INFORMATION TECHNOLOGY

Renu Gupta

A MAHAVIR PUBLICATION

Information Technology

A Text Book For M.Com. Students of Indian Universities
As Per U.G.C New Syllabus

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A Text Book For Paper-6 of Professional Education (Examination-II) of I.C.A.I

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PREFACE

TO THE FIRST EDITION

As we all know, now a days there are large number of people using personal computer (PC) in their daily activities. Those people are Managers,Operators, Programmers, Accountants and many others, and usually have their works made simple by using personal computers. Simple-to-understand programs make life even easier to organize.Today's computer systems are far more than computational and text processing tools. They enable new communication paradigm. Thus, computer know-how has became the need of the hour.

This book is primarily written for the students who are new to computers. The book aims to provide essential, practical guidance in the short amount of time available to students. A workbook format is used to provide a hands-on approach to learning these skills. You will learn as you do. The book is divided into 8 parts that readers can dip into, as they need to during their course. Exercises relate directly to situations that students may find themselves in during their course of study.

It also provides useful guidelines on how to operate Windows. It provides basic Windows operating skills to those who are not familiar with the windows environment.

The book has been prepared to complement the Internet Training which include instructions for the following subjects:

- An overview of the Internet;
- Using e-mail; and
- Navigating the Web.

Whereas the first 4 parts deals with the computer basics and fundamentals; database Management, internet and cyber laws, the last 4 parts of the book introduces you to the Word-Processing Package : *MS-Word*; Spreadsheet Package : *MS-Excel;* Presentation Package : *PowerPoint;* and Accounting Package : *Tally.*

It is hoped that the book in its present form will catter to the needs of students preparing for thier C.A. examination.

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SYLLABUS

Paper 6 : Information Technology

(One Paper—Three hours—100 marks)

Level of Knowledge : Working Knowledge

Objective : To develop understanding the appreciation of broad nature and application of information technology.

Contents :

1. Introduction to computers
2. Overview of technology architecture

   Hardware :
   - Types of computer–mainframes, minicomputers, microcomputers, advantages, and limitations
   - Anatomy of computer–functions and components of a computer

   Software :
   - System software,
   - Application software
   - Other expert/specialised systems (decision support, artificial intelligence systems, etc.)

   Database structure :
   - What is database?
   - Types of database structures–comparisons between the structures.
   - Database types and manner of data storage
   - Data access control software
   - Database management methods and techniques–data dictionaries, Management through Data Center–what is data center, features, how does it function?

   Telecommunication and Networking :
   - Types of network design structures
   - LAN/WAN/SAN
   - Suitability of network structures to different organisation setups
   - Advantages and limitations
   - Data transmission methods and their infrastructure requirements
3. Data Storage, Retrievals and Database management
   - Storage techniques
   - Access control methods and best policies depending upon the frequency of access and volumes
   - Usage of system software like program library management systems and tape and disk management systems–features, functionalities, advantages
   - Database performance monitoring methods
   - Current most frequently used management systems
   - Data reporting methods and languages used
4. Data processing :
   - Techniques in data processing–online, batch mode, real time.
   - Processing software tools and applicability to organisation setups.
5. Introduction to Internet and other emerging technologies :
6. Office productivity tools
   - Word Processing
   - Electronic spreadsheets
   - Business project management and presentation tools.
7. Development tools :
   - Introduction to flowcharts–system flowcharts, run flowcharts, program flowcharts–illustration and limitations
   - Decision tables–types; illustration, benefit and limitations
8. Computer assisted audit techniques (CAAT) :
   - Introduction to CAAT and usage in accounting/audit
9. Introduction to accounting packages :
10. Cyber Laws and Information Technology Act, 2000.

CONTENTS

chapter 1

Introduction to Computers

Introduction

The computer is a versatile and powerful tool for all of us. It enables us to work more effectively and to communicate with people around the world.

A computer is a machine that receives, processes, and stores information electronically.

