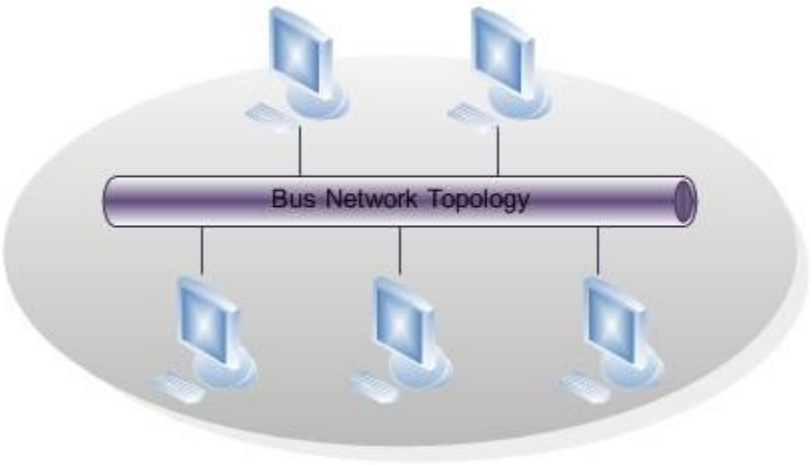
NETWORK TOPOLOGY

A topology describes the configuration of a communication network. The way in which the elements of a network are mapped or arranged is known as a network topology. A topology describes the physical and the logical interconnection between the different nodes of a network.

A node is an active electronic device that is attached to a network, and is capable of sending, receiving, or forwarding information over a communications channel.

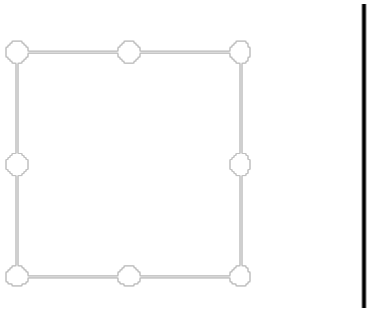
Types of Network Topologies

Bus Topology:



In this type of network topology, all the nodes of a network are connected to a common transmission medium having two endpoints. All the data that travels over the network is transmitted through a common transmission medium known as the bus or the backbone of the network. When the transmission medium has exactly two endpoints, the network topology is known by the name, ‘linear bus topology'. In case the transmission medium, also called as the network backbone, has more than two endpoints, the network is said to have a distributed bus topology. Bus topology is easy to handle and implement and is best suited for small networks. But the downside of this topology is that the limited cable length limits the number of stations, thus limiting the performance to a less number of nodes.

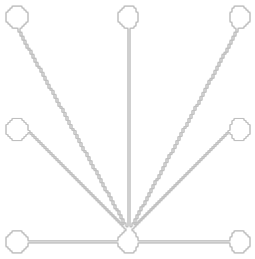
Ring Topology:



In a ring topology, every node in the network is connected to two other nodes and the first and the last nodes are connected to each other. The data that are transmitted over the network pass through each of the nodes in the ring until they reach the destination node. In a ring network, the data and the signals that pass over the network travel in a single

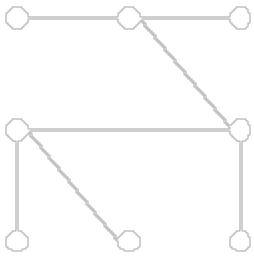
direction. The dual ring topology varies in having two connections between each of the network nodes. The data flow along two directions in the two rings formed thereby. The ring topology does not require a central server to manage connectivity between the nodes and facilitates an orderly network operation. But, the failure of a single station in the network can render the entire network inoperable. Changes and moves in the stations forming the network affect the network operation.

Star Topology:



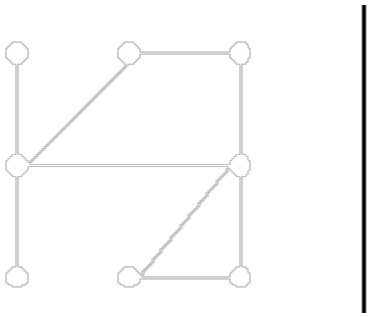
In this type of network topology, each node of the network is connected to a central node, which is known as a hub. The data that is transmitted between the network nodes passes across the central hub. A distributed star is formed by the interconnection of two or more individual star networks. The centralized nature of a star network provides a certain amount of simplicity while also achieving isolation of each device in the network. However, the disadvantage of a star topology is that the network transmission is largely dependent on the central hub. The failure of the central hub results in total network inoperability.

Tree Topology:



It is also known as a hierarchical topology and has a central root node that is connected to one or more nodes of a lower hierarchy. In a symmetrical hierarchy, each node in the network has a specific fixed number of nodes connected to those at a lower level.

Mesh Topology:



In a full mesh network, each network node is connected to every other node in the network. Due to this arrangement of nodes, it becomes possible for a simultaneous transmission of signals from one node to several other nodes. In a partially connected mesh network, only some of the network nodes are connected to more than one node. This is beneficial over a fully connected mesh in terms of redundancy caused by the point-to-point links between all the nodes. The nodes of a mesh network require possessing some kind of routing logic so that the signals and the data traveling over the network take the shortest path during each of the transmissions.

NETWORK SECURITY

Without security measures and controls in place, your data might be subjected to an attack. Some attacks are passive, meaning information is monitored; others are active, meaning the information is altered with intent to corrupt or destroy the data or the network itself.

Your networks and data are vulnerable to any of the following types of attacks if you do not have a security plan in place.

Eavesdropping

When an attacker is eavesdropping on your communications, it is referred to as sniffing or snooping. The ability of an eavesdropper to monitor the network is generally the biggest security problem that administrators face in an enterprise. Without strong encryption services your data can be read by others as it traverses the network.

Data Modification

After an attacker has read your data, the next logical step is to alter it. An attacker can modify the data in the packet without the knowledge of the sender or receiver.

Identity Spoofing (IP Address Spoofing)

Most networks and operating systems use the IP address of a computer to identify a valid entity. In certain cases, it is possible for an IP address to be falsely assumed— identity

spoofing. An attacker might also use special programs to construct IP packets that appear to originate from valid addresses inside the corporate intranet.

Password-Based Attacks

A common denominator of most operating system and network security plans is password-based access control. This means your access rights to a computer and network resources are determined by who you are, that is, your user name and your password.

When an attacker finds a valid user account, the attacker has the same rights as the real user. Therefore, if the user has administrator-level rights, the attacker also can create accounts for subsequent access at a later time.

Denial-of-Service Attack

Unlike a password-based attack, the denial-of-service attack prevents normal use of your computer or network by valid users.

After gaining access to your network, the attacker can do any of the following:

- Randomize the attention of your internal Information Systems staff so that they do not see the intrusion immediately, which allows the attacker to make more attacks during the diversion.
- Send invalid data to applications or network services, which causes abnormal termination or behavior of the applications or services.

- Flood a computer or the entire network with traffic until a shutdown occurs because of the overload.

- Block traffic, which results in a loss of access to network resources by authorized users.

Man-in-the-Middle Attack

As the name indicates, a man-in-the-middle attack occurs when someone between you and the person with whom you are communicating is actively monitoring, capturing, and controlling your communication transparently. For example, the attacker can re-route a data exchange.

Man-in-the-middle attacks are like someone assuming your identity in order to read your message. The person on the other end might believe it is you because the attacker might be actively replying *as you* to keep the exchange going and gain more information. This attack is capable of the same damage as an application-layer attack, described later in this section.

Compromised-Key Attack

A key is a secret code or number necessary to interpret secured information. Although obtaining a key is a difficult and resource-intensive process for an attacker, it is possible. After an attacker obtains a key, that key is referred to as a compromised key.

An attacker uses the compromised key to gain access to a secured communication without the sender or receiver being aware of the attack. With the compromised key, the attacker can decrypt or modify data, and try to use the compromised key to compute additional keys, which might allow the attacker access to other secured communications.

Revision Questions

a. Find out reasons why it is important to ensure Network Security.
b. Justify why networked computers are at a higher risk of virus invasion as well as other security concerns.
c. Identify various factors that determine the choice of a network topology.
d. List and briefly explain the major components of a typical LAN setup.
e. Identify the main challenges of networking in computing today.

DATA PROCESSING AND DATA SECURITY

Objectives

By the end of this topic, the trainee should be able to:

a) Define data and data processing
b) Describe the data processing cycle
c) Describe data processing modes
d) Explain the elements of data hierarchy

e) Describe file organization and access methods

f) Explain database and related terminologies

g) Describe threats and hazards to data

h) Explain methods of securing data

i) Explain health and safety issues ion a computer environment.

Introduction

Data- this is information which is in raw or unorganized form (such as alphabets, numbers, or symbols) that refer to, or represent, conditions, ideas, or objects.

Information- this is data which have been summarised the way the user wants.

Data processing- It involves collecting, recording, analysing, sorting, summarising, calculating, disseminating and storing data.

Several methods of data processing exist. They generally describe how data is processed i.e. either manually/mechanical, electronically or electro-mechanically.

Manual Data Processing
This is done by hands and there is no use of computers in this method.

Electronic Data Processing
This refers to use of automated methods to process commercial data. It is relatively simple, repetitive activities to process large volume of similar information e.g. stock updates applied to an inventory, banking transaction, customer master files, booking and ticketing transaction to airline reservation etc.

