SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF INFORMATION TECHNOLOGY

PROGRAMMING FOR PROBLEM SOLVING

I YEAR - I SEM

UNIT 1 – Introduction to Problem Solving Techniques

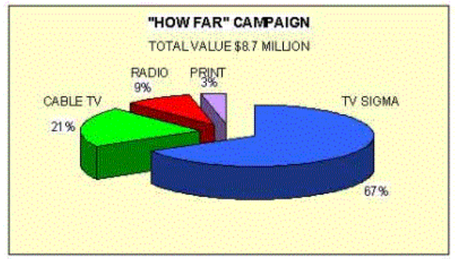
TOPIC 1 – FUNDAMENTALS

UNIT – 1
INTRODUCTION TO PROBLEM SOLVING TECHNIQUES

Fundamentals - Computer Hardware – Computer Software - Algorithms - Building blocks of algorithms (statements, state, control flow, functions) - Notation (pseudo code, flow chart, and programming language) -Problem formulation - Algorithmic problem solving - Simple strategies for developing algorithms (iteration, recursion). Illustrative problems.

DATA

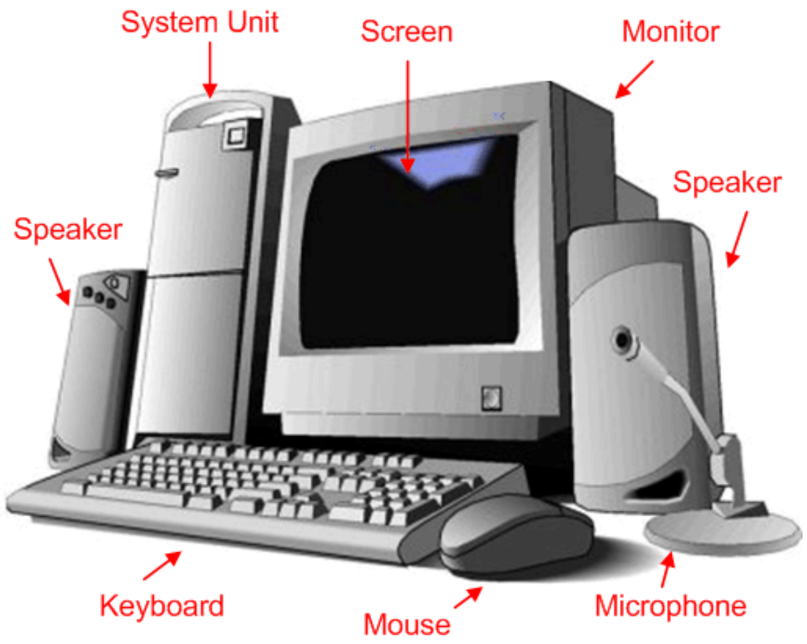
PROCESSING SYSTEM

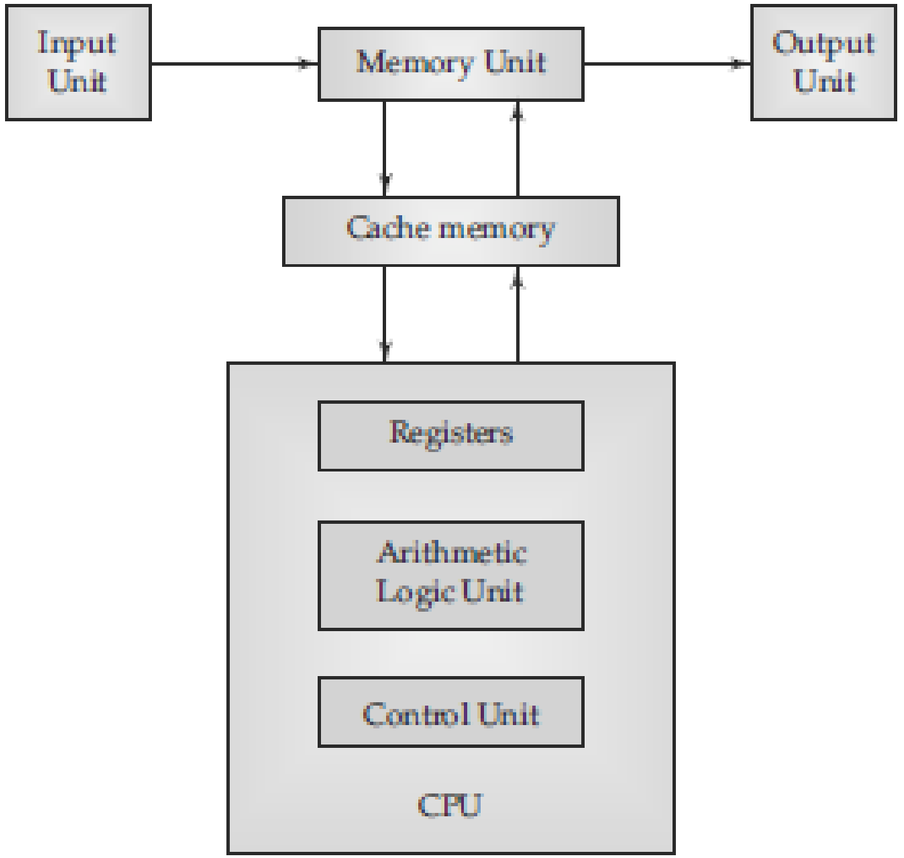


INFORMATION

BASIC OVERVIEW OF A COMPUTER

- Central Processing Unit (CPU)
- Memory Unit
- Input Devices
- Output Devices
- Secondary Storage Devices