Computers can pass information to each other in the same way that telephones do. Because computers do so many things, it's important to keep in mind that this is a tool to help you do what **you** want. Some of the things computers can enable you to do include:-

- Creating documents
- Accounting and calculating
- Sending and receiving e-mail messages
- Finding information
- Publishing information

Computers are made of hardware which includes:-

- Input devices such as the keyboard and mouse
- The central processing unit (CPU) and memory
- Storage devices such as hard drives
- Output devices such as printers and monitors

  and software (the instructions that tell the computer what to do) which includes:-
- System software
- Programs (application software).

In a nutshell we can say that a computer is a general-purpose machine that processes data according to a set of instructions that are stored internally either temporarily or permanently. The computer and all equipment attached to it called hardware. The instructions that tell it what to do are the software. A set of instructions that perform a particular task is called a program or software program.

What computer do

In a computer data is entered using a keyboard, mouse, microphone, touch monitor or sensor. These are called input devices. The central processing unit (CPU) processes the data as it is entered. Data can be stored on a hard disk, a floppy disk, a CD-ROM, a tape, or some other peripheral device connected to the computer. It may be printed or displayed on a screen. Storage devices, visual display units (VDUs) and printers are output devices.

Most computers have at least two kinds of memory: primary and secondary. Primary memory is usually silicon chips. 'Random access memory' (RAM) means that any part of it can be obtained immediately, as with a book that can be opened at any page. The processor works very quickly, usually taking less than one microsecond to obtain an item of information. Secondary memory is usually magnetic disk, made of one or more platters rotating under a reading head. It is not random access: a particular part of the disk cannot be read until it rotates under the reading head, which usually takes several milliseconds. Storage is measured in bytes (one byte containing eight bits)

The computer processes the data by calculating, comparing and copying it. This enables the computer to carry out all forms of data processing. For example, with a database program, the data is copied into the computer's memory for processing. The records are sorted into a different order by comparing two records and copying the one with the lower value in front of the one with the higher value. The original data remains the same. Searching for specific data involves comparing the requested data with the appropriate section on each record to find a match.

In word processing, editing text is accomplished by copying characters from one place to another. To insert a character into an existing line of text, the remaining characters are copied one memory location (byte) to the right so there is room for the additional letter. Deleting is just copying in reverse. Keeping track of where the text is stored in memory involves a lot of calculating and comparing. The processor speed and the amount of memory available determine the speed at which this happens.

Classification of Computers

The term 'computer' is used to refer to a wide range of devices. It can mean personal computer, file server or mainframe. A terminal does not have a CPU, but acts as an input/output device for a computer and usually has a keyboard for input and a monitor or printer for output.

A **computer** is a programmable machine (or more precisely, a programmable sequential state machine). There are three kinds of computers: analog, digital and hybrid.