Comparison between electronic data processing and manual data processing

- EDP is more reliable and faster as compared to MDP.
- EDP is less energy consuming in comparison to MDP.
- EDP is less costly as compared to MDP
- EDP is more reliable as compared to MDP
- EDP is more accurate as compared to MDP
-

Electro-mechanical Data Processing

Before introduction of electronic computers processing was performed using electromechanical devices called record equipment or tabulating machines. The

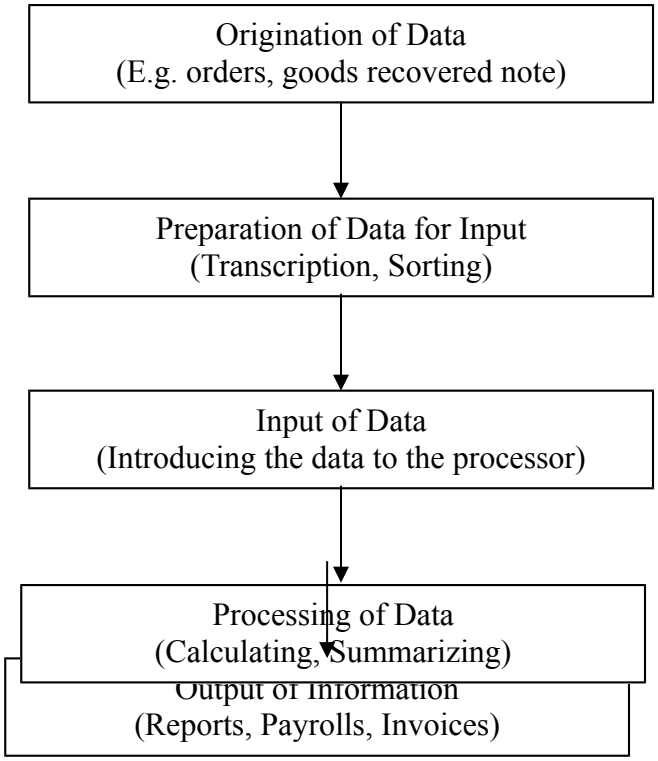
processing was accomplished by processing packs of punched cards through various unit record machines in a careful designed progression.

The flow from machine to machine was often planned and documented with drawing that used standardized symbols for various machines.

Data Processing Cycle

Individual data unit within an organization are known as transactions.
The data processing cycle consists mainly of the following stages:
Origination of data- this si the data collection phase
Preparation- this involves getting the data ready which comprises of checking for correctness and validity of the data entered,.
Input- this is the act of passing the data to the processing stage.
Processing- all the needed information having been collected and made ready it is subjected to the necessary mechanisms to produce the required output.
Output- this is the production of the end result (product)

Example of data processing cycle in stock management



DATA PROCESSING MODES

Data processing modes describe the way transactions are handled during processing. The modes are also known as data processing systems. The various data processing modes include:

- Batch processing
- Online processing
- Real-time processing
- Time-sharing processing
- Multitasking processing
- Interactive processing
- Distributed processing

Batch Processing

It's also known as off-line processing.

It's a processing mode whereby the transactions are accumulated over a period of time and then processed at a pre-specified time to produce a batch output.

The batch processing mode was the basis for the earlier computers to deal with transactions.

In batch processing data collection is usually done off-line i.e. in isolation with C.P.U. on special machines known as data entry terminals.

The data collected is input into the computer after affixed period of time, processed and results obtained. A batch of transactions (jobs) is scheduled for processing by assigning them priorities on percentage basis. The highest priority jobs are processed first and the low priority later.

Once the processing of a given batch is started there is no interaction between the user and the operating system. The user has to instruct the operating system I advance on how the jobs are to processed through a special command language known as Job Command Language.

The OS that co-ordinate and monitors the batch processing environment is described as the batch operating system.

If these transitions are entered into the computer from a remote terminal then they are described as remote entry.

Advantages

i. Simple to develop batch processing system
ii. The timing of the report is not a necessity.
iii. The unit cost of processing is low.

Disadvantages

i. There is significant time delay between the commencement of a transaction and when the information becomes available.
ii. Late information is not suitable in situations where instant decisions are required.
iii. It's difficult to set the desired priority scheduling.

ONLINE PROCESSING

This is a type of processing whereby the results of fat processing are made available almost immediately.

In online mode all the computer peripherals and other equipments are under direct influence of the central processor.

In this mode as soon as the input transactions are made available, it can be processed to produce the desired information. The user/operator can interact directly and at any time during processing with the OS.

The files are also held online and therefore any enquiries or file interrogation can be at any time. Master files can be upgraded on the spot.

Examples of online applications

Banking- online systems are used to inform bank customers about the status of their account in response to an enquiry by accessing relevant file through an online terminal.

Stock exchange: terminals located in major stock exchange throughout the country and the personnel in participating brokerage firms enable the speedy processing of share dealing.

Stock control: terminals located in ware houses provide a means for automatic re-ordering of stock records, preservations and printing of reports.

Updating work progress and control in plants.

Inventor status /ordering and reporting of geographically dispersed distributors.

Advantages

i. Files are always maintained up to date.
ii. Information is available for making current decisions
iii. File enquiries are possible through terminals

Disadvantages

i. Online systems are complex to develop
ii. They are costly in terms of hardware, software, storage media, operating system and communication facilities.

TIME SHARING PROCESSING

This is a processing mode in which the central processor serves two or more users with different processing requirement. The central computer is therefore available to a variety of users that are connected to the central computer through communication links.

Users who wish to process their data, receive information or test their software can query the central computer through the communication links.

In time sharing the processor time is divided out appropriately among the user tasks into time slices. Time slice is a period where an active job has got sole access to the processors resources.

The control is switched from one job to another under the influence of the operating system and therefore the processor's idle time is removed.

The central computer checks if there is ant request fr4om a particular terminal that requires service. If there is it is served and control is shifted to the next terminal. These sequences of events are described as polling of round robin.

Characteristics of time sharing systems

i. Each user has one or more input/output devices connected to the central processor through communication links.
ii. Each user acts independently of the others who are connected to the system.
iii. The central computer accepts data and instructions arriving simultaneously from many users and then gives each user a small but frequently repeated segment of computer time.

iv. The user's data files are maintained in the central computer.

v. Each user has his set of private programs plus access to a set of public programs.

vi. The data files, program files, input and output devise are directly connected to the computer so that processing can be performed at random as requests are made.

Applications of time sharing systems

i. Mainly used in computer bureaus to serve individuals and small companies who cannot afford computer facilities.
ii. They are also applied in learning institutions whereby there are a large number of users.

Advantages of time-sharing systems

i. They have better service to users because the information /output is fast.
ii. The problem of processor idle time is solved because it doesn't have to wait for the slower communicating peripherals.

iii. Files are held on-line therefore inquiries or interrogations are possible.

iv. User to computer dialog is often done through terminals that are connected to the central computer.

v. It's helpful to small organizations which cannot afford to purchase a computer and its related facilities.

vi. It avoids duplication of software.

vii. The users of a system can avail the computer facility through a remote terminal

Disadvantages

i. It's not reliable as far as security of data concerned.
ii. The response time is high (i.e. slow response) when there many users.
iii. Users have got no control over the central computer.

REAL-TIME PROCESSING

A real-time system is defined as a data processing system where-by the time interval required to process and respond to input is so small that the response can be used make immediate decisions.

Real time processing provides an immediate transaction input capability from all the generating terminals. Many remote terminals may be connected directly thorough appropriative communicating equipment into the central processor.

Files may be updated currently and any enquire receive immediate access to the updated records.

The essential requirements of real-time processing include:

- A direct connection (online) between input/output devices and the central processor.
- It must be fairly fast response time allowing 2-way communication between the user and the central processor.

The important distinction between online and real-time processing is the immediacy of response to a request i.e. a real-time system I designed to provide immediate information that results in prompt action e.g. in the functioning of a production process as necessary.

Application of real time systems

- Real time processing is for application that require a vary speedy response. E.g. an airline preservation system e.g. an individual cannot be booked to travel before an enquiry into whether the seat is available is done.
- Other applications include in chemical plants whereby e.g. temperature needs to be regulated and arise or fall in the same needs an immediate action.

Advantages

i. Information is readily available for instant decisions.
ii. It provides a fast and better service to users/customers.
iii. It is fast and reliable mode of data processing.

Disadvantages

i. Real time systems are complex systems that use complex operating system whereby making them is costly.
ii. They are nit easy to develop
iii. They require a large amount of direct access storage, communication equipment and a front head processor which relieves the central computer by handling tasks that require limited processing.
iv. Real time systems usually use two or more computers sharing the workload which is usually a complex and expensive undertaking

DISTRIBUTED PROCESSING

A data processing mode is described as distributed if data processing system consists of various geographically dispersed computers which are linked together via communication lines. All the computers linked must also belong to the same organisation. Computers in different departments or business site may not be communicating to each other at all e.g. microcomputers may serve as terminals from various departments connected to a central computer of enhanced processing

capability e.g. mainframe. The most distinctive feature of distributed processing mode is that all affected departments are served individually in terms of computer resources employed.

Unlike the centralized processing where the use of the central computer is a guarantee in distributed processing this is an option. A typical application is in banks whereby all the branches have intelligence terminals which are usually linked to the main computer at the head office.

Data from the branches is forwarded to the main computer where it is processed.

Advantages of distributed processing

i. Reduction of the load on the host computer.
ii. Minimization of costs in data processing due to the use of low cost many computers.
iii. Reduction of delays in data processing
iv. Provide a better service to the customers
v. Loser risks of system breakdown.
vi. Less complexity of system design and implementation due to decentralization.
vii. Level of expertise required is low.

Disadvantages

i. Expensive because there is an extra cost of communication equipment
ii. Data duplication is very common
iii. Programming problems occur.

iv. Extra training needed for all users involved.

THREATS AND HAZARDS OF DATA

Power Failure

This results in loss of data especially if the user had not saved the data at the time of power loss. This is especially so if the user was using a computer that does not have a power backup.