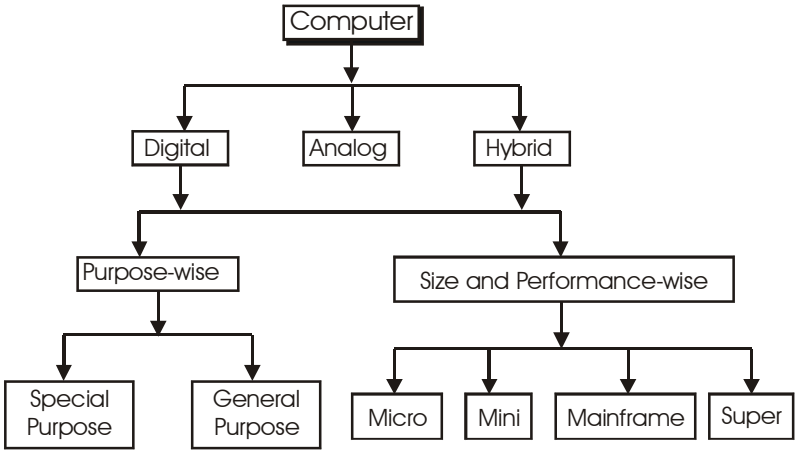

Fig 1.1 Classification of Computers

Digital Computer

*A **digital computer** is a programmable-clocked sequential state machine.* A digital computer uses discrete states. A binary digital computer uses two discrete states, such as positive/negative, high/low, on/off, used to represent the binary digits zero and one. A digital computer converts the data (alphabets, numbers, etc.) into electric pulses and then perform mathematical operations on numbers in discrete forms. It stores data for processing, perform logical operations, edit the input data and print the processed result. The Digital computer has a high level of accuracy that is why it is used in most business applications. The main disadvantage of digital computers is their high cost and the complexity in programming.

The digital computer can be classified into two ways:

- Purpose Wise
- Size and Performance Wise

(A) Purposewise Digital Computers

Purpose-wise digital computers are classified into two ways:

i. Special Purpose computer : Are the one which are designed to perform a specific task. The instructions to carry out the task are permanently stored in the machine. For the specific tasks, this type of computer works efficiently but such computers are not versatile.

ii. General Purpose computer : Are the one that can work on different types of programs input to it and thus be used in countless applications. The programs are not permanently stored but are input at the time of execution. Such computers are not versatile.

(B) Size and Performance Wise Computers

Computers vary widely in performance, size and cost. There is a computer for every use under heaven, or so it seems. Let's look at the kinds of computers that there are, based on **general performance levels.**

i. Supercomputer : A supercomputer is a computer that leads the world in terms of processing capacity, particularly speed of calculation, at the time of its introduction. The term is rather fluid, and today's supercomputer tends to become tomorrow's also-ran.

Supercomputers are used for highly calculation-intensive tasks such as weather forecasting, climate research (including research into global warming), molecular modeling (computing the structures and properties of chemical compounds, biological macromolecules, polymers, and crystals), physical simulations (such as simulation of airplanes in wind tunnels, simulation of the detonation of nuclear weapons, and research into nuclear fusion), cryptanalysis, and the like. Military and scientific agencies are heavy users.

Supercomputers traditionally gained their speed over conventional computers through the use of innovative designs that allow them to perform many tasks in parallel, as well as complex detail engineering. They tend to be specialized for certain types of computation, usually numerical calculations, and perform poorly at more general computing tasks.

As we move ahead...

Supercomputer challenges and technologies

- A supercomputer generates heat and must be cooled. Cooling a supercomputer is a major HVAC problem.
- Information cannot move faster than the speed of light between two parts of a supercomputer. For this reason, a supercomputer that is many meters across must have latencies between its components measured at least in the tens of nanoseconds. Seymour Cray's Cray supercomputer designs attempted to keep cable runs as short as possible for this reason.
- Supercomputers consume and produce massive amounts of data in a very short period of time. Much work is needed to ensure that this information can be transferred quickly and stored.

ii. Mainframe : A mainframe is simply a very large computer. And totally different from what you have on your desk. Mainframe is an industry term for a large computer. The name comes from the way the machine is build up: all units (processing, communication etc.) were hung into a frame. Thus the main computer is build into a frame, therefore: **Mainframe.** This is a large-scale computer with big data-storage facilities that can be accessed simultaneously from many terminals. A mainframe is made up of many sub-systems. These collect and store data and check for errors, leaving the CPU to do the data processing. Mainframes process data much faster than personal computers. Much of the circuitry is designed to detect and correct errors, with every sub-system being monitored constantly for potential failure. Consequently, mainframes are very reliable.

And because of the sheer development costs, mainframes are typically manufactured by a large company such as IBM, Amdahl, Hitachi. Their main purpose is to run commercial applications of Fortune 1000 businesses and other large-scale computing purposes. Think here of banking and insurance businesses where enormous amounts of data are processed, typically (at least) millions of records, each day.