Fire

The result of fires is to burn everything and this can be very critical especially if there was no backup data. Fire results in total loss of data.

Natural disasters

This may include such things like earthquakes, tornados, hurricane, and landslides among others. They too result in loss of data as buildings get destroyed hence all the data stored in those buildings getting totally or partially destroyed.

Viruses

These are malicious programs which are meant to destroy the data stored within a computer; they also may result in malfunctioning of the computer system. Viruses may either delete the data totally or change the contents thereof hence compromising its integrity.

Worms

They are almost similar to viruses but the only difference is that worms don't destroy the data or even delete it. Rather they infest a host computer and replicates so fast that they occupy all the available space hence making the computer to respond very slow ad eventually it crashes hence losing the data stored in it.

Theft

This can be carried out n a variety of ways. It can be done physically by breaking into an office and stealing the data or by gaining unauthorized access to a private site and stealing information from there. It is also done for a variety of reasons but mostly is due to sabotage, competition or any other malicious reason.

Cyber Crime

Cyber Crime refers to any crime that involves a computer and a network. This involves use of internet to gain unauthorized access. This involves interception of data in transmission and this may result to either total loss of the data or compromise of its integrity.

Sabotage

This is a deliberate action aimed at weakening another entity through subversion, obstruction, disruption, or destruction. In a workplace setting, sabotage is the conscious withdrawal of efficiency generally directed at causing some change in workplace conditions. One who engages in sabotage is a saboteur. As a rule, saboteurs try to conceal their identities because of the consequences of their actions. For example, whereas an environmental pressure group might be happy to be identified with an act of sabotage, it would not want the individual identities of the perpetrators known.

METHODS OF SECURING DATA

Surge Suppressors

A **surge protector** (or **surge suppressor**) is an appliance designed to protect electrical devices from voltage spikes. A surge protector attempts to regulate the voltage supplied to an electric device by either blocking or by shorting to ground voltages above a safe

threshold. This will protect the computer from electric short which may lead to breakdown of computer hence loss of data.

UPS

An **uninterruptible power supply**, also **uninterruptible power source**, **UPS**, is an electrical apparatus that provides emergency power to a load when the input power source, typically the utility mains, fails. It is used where an unexpected power disruption could cause injuries, fatalities, serious business disruption or data loss. UPS enables the user to safely save the data before the computer shuts down.

Password

A **password** is a secret word or string of characters that is used for authentication, to prove identity or gain access to a resource (example: an access code is a type of password). The password should be kept secret from those not allowed access. This limits who access the network or the computer hence ensuring safety and integrity of the data being transmitted or stored in the computer.

Backup

In Information Technology, a **backup** or the process of **backing up** refers to making copies of data so that these additional copies may be used to *restore* the original after a data loss event.

Backups are useful primarily for two purposes. The first is to restore a state following a disaster (called disaster recovery). The second is to restore small numbers of files after they have been accidentally deleted or corrupted. Data loss is also very common. 67% of internet users have suffered serious data loss.

Antivirus

Antivirus or **anti-virus software** is used to prevent, detect, and remove computer viruses, worms, and Trojan horses. It may also prevent and remove adware, spyware, and other forms of malware. This prevents the data by ensuring that the computer doesn't get invested with viruses which may lead to loss of data.

Biometric access

This type of security measures the user's physiological and behavioral characteristics. A person's physiological aspect is unique to him or her. Due to this reason certain aspects are chosen for use in this method to grant access to the computer system. Physiological aspects include fingerprints, eye retinas and irises, voice pattern and physical patterns etc.

DATA HIERARCHY

Data Hierarchy refers to the systematic organization of data; often in a hierarchical form i.e. starting from the simplest form of data to the most complex. Data organization involves fields, records, files and so on.

Bit

The term bit is short form for binary digit. It can assume either of two possible states and, therefore, can represent either 0 or 1. In secondary storage, a bit is used to represent data through positive or negative polarity of an electrical charge on a magnetic recording medium, such as tape or disk. Semi conductor storage is usually used for primary storage. In semiconductor storage, a bit is represented by an electrical circuit that is either conducting or not conducting electricity.

Byte

An ability to represent only binary digits in a computer system is not sufficient for business information processing. Numeric and alphabetic characters as well as a wide variety of special characters (such as, dollar signs, question marks and quotation marks) should be stored. **In a computer system, a character of information is called a byte**. A byte of information is stored by using several bits in specified combination called bit patterns. A widely used bit pattern for personal computers and data communication is the American Standard Code for Information Interchange (ASCII).ASCII uses seven bits to represent one character. Each 1 or 0 corresponds to a single bit.

Data Field or Item

The next level in data hierarchy is a field or item of data. A field or item of data is one or more bytes containing data about the attribute of an entity in an information system. An entity in a payroll system is an individual employee.
Attributes are the employee's name, pay rate and so on. The basic pay is a field or item of data.

Data Record

A record is a collection of fields relating to a specific entity. For example, a payroll record contains fields of data relating to a specific employee. An analogy can be made between a computer-based record and an individual folder in a manual file. A folder in a payroll file may contain almost the same information as a record in a computer-based payroll file. The field that identifies a record from all other records in a file is the record key. For example, the record key in a payroll record is usually an employee's provident fund number or social security number because it is different for each employee.

File

A file is a collection of related records. For example, the collection of payroll records of all employees in a company is a payroll file. The concept of a computer file is very similar to a manual file in a filing cabinet.

Database

A database consists of all the files of an organization. It is structured and integrated to facilitate update of the files and retrieval of information from them.
The term has often been used rather loosely. Technically, a database consists of those files that are a part of data base management system. However, a database is often used to refer to all the files of an organization.
Now, all this is called as data hierarchy because databases are composed of files, files are composed of records, records are composed of filed, fields composed of data bytes and finally, data bytes are a group of bits. This is very well a hierarchical structure.

File Organization

This refers to the manner in which computer files are stored in physical media. It also describes the relationship of a key of the record to the physical location. A computer file may be described in terms of data items records and how those fields are grouped within records.

The computer file may be described in terms of data items(fields) included in the records and how these records are grouped within records. The file can also be described in terms of how records are laid out within the file and this is what is referred to as file organization.

File organization is influenced by the storage media and the processing requirement to be carried out on the file. The file structure and access determines which input, processing and output devices can be employed most effectively.

File Organization Types

There are various methods or types of file organization and they include:

- Serial organization
- Sequential organization
- Indexed sequential organization
- Random organization

Serial Organization

In this method the records are laid out contiguously one after another in no particular sequence. The records are just stored one after another in the order in which they arrive. There is no relationship between contiguous or adjacent records, serial files are accessed serially i.e. to search for a record one has to start from the beginning of the file and move towards the tail until the desired record is found. This method is suitable when all the records are to be accessed.

Serial files are not commonly used in the business environment today. This is because of the slow speed of accessing records.

Sequential file organization

This organization method is related to the serial method in that the records are laid out within the file serially/contiguously in the order of arrival. The difference is that in sequential file organization, the records are laid in the sequence of the sequence of the key field. And therefore contiguous records have a relationship of the key field existing between them i.e. sequential files are accessed sequentially i.e. the key field is used to search for a particular record of interest.

In this case searching also begins at the head and proceeds to thee tail of the file until the desired record is located. This method is suitable for high activity files.

Advantages of S.F.O.

i. Simple to understand.
ii. Easy to organize and maintain

iii. Loading a record only requires a record key.

iv. It is efficient and economical if the activity rate is high.

v. Relatively in-expensive because input/output media may be used.

vi. Any error in file remains localized.

vii. File may be relatively easy to construct since there is a good measure of build in back-up available.

Disadvantages

i. An entire file must be processed even when the activity rate is very low.
ii. Transaction must be sorted and placed in sequence prior/ before processing.

iii. The timelines of data in a file deteriorate while the purchase is being accumulated.

iv. Data redundancy/repetition is typically high since the same data may be sto0red in several files sequences in different keys.

v. Random enquires are almost impossible to handle.

Indexed Sequential File Organization

In this made the records are arranged sequentially just like in sequential files. It however has got an additional feature and this feature is the additional index which for selective access.

Indexes are a particular cylinder position or track addresses. These indexes are used to point to particular portions where the re cords are stored in groups. This allows the by-passing of a group of records that are not required in a particular processing run.

Indexed sequential file organization may be accessed using three methods:

- Sequential access
- Selective sequential access

- Random access

Sequential access is achieved by using the key fields i.e. the records are red one after the other until the one that matches the search key is found and copied into the main memory. This method is suitable for high activity files.

Selective sequential access is achieved by using indexes. In this access mode only the records of interest are accessed. It is suitable for low hit-rate files (low activity files)

Random access is achieved by moving forward and backward through a file in an orderly manner in order to access a record of interest. This method is also suitable for low activity files.

Advantages of Indexed Sequential File Organization

i. Records can be accessed both sequentially and randomly.
ii. Records are not duplicated

iii. Accessing of the file scan be done fast, if is done randomly.

Disadvantages of Indexed Sequential File Organization

i. The storage mode of this method is rather expensive.
ii. Accessing records sequentially is time consuming.

iii. Processing records sequentially may sometimes introduce redundancy.

Random File Organization

In R.F.O. the records are arranged within a file in no particular order. There is no relationship between two contiguous records. An algorithm is applied onto the record key to generate the storage location for the record. During access, the same algorithm is applied to the key field to generate the record location from where the record is and read it into the computers memory.

Random files can therefore be said top be accessed directly or randomly. The algorithm generation of the storage location may not provide a uniform spread of the records within the files allocated area in the storage media.

The purpose of the algorithm is to generate address of storage location to which the record is written to or from which the records are read.

Advantages of R.F.O.

i. Records are quickly accessed.
ii. File-update i.e. adding, deleting or amending is easily achieved.

iii. The method does not require the use of indexes.

iv. Transactions do not need to be sorted prior to the update process as is the case for the sequential files. Sequential files require the transaction files to be sorted in the sequence of the master file.

Disadvantages of R.F.O.

i. Data may be accidentally deleted or over-written unless special precautions aree taken.
ii. Records in online file may be exposed to the risks of loss of accuracy and serity bleaches. As a result special back up and reconstruction procedures must be established.

iii. They may be less efficient in the use of storage space when compared to the other methods.

iv. Expensive hardware and software resources are required.

v. There is relative complexity of programming for this organization method.

vi. System design for this method is also complex and costly.

The main factors usually considered in selecting the file organization method are:

1. Fast access to single record or collection of related records.

2. Easy record adding/update/removal, without disrupting the normal running of the system.
3. Storage efficiency.
4. Redundancy as a warranty against data corruption.

File Access Methods

An access method defines the way processes read and write files. These methods include:

Sequential Access

Under this access method, the entire file is read or written from the beginning to the end sequentially. The file is associated with a read/write mark, which is advanced on each access. If several processes are reading or writing from the same file, then the system may define one read/write mark or several. In the former case, the read/write mark is kept at a central place, while in the latter case it is kept with the process table entry.

Direct Access

This access allows a user to position the read/write mark before reading or writing. This feature is useful for applications such as editors that need to randomly access the contents of the file.

Mapped Access

When a process opens a file, it is mapped to a segment. The open call returns the number of this segment. The process can thus access the file as part of its virtual store.

Structured Files

So far, we have treated files as byte streams. Database applications often wish to treat them as records that may be accessed by some key. To accommodate these applications, some systems support typed or structured files that are considered streams of records. If a file is structured, the owner of the file describes the records of the file and the fields to be used as keys.

Database

This is an organized collection of data stored in a manner that makes it easy to access and also free from redundancies.

The data stored in a database is any information that is of significance to the organization. The basic components of any database system will comprise of the following elements:

Files: it is a large organized data structure that contains related information. Files are mainly used for storing programs along with data in secondary/auxiliary storage.

Records: every entry of data into a database is referred to as a record. A record is a group of related data about one item /entity that you can treat as a single group.

Field: a field in a database is a column of similar information or groups of changed data that contain similar information of the same data type. A key field in a database is a field or set of fields of a database table which together form a unique identifier for a database record (a table entry).

Database system:

It comprises of 4 major components which are:

- Data
- Software
- Hardware
- Users

Data refers to the actual physical values that are stored in the database.

Software is the set of application programs that allow users to store information in an orderly and timely manner and is known as the database management system. This is the software that lies between the actual database and the users of the system.

Hardware consists of secondary storage disks, tapes etc. this is where the actual database is stored or resides.

Users: these are the people who work with the database whether as end-users or administrators.

The different data types of the data entered into database include:

Text: stores text or combination of text and numbers, such as addresses, numbers that do not require calculations, such as phone nos., postal codes etc.

Memo: store lengthy text and numbers, such as general notes or detailed descriptions. Memo fields hold up to 64000 characters of information.

Number: numeric data to be used for mathematical calculations, except calculations involving money.

Date/time: stores dates and time.

Currency: used to store monetary values e.g. KSH, $,£ etc.

Auto number: used for unique sequential incrementing or random numbers automatically inserted when a record is added.

Yes/No: fields that will contain only one of two values such as yes/No, True/False.

OLE Object: objects (such as Microsoft word documents, Microsoft Excel Spreadsheets, picture etc), created in other programs using OLE protocol can be linked or embedded in Microsoft Access table.

Role of Database

a) The ability to update and retrieve data this includes adding new records, deleting existing records and changing information within a record.
b) Support Concurrent Updates- this allows simultaneous access of the database by multiple users.

c) Recovery of Data- computers may crash, a fire or other natural disaster may occur, or a user may enter incorrect information invalidating or making records inconsistent. in such an event users must be able to recover the correct state of the database.

d) Security- this is the prevention of unauthorized users accessing the data stored within the database. It uses features such as encryption, authentication, authorization and views to provide security to the database.

e) Data Integrity- data integrity is enforced, so as to avoid incorrect or inconsistent data.

ERGONOMICS

This deals with how humans relate with heir workplaces. It defines how comfortable the working conditions behind a certain profession are. In computing it deals with the comfortability of the computers to the users.

In computing we can generally look at ergonomics in two main headings i.e.:

Machine Set-up

- **Visibility**

You must be able to see what you are doing easily to avoid eye strain and neck pain. Have adequate amounts of light. Rearrange things until you can see well and it feels comfortable for you.

Chairs

As with visibility factors, experiment with chair height and/or tilt. Try different chairs. Keep trying until you get it the way your body likes.

Keyboards

Be sure to get the height right to prevent too much bend at the wrist and allow the forearm to have some support. The arms should hang loose to prevent the shoulder muscles from cramping.

Mouse

The continual clicking and small, precise motions involved in mouse use are a repetitive action that can be a health hazard. A few basic rules can help make handling this convenient input devise safer and more comfortable:
1.) Hold the mouse loosely; Use a light touch when you click.
2.) Use you whole arm and shoulder to move the mouse, not just your wrist. Don't rest your forearm on the desk while you move the mouse.
3.) Keep your wrist relaxed and neutral, not bent. The click button should be about the same height as your keyboard.
4.) Avoid prolonged postures. Rotate your shoulders, gently shake your hands and fingers four or five times per hour.
5.) Left handed people should use a "left handed" mouse, or configure the mouse to work best with their different (mirror image) hand shape.

Desks

Make enough space so that you have room to work, especially if you're pushing your mouse around. Use a paper holder to keep letters or books semi-vertical and at eye level. Your work space should be set up so that you need not twist your neck. Make your work space user friendly.

VDT

Keep your distance. You can protect yourself with space. It's recommended that you stay at least 75 centimeters (30 inches) from your terminal and at least one meter (40 inches) from other terminals.

Keep it fixed. X-ray and other radiation production increases dramatically when the VDT is damaged, improperly maintained, or just plain worn out.

Human Set-Up

🎬 Posture

No one posture is perfect. Footrests help, as do cushions if your chair is not providing adequate support. The most important rule is to avoid prolonged positions.

🎬 Eyes

After good lighting and avoiding glare, the most important eye consideration is to look away from the screen occasionally. Also, don't forget to blink. Blinking moistens the eyes to prevent burning from dryness.

🎬 Breaks

If you hold any part of you in one position for longer than an hour, you set your self up for stiff joints, achy muscles, tendon fatigue and ligament weakness.

Revision Questions

i. Explain how the following file organization method operates:
   a) Hashed file organization
   b) Pile file organization

ii. List the advantages and disadvantages of serial file organization.

iii. Find out how the following security features are applied in database security:

a) encryption

b) authorization

c) authentication

iv. Write short notes on the types of computer viruses.

v. Identify at least four characteristics of a computer virus.

vi. Give ways in which computer viruses can be controlled

vii. Define the following terms and briefly explain how they influence computer security:

a) Hacking

b) Tracking

c) Cracking

d) Eavesdropping

EMERGING TRENDS IN COMPUTER TECHNOLOGY

INTRODUCTION

It is said that computers are doubling in performance every 18 months that is, in 18 months you could buy a computer twice as powerful/fast as today for the same price.

Motherboard performance is currently doubling every 38 ± 5 months. Notice that the measuring of performance is for the motherboard as a whole, not just the CPU. There have been fluctuations but the trend does look more or less exponential.

In application areas there have been even more development, we will focus on the emerging trends in the application areas of ICT.

NEW TRENDS OF COMPUTER APPLICATION AREAS

1. ARTIFICIAL INTELLIGENCE

Artificial Intelligence (AI) is the area of computer science focusing on creating machines that can engage on behaviors that humans consider intelligent. The ability to create intelligent machines has intrigued humans since ancient times, and today with the advent of the computer and 50 years of research into AI programming techniques, the dream of smart machines is becoming a reality. Researchers are creating systems which can mimic human thought, understand speech, beat the best human chess player, and countless other feats never before possible.

Apple Computers may not have ever been considered as the state of art in Artificial Intelligence, but a second look should be given. Not only are today's PC's becoming more powerful but AI influence is showing up in them. From Macros to Voice Recognition technology, PC's are becoming our talking buddies. Who else would go surfing with you on short notice- even if it is the net. Who else would care to tell you that you have a business appointment scheduled at 8:35 and 28 seconds and would notify you about it every minute till you told it to shut up. Even with all the abuse we give today's PC's they still plug away to make us happy. We use PC's more not because they do more or are faster but because they are getting so much easier to use. And their ease of use comes from their use of AI.

All Power Macintoshes come with **Speech Recognition**. That's right- you tell the computer to do what you want without it having to learn your voice. This implication of AI in Personal computers is still very crude but it does work given the correct conditions to work in and a clear voice. Not to mention the requirement of at least 16Mbs of RAM for quick use. Also Apple's Newton and other hand held note pads have Script

recognition. Cursive or Print can be recognized by these notepad sized devices. With the pen that accompanies your silicon note pad you can write a little note to yourself which magically changes into computer text if desired. No more complaining about sloppy written reports if your computer can read your handwriting. If it can't read it though- perhaps in the future, you can correct it by dictating your letters instead.

Macros provide a huge stress relief as your computer does faster what you could do more tediously. Macros are old but they are to an extent, Intelligent. You have taught the computer to do something only by doing it once. In businesses, many times applications are upgraded. But the files must be converted. All of the businesses records must be changed into the new software's type. Macros save the work of conversion of hundred of files by a human by teaching the computer to mimic the actions of the programmer. Thus teaching the computer a task that it can repeat whenever ordered to do so.