A mainframe has 1 to 16 CPU's (modern machines more), Memory ranges from 128 Mb over 8 Gigabyte on line RAM. Its processing power ranges from 80 over 550 Mips.

Historically, a mainframe is associated with centralized computing opposite from distributed computing. Meaning all computing takes (physically) place on the mainframe itself: the processor section.

iii. Minicomputer : Minicomputer is the now largely obsolete name for a class of multi-user computers which made up the middle range of the computing spectrum, in between the largest multi-user systems (mainframe computers) and the smallest single-user systems (microcomputers or personal computers)

The term evolved in the 1960s to describe "small" server-class computers, usually taking up one or a few cabinets, compared with mainframes that would usually fill a room. They were far less expensive than mainframes.

As microcomputers developed in the 1970s and 80s, minicomputers filled the mid-range area between micros and mainframes. Microcomputers were single-user, relatively simple machines running simple program-launcher operating systems like CP/M or MS-DOS, while minis were much more powerful systems that ran full multi-user, multitasking operating systems like VMS and Unix. The classical mini was a 16-bit computer, while the emerging higher performance 32-bit minis were often referred to as superminis.

As of 2001, the term minicomputer is no longer used for the mid-range computer systems, and most are now referred to simply as servers. This has come about as a result of several factors, including:

(i) Several versions of Unix now run on the Intel architecture, including Solaris, Linux and FreeBSD.

(ii) The Windows series of operating systems includes server versions that support multitasking and other features required for mid-range uses, beginning with Windows NT.

(iii) Hewlett-Packard now refers to its HP3000 series of computers as servers, rather than as minicomputers.

A number of pioneering computer companies first built minicomputers, such as DEC, Data General, Hewlett-Packard, and IBM.

Today's personal computers are descendants of the microcomputers, but architecturally their CPUs and operating systems have evolved largely by integrating features from minicomputers.

iv. Microcomputers or Personal computer : Personal computers are relative newcomers to the computer scene. Although the first generation computers were built in the 1940s, the first personal computers were only introduced in the 1970s and didn't come into widespread use until the 1980s. The speed and capacity of the machines has continued to increase almost as fast as their size and price shrinks, making them all the more practical and popular. Today's personal computers are hundreds of times more powerful than those sold 10 or 15 years ago, generally cost less, and can fit in packages the size of a notebook

These can be desktop, notebook or palmtop computers. Computers are often linked together in local area networks (LANs) enabling them to share data and peripherals such as printers, fax machines and scanners.

Analog Computers

Analog computers are analog devices. That is, they have continuous states rather than discrete numbered states. An analog computer can represent fractional or irrational values exactly, with no round off. Analog computers are almost never used outside of experimental settings.

Hybrid computers

A **hybrid computer** contains elements of both the digital and analog types (generally used to solve for large, complex equations). Hybrid computer is a computer with digital processor and stored-program linked with a multiplicity of analog computing units and is capable of analog-to-digital and digital-to-analog data Conversion.

File server

This is a high-speed computer on a network that stores the programs and data files shared by users. It acts like a remote disk drive.

Characteristics of Computer

Computer's size and power are measured with five criteria; its processing speed, its word length, its primary memory capacity, its accuracy, and its reliability. The accuracy and reliability are less formally applied to microcomputers than minicomputers, mainframes, and supercomputers. Some erroneously consider the capacity of secondary storage and other peripherals (options) as criteria for computer power and size.

Computers being data processing devices have the following characteristics:

(A) Speed : Process millions of instructions in a fraction of a second. The speed of the computer is measured in Nano seconds (or 10-9 of a second).

(B) Accuracy : Perform each and every computation with 100% accuracy.

(C) Versatility : Computers can be used in many fields of operation, such as, Education, Engineering, Medicine, Defence etc.

(D) Diligence : Can perform a task repetitively for N number of times, without any degradation in processing speed.