Artificial intelligence has successfully been used in a wide range of fields including **medical diagnosis, stock trading, robot control, law, scientific discovery, video games, toys, and Web search engines.**

2. OFFICE AUTOMATION

The term office automation refers to all tools and methods that are applied to *office* activities which make it possible to process written, visual, and sound data in a computer-aided manner.

Office automation is intended to provide elements which make it possible to simplify, improve, and automate the organisation of the activities of a company or a group of people (management of administrative data, synchronisation of meetings, etc.).

In particular, office automation includes the following activities:

- exchange of information
- management of administrative documents
- handling of numerical data
- meeting planning and management of work schedules

Office suite tools

The term "office suite" refers to all software programs which make it possible to meet office needs. In particular, an office suite therefore includes the following software programs:

- word processing
- a spreadsheet
- a presentation tool
- a database
- a scheduler

3. VIRTUAL REALITY

Virtual reality is a term that applies to computer-simulated environments that can simulate places in the real world as well as in imaginary worlds. Most current virtual reality environments are primarily visual experiences, displayed either on a computer screen or through special stereoscopic displays, but some simulations include additional sensory information, such as sound through speakers or headphones.

Users can interact with a virtual environment or a virtual artifact (VA) either through the use of standard input devices such as a keyboard and mouse, or through multimodal devices such as a wired glove.

The study of people in relation to their environments (ergonomics) may also be revolutionized by trials in cyberspace. Engineers at the Volvo car company use virtual reality to test various designs for the dashboard configuration from the perspective of the user.

In **medicine**, virtual reality systems are being developed to help surgeons plan and practice delicate surgical procedures. Using instruments connected to a computer, the operation can be performed cyberspace.

Virtual reality may even have applications in **psychiatry**. For example, someone with acrophobia (a fear of heights) may be treated by having the patient stand atop virtual skyscrapers or soar through the air like a bird.

4. MULTIMEDIA

Multimedia is media and content that uses a combination of different content forms. It includes a combination of text, audio, still images, animation, video, and interactivity content forms.

Multimedia is usually recorded and played, displayed or accessed by information content processing devices, such as computerized and electronic devices, but can also be part of a live performance. The term "rich media" is synonymous for interactive multimedia. Hypermedia can be considered one particular multimedia application.

Application areas:

Multimedia finds its application in various areas including, but not limited to, advertisements, art, education, entertainment, engineering, medicine, mathematics, business, scientific research and spatial temporal applications. Several examples are as follows:

Creative industries

Creative industries use multimedia for a variety of purposes ranging from fine arts, to entertainment, to commercial art, to journalism, to media and software services provided for any of the industries listed below.

Commercial

Exciting presentations are used to grab and keep attention in advertising. Business to business, and interoffice communications are often developed by creative services firms for advanced multimedia presentations beyond simple slide shows to sell ideas or liven-up training.

Entertainment and fine arts

In addition, multimedia is heavily used in the entertainment industry, especially to develop special effects in movies and animations. Some video games also use multimedia features. Multimedia applications that allow users to actively participate instead of just sitting by as passive recipients of information are called *Interactive Multimedia*.

Education

In Education, multimedia is used to produce computer-based training courses and reference books like encyclopedia and almanacs. This lets the user go through a series of presentations, text about a particular topic, and associated illustrations in various information formats.

Industry

In the Industrial sector, multimedia is used as a way to help present information to shareholders, superiors and coworkers. Multimedia is also helpful for providing employee training, advertising and selling products all over the world via virtually unlimited web-based technology

Medicine

In Medicine, doctors can get trained by looking at a virtual surgery or they can simulate how the human body is affected by diseases spread by viruses and bacteria and then develop techniques to prevent it.

5. EXPERT SYTEMS

These are computer programs that are derived from a branch of computer science research called *Artificial Intelligence* (AI). Often, the term expert systems is reserved for programs whose knowledge base contains the knowledge used by human experts, in contrast to knowledge gathered from textbooks or non-experts. More often than not, the

two terms, expert systems (ES) and knowledge-based systems (KBS), are used synonymously. Taken together, they represent the most widespread type of AI application. The area of human intellectual endeavor to be captured in an expert system is called the *task domain*. *Task* refers to some goal-oriented, problem-solving activity. *Domain* refers to the area within which the task is being performed. Typical tasks are diagnosis, planning, scheduling, configuration and design

Building an expert system is known as *knowledge engineering* and its practitioners are called *knowledge engineers*. The knowledge engineer must make sure that the computer has all the knowledge needed to solve a problem. The knowledge engineer must choose one or more forms in which to represent the required knowledge as symbol patterns in the memory of the computer -- that is, he (or she) must choose a *knowledge representation*. He must also ensure that the computer can use the knowledge efficiently by selecting from a handful of *reasoning methods*. The practice of knowledge engineering is described later. We first describe the components of expert systems.

The most important ingredient in any expert system is knowledge. The power of expert systems resides in the specific, high-quality knowledge they contain about task domains. AI researchers will continue to explore and add to the current repertoire of knowledge representation and reasoning methods. But in knowledge resides the power. Because of the importance of knowledge in expert systems and because the current knowledge acquisition method is slow and tedious, much of the future of expert systems depends on breaking the knowledge acquisition bottleneck and in codifying and representing a large knowledge infrastructure.

THE APPLICATIONS OF EXPERT SYSTEMS

The spectrum of applications of expert systems technology to industrial and commercial problems is so wide as to defy easy characterization. The applications find their way into most areas of knowledge work. They are as varied as helping salespersons sell modular factory-built homes to helping NASA plan the maintenance of a space shuttle in preparation for its next flight.

Applications tend to cluster into seven major classes.

Diagnosis and Troubleshooting of Devices and Systems of All Kinds

This class comprises systems that deduce faults and suggest corrective actions for a malfunctioning device or process. Medical diagnosis was one of the first knowledge areas to which ES technology was applied, but diagnosis of engineered systems quickly surpassed medical diagnosis. There are probably more diagnostic applications of ES than any other type. The diagnostic problem can be stated in the abstract as: given the evidence presenting itself, what is the underlying problem/reason/cause?

Planning and Scheduling

Systems that fall into this class analyze a set of one or more potentially complex and interacting goals in order to determine a set of actions to achieve those goals, and/or provide a detailed temporal ordering of those actions, taking into account personnel, materiel, and other constraints. This class has great commercial potential, which has been recognized. Examples involve airline scheduling of flights, personnel, and gates; manufacturing job-shop scheduling; and manufacturing process planning.

Configuration of Manufactured Objects from Subassemblies

Configuration, whereby a solution to a problem is synthesized from a given set of elements related by a set of constraints, is historically one of the most important of expert system applications. Configuration applications were pioneered by computer companies as a means of facilitating the manufacture of semi-custom minicomputers. The technique has found its way into use in many different industries, for example, modular home building, manufacturing, and other problems involving complex engineering design and manufacturing.

Financial Decision Making

The financial services industry has been a vigorous user of expert system techniques. Advisory programs have been created to assist bankers in determining whether to make loans to businesses and individuals. Insurance companies have used expert systems to assess the risk presented by the customer and to determine a price for the insurance.

Knowledge Publishing

The two most widely distributed expert systems in the world are in this category. The first is an advisor which counsels a user on appropriate grammatical usage in a text. The second is a tax advisor that accompanies a tax preparation program and advises the user on tax strategy, tactics, and individual tax policy.

Process Monitoring and Control

Systems falling in this class analyze real-time data from physical devices with the goal of noticing anomalies, predicting trends, and controlling for both optimality and failure correction.

IMPACT OF NEW TRENDS IN ICT TO BUSINESS

The impact that these new trends have had in the business environment is enormous, it include:

- **Improving marketing and advertisement** for example instead of using facebook as a communication medium, it also can be used for business matters. For example, users can use facebook to advertise about their business, give information about job opportunities, and post about marketing or new issues related to business matters. In other words, mankind should take seriously about facebook while neglecting bad words about facebook. Facebook could be better than the social networking existed nowadays, such as Myspace. The systems do not provide contact information to third party marketers without user permission. Facebook share user information with third parties only in limited circumstances where the system believes such sharing is reasonably necessary to offer the service, legally required or, permitted by the user.
- **Expanding the market-** this is through opening up of new markets beyond ones region. This has been made possible especially due to the use of internet.

- **Cutting on firm's costs-** this has been enhanced mostly by use of new techniques which has replaced humans hence cutting on cost. This is also through use such techniques like online conferencing, bulletin boards among others which reduces travelling and hence cost.

- **Enhancing business performance** this is through use of management information systems which provides management with all the information needed to make informed decisions.

- **Improving the quality of products**- this is majorly through automation of operations which has effectively improved the quality of the products being delivered.

WORD PROCESSING

This is the creation, input, editing, and production of documents and texts by means of computer systems. This should be differentiated from word processor which is a computer system or program designed for word processing.

There are two types of word processing i.e. dedicated word processors and non-dedicated word processors. Dedicated are type writer like and they can't do any other task apart from text production, they have an in built processor, they also tend to be fast when compared to non-dedicated word processors. Non-dedicated on the other hand they are the computer programs which are used in text production in computers. They are easy to use because they are more user-interactive as compared to dedicated word processors.

The common word processors in the market today include:-

- Microsoft Word
- WordPerfect
- WordPro
- TextMaker
- KWord

Features of Word Processor

Text Editing

Text can be changed by deleting it, typing over it or by inserting additional text within it.

Word Wrap and Centering

Words that extend beyond the right margin are wrapped around to the next line. Text can be centered between left and right margins.

Search and Replace, Move and Copy

Any occurrence of text can be replaced with another block of text. You can mark a block of text and move it elsewhere in the document or copy it throughout the document.

Layout Settings

Margins, tabs, line spacing, indents, font changes, underlining, boldface and italics can be set and reset anywhere within the document.

Headers, Footers and Page Numbering

Headers and footers are common text printed on the top and bottom of every page. Headers, footers and page numbering can be set and reset anywhere within the document. Page numbering in optional Roman numerals or alphabetic letters is common.

Style Sheets

After designing a document, its format can be used again. Layout codes (margins, tabs, fonts, etc.) can be stored in a style sheet file and applied to a new document.

Mail Merge

Creates customized letters from a form letter and a list of names and addresses. The list can be created as a document or can be imported from popular database formats.

Math and Sorting

Columns of numbers can be summed and simple arithmetic expressions can be computed. Lines of text can be reordered into ascending (A-Z) or descending (Z-A) sequence.

Preview, Print and Group Print

A document can be previewed before it is printed to show any layout change that may not normally show on screen (page breaks, headers, footers, etc.). Documents can be printed individually or as a group with page numbers consecutively numbered from the first to the last document.

Footnotes and Endnotes

Footnote entries can be made at any place in the document, and the footnotes printed at the end of a page or document.

Spelling Checker and Thesaurus

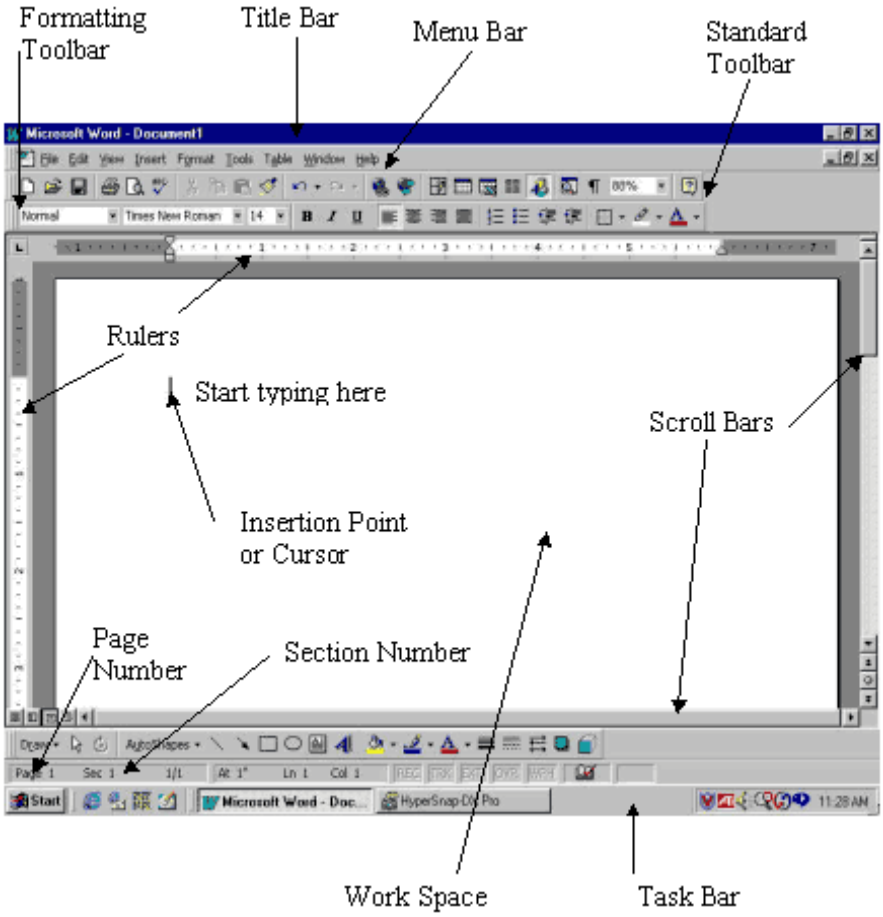
Spelling can be checked for an individual word, marked block of text or an entire document. When words are in doubt, possible corrections are suggested. Advanced systems can correct the misspellings automatically the next time. A thesaurus displays synonyms for the word at the current cursor location.

File Management

Documents can be copied, renamed and deleted, and directories, or folders, can be created and deleted from within the program. Advanced systems set up a purge list of names or glimpses of document contents in order to allow a user to easily rid the disk of

unwanted files.

Parts of a Microsoft Word Window



Function of various keys as used in word processing

Function Keys (F keys)

Most computer keyboards have a row of function keys at the top of the keyboard. These keys are marked F1 through F10 or F12. The function keys are frequently used in combination with other keys such as the CTRL key, the ALT key, and the Shift key. These combinations result in a plethora of possible keyboard shortcuts.

Return or Enter Key

This key is usually marked Return or Enter, but sometimes is labeled with only a large arrow. Enter key is used to enter commands or to move the cursor to the beginning of the next line.

Escape Key

The Escape key, which is marked ESC on most keyboards, is basically used to exit or escape from programs and tasks. In many cases, it will have no effect at all. However, it can sometimes get you out of trouble by making the computer go back or escape to a previous screen.

Control Key (CTRL)

The CTRL key is used in conjunction with another key. Holding it down while pressing another key will initiate a certain action. CTRL key combinations are defined by the application being used. Some, however, have become a standard that most programs follow. For instance in most Windows programs, CTRL+S will save the current file or document, and CTRL+P will print the current file or document.

Alternate Key (ALT)

Like the Control Key, the ALT key is used in combination with other keys. In most Windows programs, each of the menu choices at the top of the screen has one letter underlined. Holding down the ALT key while pressing the key corresponding to the underlined letter will open the menu just as though you had clicked your mouse on that menu choice. For instance, if the menu shows the choice File, you can open that menu by clicking the mouse on the word File or by pressing the ALT key and the F key simultaneously.

Caps Lock

The Caps Lock key is a toggle key. Pressing it once turns it on. Pressing it again turns it off. Some computer keyboards have a light or indicator that shows when the Caps Lock is on and when it is off. When Caps Lock is on, every letter that is typed will be a capital letter.

Num Lock & Numeric Keypad

Many, but not all, computer keyboards have a numeric keypad usually located on the right side of the keyboard. This keypad has a group of number keys with additional markings like arrows, PgDn, End, etc. The numeric pad is controlled by a toggle key marked Num Lock. When the Num Lock key is on, this pad can be used to enter numbers. When the Num Lock key is off, the functions listed below the number will be activated.

Home Goes to beginning of current line.

End Goes to end of current line.

Insert used to switch between overtype and insert modes of typing.

Delete clears character to the right of the insertion point.

Backspace clears characters to the left of the insertion point.

The various keyboard short cuts used in word processing include:

Alt + F File menu options in current program.

Alt + E Edit options in current program

F1 Universal Help in almost every Windows program.

Ctrl + A Select all text.

Ctrl + X Cut selected item.

Shift + Del Cut selected item.

Ctrl + C Copy selected item.

Ctrl + Ins Copy selected item

Ctrl + V Paste

Shift + Ins Paste

Ctrl + Home Goes to beginning of document.

Ctrl + End Goes to end of document.

Shift + Home Highlights from current position to beginning of line.

Shift + End Highlights from current position to end of line.

Ctrl + Left arrow Moves one word to the left at a time.

Ctrl + Right arrow Moves one word to the right at a time.

Word Processing Practices

Formatting text:-

To change text to **bold**, *italics*, underline or a different format style the following procedure should be followed:-

1. Highlight the text to be formatted.

2. Click format followed by font.

3. Format as appropriate and then click ok.

Superscripts (E.g. 4^2) and Subscripts (H_20)

To format the 2s above to appear as they do, the following procedure should be followed:-

1. Highlight the text to be formatted.

2. Click Format followed by Font.

3. Under effects choose either subscript or superscript as appropriate.

4. Click OK to exit.

Creation and Editing of Tables

The procedure for creating tables is as follows:

i. Click tables.
ii. Click insert then table.

iii. Choose the number of rows and columns required.

The editing of table is similar to the normal text editing.

Merging and Splitting Cells

i. Select the cells to be merged or split then on the menu bar click table
ii. Choose Merge Cells or Split Cells as required.

Drop Cap

This is a procedure used to enlarge the first character either occupying the entire margin or dropped by a few lines. Drop cap can be in two forms i.e. either Dropped or In Margin

Procedure:

i. Select the character to be formatted
ii. Click format then Drop Cap

iii. Click either Dropped or In Margin as appropriate

iv. Choose the number of lines to drop with incase of dropped.

v. Click OK to exit

Insert Page Numbers

i. Click insert from the menu bar followed by page numbers
ii. Select the position and alignment where the page is to be inserted.

iii. Click format to select the preferred page format.

iv. Select the page format of your choice the click ok to exit.

Insert Date and or Time

i. Click where the date is to be inserted.
ii. Click insert followed by Date and Time.

iii. Choose the desired format and click.

iv. Click OK to exit.

Insert Special Symbols

The symbols which can't be easily located on the keyboard can be inserted into a word document. The following procedure should be used:

i. Click where the symbol is to be inserted.
ii. Click symbol.

iii. Select the desired symbol then click insert followed by close.

Headers and Footers

a header is located on the top of every page while the footer appears at the bottom. The procedure is as follows:

i. From the menu bar click view
ii. Select Header and Footer

iii. Enter the header as required and hen the footer.

Student Activity

The student should learn how to carry out the following activities:-

- Printing a document in both landscape and portrait.
- Carrying out a mail merge.

Revision Questions

i. give at least two functions of the following bars:-

- Title bar
- Menu bar
- Task bar
- Horizontal and vertical scroll bar
- status bar

ii. Differentiate between standard tool bar and formatting tool bar.

iii. Find out the difference between insert and overtype modes of typing.

iv. Establish the procedure that one can follow to develop a printout that is a mix up of both columns and full-page writings.

v. Explain what is meant by the following terminologies as used in mail-merge

- Datasource
- Main Document
- Merge

MICROSOFT EXCEL

Definition:

A spreadsheet is the computer equivalent of a paper ledger sheet. It consists of a grid made from columns and rows.