(E) Storage : Can store huge data within themselves in a limited area. Here the information is stored in the form of files, on disks and tapes. This helps in easy and speedy retrieval of information.

Historical Development of computer

The history of computer development is often referred to the different generations of computing devices. Each generation of computer is characterized by a major technological development that fundamentally changed the way computers operate, resulting in increasingly smaller, cheaper, more powerful and more efficient and reliable devices. Read about each generation and the developments that led to the current devices that we use today.

First Generation Computers

The era of modern computing began with a flurry of development during the years of World War II, as electronic circuits, vacuum tubes, capacitors, and relays replaced mechanical equivalents and digital calculations replaced analog calculations. The computers designed and constructed then were 'first generation' computers. *First generation computers were normally based around wired circuits containing relays or vacuum valves (tubes), and used punched cards or punched paper tape for input and as the main (non-volatile) storage medium.* Temporary, or working storage, was provided by acoustic delay lines (which use the propagation time of sound in a medium such as wire to store data) or Williams tubes (which use the ability of a television picture tube to store and retrieve data). Around 1954, magnetic core memory rapidly displaced most other forms of storage, and was dominant through the mid-1970s.

Second Generation

Transistors replaced vacuum tubes and ushered in the second generation of computers. The transistor was invented in 1947 but did not see widespread use in computers until the late 50s. 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. The first computers of this generation were developed for the atomic energy industry.

Third Generation

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.

Instead of punched cards and printouts, users interacted with third generation computers through keyboards and monitors and interfaced with an operating system, which allowed the device to run many different applications at one 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 Computers

The microprocessor brought the fourth generation of computers, as thousands of integrated circuits were built onto a single silicon chip. What in the first generation filled an entire room could now fit in the palm of the hand. The Intel 4004 chip, developed in 1971, located all the components of the computer - from the central processing unit and memory to input/output controls - on a single chip.

In 1981 IBM introduced its first computer for the home user. The 1980's saw an expansion in computer use in all three arenas as clones of the IBM PC made the personal computer even more affordable. The number of personal computers in use more than doubled from 2 million in 1981 to 5.5 million in 1982.

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 GUIs, the mouse and handheld devices.*

Ten years later, 65 million PCs were being used. Computers continued their trend toward a smaller size, working their way down from desktop to laptop computers (which could fit inside a briefcase) to palmtop (able to fit inside a breast pocket). In direct competition with IBM's PC was Apple's Macintosh line, introduced in 1984. Notable for its user-friendly design, the Macintosh offered an operating system that allowed users to move screen icons instead of typing instructions.

Fifth Generation Computers

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. The use of parallel processing and superconductors is helping to make artificial intelligence a reality. Quantum computation and molecular and nanotechnology will radically change the face of computers in years to come. The goal of fifth-generation computing is to develop devices that respond to natural language input and are capable of learning and self-organization.

Computer Organization

The ability to represent and manipulate digital information depends on the capabilities of the underlying hardware, and the systems software that controls it. Whatever its size and architecture, a current general-purpose computer will have the following functional components:

- Input and output devices,
- Internal (short-term) memory,
- External storage devices (e.g. discs),
- One or more processors,
- (Normally) a connection to a local and / or wide-area network.

We will now study these input / output devices in bit detail :.