The packages used in the market today to develop spreadsheet documents include:

Microsoft excel

Lotus 1-2-3

Quattro Pro

GS-Calc

Features of excel

Columns these are labeled alphabetically.

Rows these are horizontal lines which are numbered digitally.

Cells this is the intersection between a row and a column. it's the basic unit of a worksheet.

Border this is the left and top label that is used to show the current cell

In each cell there may be the following types of data

- text (labels)
- number data (constants)
- formulas (mathematical equations that do all the work)

For example:

data types	examples	descriptions
LABEL	Name or Wage or Days	anything that is just text
CONSTANT	5 or 3.75 or -7.4	any number
FORMULA	=5+3 or = 8*5+3	math equation

Spreadsheets have many Math functions built into them. Of the most basic operations are the standard multiply, divide, add and subtract. These operations follow the order of operations (just like algebra). Let's look at some examples.

- A1 (column A, row 1) = 5
- A2 (column A, row 2) = 7
- A3 (column A, row 3) = 8
- B1 (column B, row 1) = 3
- B2 (column B, row 2) = 4
- B3 (column B, row 3) = 6

	A	B
1	5	3
2	7	4
3	8	6

Operation	Symbol	Constant Data	Referenced Data	Answer
Multiplication	*	= 5 * 6	= A1 * B3	30
Division	/	= 8 / 4	= A3 / B2	2
Addition	+	= 4 + 7	= B2 + A2	11
Subtraction	-	= 8 - 3	= A3 - B1	5

Some of the functions include

Count Function

This will return the number of entries (actually counts each cell that contains number data) in the selected range of cells.

- Blank entries are not counted.
- Text entries are NOT counted.

	A
1	10
2	20
3	30
4	test
5	

Example of **Count**	Cells to look at	Answer
=Count (A1:A3)	A1, A2, A3	3
=Count (A1:A3, 100)	A1, A2, A3 and 100	4
=Count (A1, A3)	A1, A3	2
=Count (A1, A4)	A1, A4	1
=Count (A1, A5)	A1, A5	1

CountA Function

This will return the number of entries (actually counts each cell that contains number data **OR** text data) in the selected range of cells.

- Blank entries are not Counted.
- Text entries **ARE** Counted.
-

	A
1	10
2	20
3	30
4	test
5	

=CountA (A1:A3)	A1, A2, A3	3
=CountA (A1:A3, 100)	A1, A2, A3 and 100	4
=CountA (A1, A3)	A1, A3	2
=CountA (A1, A4)	A1, A4	2
=CountA (A1, A5)	A1, A5	1

IF Function

The IF function will check the logical condition of a statement and return one value if true and a different value if false. The syntax is

- =IF (condition, value-if-true, value-if-false)

- value returned may be either a number or text
- if value returned is text, it must be in quotes

	A	B
1	Price	Over a dollar?
2	$.95	No
3	$1.37	Yes
4	comparing #	returning #
5	14000	0.08
6	8453	0.05

Example of **IF** typed into column B	Compares	Answer
=IF (A2>1,"Yes","No")	is (.95 > 1)	No
=IF (A3>1, "Yes", "No")	is (1.37 > 1)	Yes
=IF (A5>10000, .08, .05)	is (14000 > 10000)	.08
=IF (A6>10000, .08, .05)	is (8453 > 10000)	.05

Sum Function

Probably the most popular function in any spreadsheet is the SUM function. The Sum function takes all of the values in each of the specified cells and totals their values. The syntax is:

- =SUM(first value, second value, etc)

In the first and second spots you can enter any of the following (constant, cell, range of cells).

- Blank cells will return a value of zero to be added to the total.
- Text cells can not be added to a number and will produce an error.

	A
1	25
2	50
3	75
4	test
5	

Example	Cells to ADD	Answer
=sum(A1:A3)	A1, A2, A3	150
=sum(A1:A3, 100)	A1, A2, A3 and 100	250
=sum(A1+A4)	A1, A4	#VALUE!
=sum(A1:A2, A5)	A1, A2, A5	75

Max Function (Maximum)

This will return the largest (max) value in the selected range of cells.

- Blank entries are not included in the calculations of the Max Function.
- Text entries are not included in the calculations of the Max Function.
-

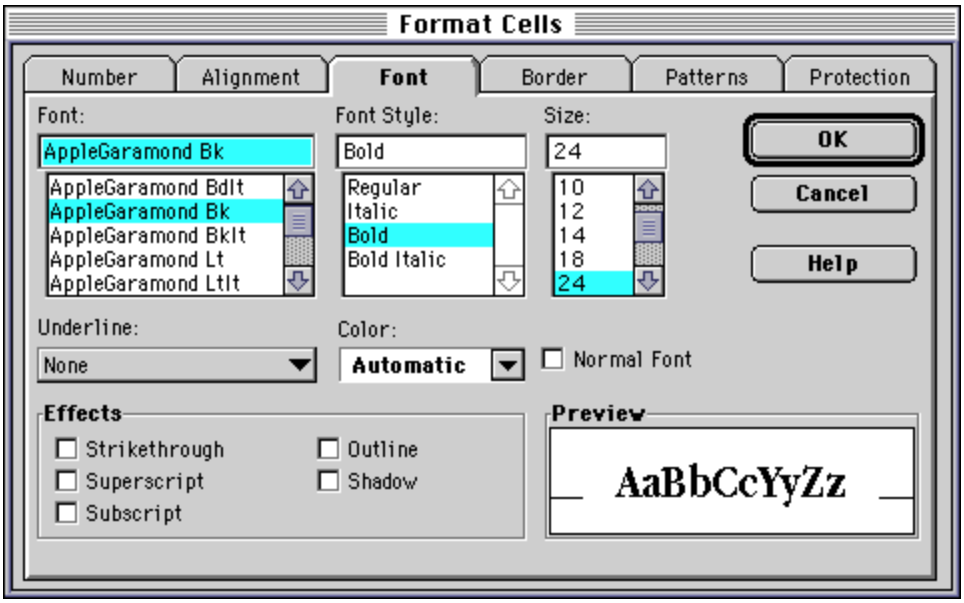
	A
1	10
2	20
3	30
4	test
5	

Example of Max	Cells to look at	Ans. Max
=max (A1:A4)	A1, A2, A3, A4	30
=max (A1:A4, 100)	A1, A2, A3, A4 and 100	100
=max (A1, A3)	A1, A3	30
=max (A1, A5)	A1, A5	10

Formatting Text

We can use: bold face, italics, underline, change the color, align (left, right, center), font size, font, etc.

We need to select the **cell (or group of cells)** that we wish to change the formatting and then go from the FORMAT menu -- down to CELLS -- click on FONT.



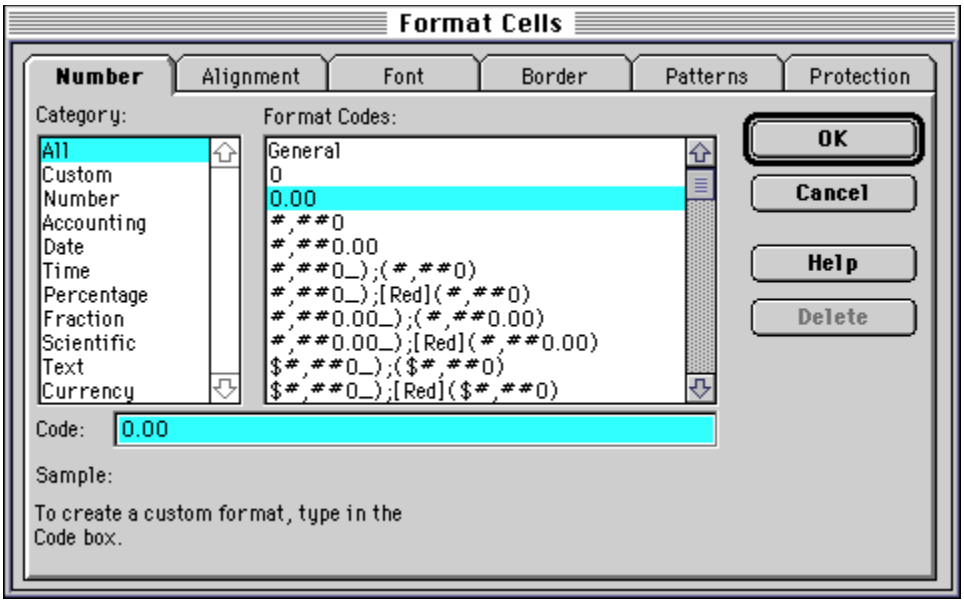
Formatting Numbers

We often need to format the numbers to display the appropriate number of decimals, dollar signs, percentage, red (for negative dollars), etc.

If we have the number 3.53262624672423, we would probably have to make the column wider and at the least bore most people. We need to set the number of decimal places to what is important.

If this was a dollar figure that had calculated tax it should be $3.53.

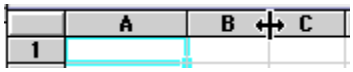
Here is a screen displaying what you would see if you select a **cell (or group of cells)** and from the FORMAT menu -- go down to format -- click on number.



Column Width

Here are two ways to change the column width

1. Select the column (or columns) with the problem by clicking on their labels (letters). Then you choose the MENU FORMAT. Go down to COLUMN and over to WIDTH and type in a new number for the column width.
2. Move the arrow to the **right** side of the column label and click and drag the mouse to the right (to make wider) or left (to make smaller). Let up on the mouse button when the column is wide enough.