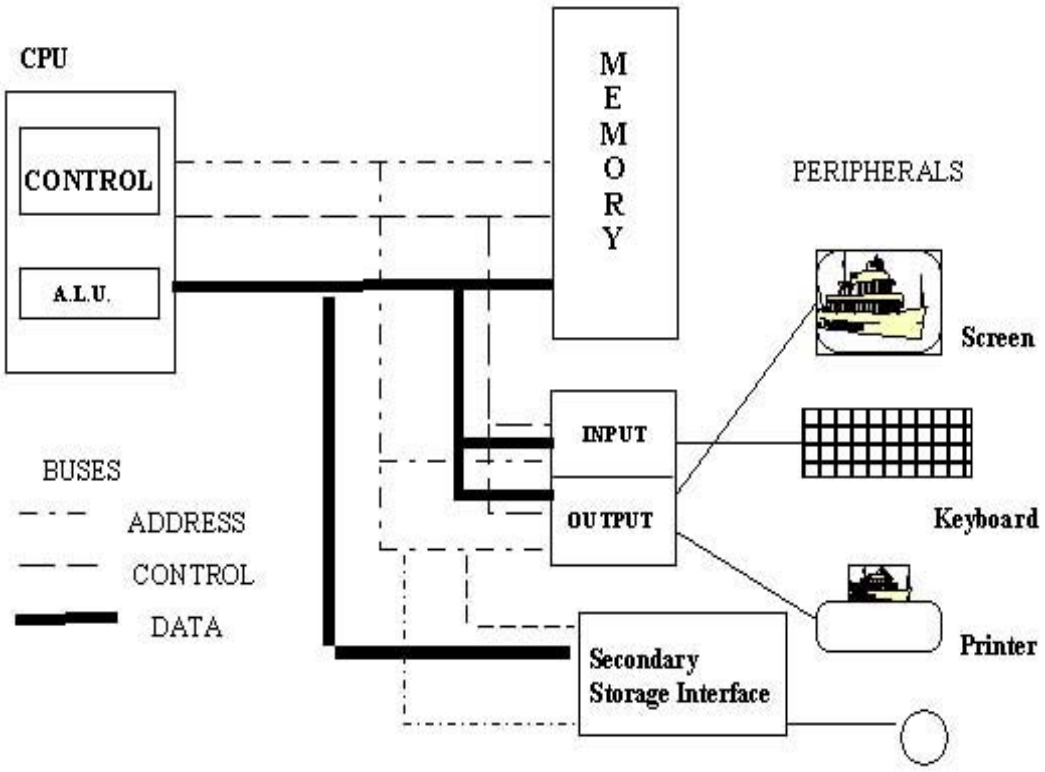

Fig 1.2 Overview of Hardware Components

Input Devices

The purpose of input devices is to translate data and information from human-readable format to electrical impulses.

Typical input outputs are: keyboard, mouse, joystick, touch-screen, scanner, digitizer, bar-code reader, camera, microphone, and midi keyboard.

Output Devices

The purpose of the output devices is to translate data and information from electrical impulses to human-readable format. The output device, which is necessary for the computer to display messages to the user, is a monitor. If we want to keep the copy of the work on paper, we use printers.

Typical output devices are: screen, ink-jet or laser printer, plotter, loudspeaker, video-player, midi instrument, Braille machine.

In general, anything that generates an electronic signal can be treated as an input device; anything controlled by an electronic signal can be treated as an output device. We often need to change continuous analogue data (e.g. a voltage level) into digital data (a series of discrete

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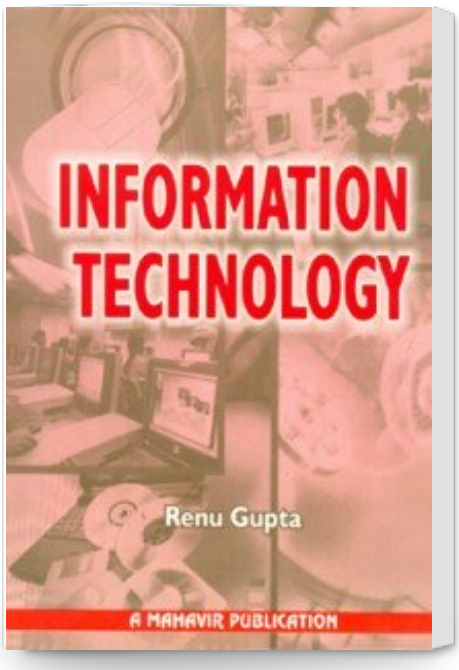

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