Notice the cursor changes to a vertical line with arrows pointing left and right.

In many spreadsheets you can also change the vertical height of a row by moving the lower edge of the row title (number).

Inserting a Row

Likewise, we can also insert rows. With the row label (number) selected you must choose the **Row** from the **Insert** menu. Again this will insert a row **before** the row you have selected.

	A	B	C	D	E
1	1	2	3	4	5
2	2	4	7	11	16
3	3	7	14	25	41
4	4	11	25	50	91

	A	B	C	D	E
1	1	2	3	4	5
2	2	4	7	11	16
3					
4	3	7	14	25	41
5	4	11	25	50	91

The formulas will be updated to their corresponding locations.
C3 was = C2+B3
NOW C4=C2+B4

Inserting a Column

Sometimes we (all) make mistakes or things change. If you have a spreadsheet designed and you forgot to include some important information, you can insert a column into an existing spreadsheet. What you must do is click on the column label (letter) and choose in **Columns** from the **Insert** menu. This will insert a column **immediately left** of the selected column.

	A	B	C	D	E
1	1	2	3	4	5
2	2	4	7	11	16
3	3	7	14	25	41
4	4	11	25	50	91

	A	B	C	D	E	F
1	1	2		3	4	5
2	2	4		7	11	16
3	3	7		14	25	41
4	4	11		25	50	91

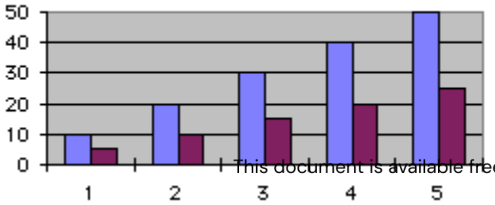
As you can see from this example there was a blank column inserted into the spreadsheet. You might wonder if this will affect your referenced formulas. Yes, the Referenced cells are changed to their new locations. For example:

Cell C4 was =C3+B4
and now is =D3+B4

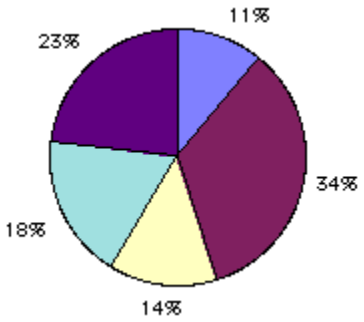
Charts or Graphing

Numbers can usually be represented quicker and to a larger audience in a picture format.

Excel has a chart program built into its main program. The Chart Wizard  will step you through questions that will (basically) draw the chart from the data that you have **selected**. There are many types of charts. The two most widely used are the bar chart and the pie chart.



The **BAR** Chart is usually used to display a change (growth or decline) over a time period. You can quickly compare the numbers of two different bar charts to each other.



The **PIE** Chart is usually used to look at what makes up **a whole** *Something.*

Revision Questions

i. Find out at least four other features of spreadsheet.
ii. Find out the different types of cell referencing that are normally used in spreadsheet.

iii. Identify four application areas of spreadsheet.

iv. Give four advantages and four disadvantages of using spreadsheet for financial analysis.

PUBLISHER

DEFINITION

Publications are be in two forms i.e. on-screen and printable. For example PowerPoint provides an on-screen publication which may even contain animation, while publisher produces a printable document which can be printed out as banners, fliers or any other publication.

The packages used to develop publications include the following:

- Microsoft Publisher
- Microsoft PowerPoint
- Corel draw

Microsoft Publisher is an application that can help you create sophisticated publications. Some examples of Publisher documents include:

Brochures	Business Cards	Certificates
Flyers	Programs	Catalogs
Posters	Stationary	Envelopes and Labels
Bookmarks	Place Cards	Postcards
Greeting Cards	Invitations	Resumes

A typical publication will contain a mixture of graphics and text.

Revision Questions

i. Identify all the objects found on an object toolbar and uniquely identify the function.
ii. list at least three areas where Microsoft publisher is mostly applicable in.
iii. identify all the components of a picture tool bar

INTERNET AND WORLD WIDE WEB

The World Wide Web is a system of Internet servers that supports hypertext and multimedia to access several Internet protocols on a single interface. The World Wide Web is often abbreviated as the web or www.

The World Wide Web was developed in 1989 by Tim Berners-Lee of the European Particle Physics Lab (CERN) in Switzerland. The initial purpose of the Web was to use networked hypertext to facilitate communication among its members, who were located in several countries. Word was soon spread beyond CERN, and a rapid growth in the number of both developers and users ensued. In addition to hypertext, the Web began to incorporate graphics, video, and sound. The use of the Web has reached global proportions and has become a defining element of human culture in an amazingly short period of time.

Internet protocols are sets of rules that allow for intermachine communication on the Internet. These are a few of the protocols you can experience on the Web:

HTTP (Hyper Text Transfer Protocol): transmits hypertext over networks. This is the protocol of the Web.

E-mail (Simple Mail Transport Protocol or SMTP): distributes e-mail messages and attached files to one or more electronic mailboxes.

FTP (File Transfer Protocol): transfers files between an FTP server and a computer, for example, to download software.

VoIP (Voice over Internet Protocol): allows delivery of voice communications over IP networks, for example, phone calls.

Hypertext is a document containing words that connect to other documents. These words are called links and are selectable by the user. A single hypertext document can contain links to many documents. In the context of the Web, words or graphics may serve as links to other documents, images, video, and sound.

Retrieving documents on the Web: the URL and Domain Name System

URL stands for Uniform Resource Locator. The URL specifies the Internet address of a file stored on a host computer, or server, connected to the Internet. Web browsers use the URL to retrieve the file from the server. This file is downloaded to the user's computer, or client, and displayed on the monitor connected to the machine. Because of this relationship between clients and servers, the Web is a client-server network.

Every file on the Internet, no matter what its protocol, has a unique URL. URLs are translated into numeric addresses using the domain name system (dns). The DNS is a worldwide system of servers that stores location pointers to Web sites. The numeric address, called the ip (internet protocol) address, is actually the "real" URL.

For example, **207.46.192.254** is also www.microsoft.com.

This is the format of the URL: for example http://www.senate.gov/general/capcam.htm

- Host computer name: **www**
- Protocol: **http**
- Second-level domain name: **senate**
- Top-level domain name: **gov**
- Directory name: **general**
- File name: **capcam.htm**

Common terms used in internet environment

- ✓ A **web browser** or **Internet browser** is a software application for retrieving, presenting, and traversing information resources on the World Wide Web. e.g. Internet Explorer, Mozilla, Opera etc
- ✓ A **web search engine** is designed to search for information on the World Wide Web. The search results are generally presented in a list of results and are often called *hits*. The information may consist of web pages, images, information and other types of files. examples of search engines include Google, Yahoo search, Ask it, Bing etc.
- ✓ **Data Communications** is the transfer of data or information between a source and a receiver.
- ✓ **Multiplexing** is the transmission of multiple data communication sessions over a common wire or medium. Multiplexing reduces the number of wires or cable required to connect multiple sessions.
- ✓ **Modulation** techniques are methods used to encode digital information in an analog world. The 3 basic modulation techniques are:
  a) AM (amplitude modulation)
  b) FM (frequency modulation)
  c) PM (phase modulation)
- ✓ Data transmission can either be **synchronous** or **asynchronous**. In synchronous transmission there is interaction f the communicating systems such that one system can't communicate if the receiver has no respond. In asynchronous the communicating systems just send the data without waiting for a response from the one another.
- ✓ **Attenuation Distortion** is the change in strength of the transmitted signal over a long distance.
- ✓ The delay from the time the signal was transmitted to the time it was received is called **Propagation Delay**.

Application areas of internet:

Telnet

This is a protocol which allows someone be on one computer system while doing work on another. It establishes an error free, rapid-link between two computers allowing you to log on to your home computer when you are traveling.

Chatting
Chatting allows people who are on the computer simultaneously to hold live, interactive conversations. Only people who happen to be signed on at the same time are able to talk because messages are not stored. The limitation of this is that the topic is open to all without security so that intruders can participate.

Usenet Newsgroups
These are world wide discussion groups in which people share information and ideas on a defined topic through large electronic bulletin boards where anyone can post messages on the topic for others to see and respond to.

Bulletin Board
A **bulletin board** is a surface intended for the posting of public messages, for example, to advertise things to buy or sell, announce events, or provide information. Bulletin boards are often be placed on the computer so people can leave and erase messages for other people to read and see.

E-mail
Electronic mail, commonly called **email** or **e-mail**, is a method of exchanging digital messages across the Internet or other computer networks. Originally, email was transmitted directly from one user to another computer. This required both computers to be online at the same time, a la instant messaging. Today's email systems are based on a store-and-forward model. Email servers accept, forward, deliver and store messages. Users no longer need be online simultaneously and need only connect briefly, typically to an email server, for as long as it takes to send or receive messages.

E-commerce
Electronic commerce, commonly known as **e-commerce** or **eCommerce**, consists of the buying and selling of products or services over electronic systems such as the Internet and other computer networks. The amount of trade conducted electronically has grown extraordinarily with widespread Internet usage. The use of commerce is conducted in this way, spurring and drawing on innovations in electronic funds transfer, supply chain management, Internet marketing, online transaction processing, electronic data interchange (EDI), inventory management systems, and automated data collection systems.

Modern electronic commerce typically uses the World Wide Web at least at some point in the transaction's lifecycle, although it can encompass a wider range of technologies such as e-mail as well.

Revision Questions

i. Identify the challenges that arise as a result of using internet for business.
ii. Find out the impact of internet in the business environment (positive).
iii. Explain the following terms in relation to e-mail communication:
    a) Spamming
    b) E-mail bombing