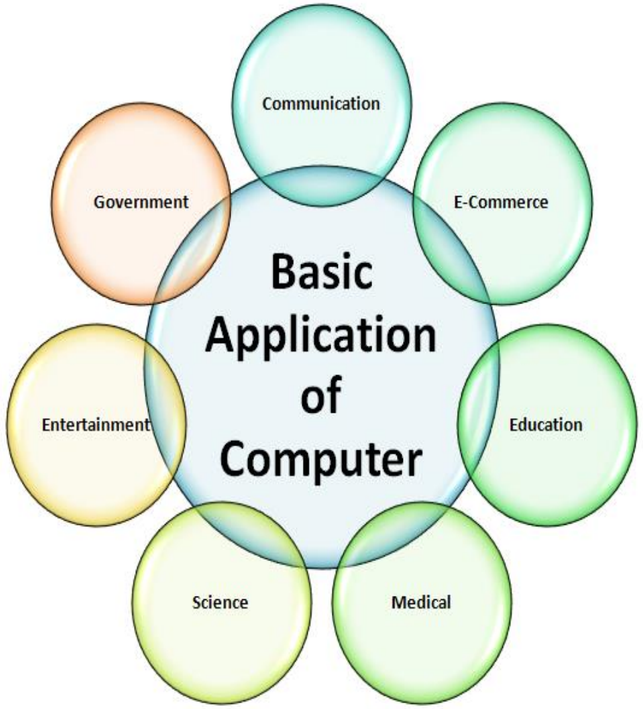


CHARACTERISTICS OF A DIGITAL COMPUTER

- **Speed:**
  A computer is a fast electronic device that can solve large and complex problems in few seconds. The speed of a computer generally depends upon its hardware configuration.
- **Storage capacity:**
  A computer can store huge amount of data in its different storage components in many different formats. The storage area of a computer system is generally divided into two categories, main memory and secondary storage.
- **Accuracy:**
  A computer carries out calculations with great accuracy. The accuracy achieved by a computer depends upon its hardware configuration and the instructions.
- **Reliability:**
  A computer produces results with no error. Most of the errors generated in the computer are human errors that are created by the user itself. Therefore, they are very trustworthy machines.
- **Versatility:**
  Computers are versatile machines. They can perform many different tasks and can be used for many different purposes.
- **Diligence:**
  Computers can perform repetitive calculations any number of times with the same accuracy. Computers do not suffer from human traits, such as tiredness, fatigue, lack of concentration, etc.

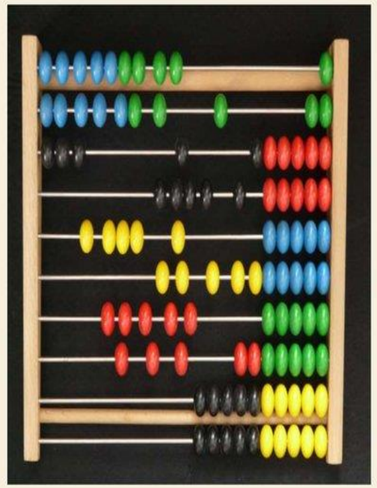
APPLICATIONS OF COMPUTERS

- **Education:**
  Computers are used in schools and colleges to teach students in a better and easy way. The students can get more information about a specific topic or subject using the Internet.
- **Business:**
  Computers are used in different types of businesses to store a large amount of information in the form of a database.
- **Communication:**
  Computers, connected with each other through Internet can be used to transfer data to and from other computers. E-mail is one of the most common mediums that is used.
- **Science:**
  Computers are used by various scientists for the purpose of research and development. They generally make use of computer for research and analysis.
- **Engineering**:
  Computers are used by engineers for the creation of complex drawings and designs while working in different fields like automobiles and construction.
- **Entertainment:**
  Computers are used in the entertainment industry for creating graphics and animations.
- **Banking:**
  Computers are being increasingly used for online banking. Through online banking, the users or customers can transfer and receive money by using computers and Internet. Etc.



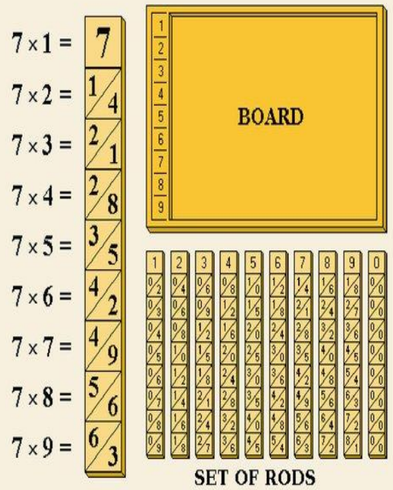
EVOLUTION OF COMPUTER SYSTEMS

❑ **ABACUS**- Many centuries ago when man started to count the numbers, he thought of a device which can trace the numbers and thus came the existence of ABACUS. It was the first counting device which was developed in China more than 3000 years ago. The name Abacus was obtained from Greek word Abax which means slab. This device basically consists of a rectangular wooden frame and beads. The frame contains horizontal rods and the beads which have holes are passed through the rods. Counting was done by moving the beads from one end of the frame to the other.



EVOLUTION OF COMPUTER SYSTEMS

❑ **Napier's Bones**- It is a device which contains a set of rods made of bones. It was developed by John Napier, a Scottish Mathematician and hence the device was named as Napier's Bones. The device was mainly developed for performing multiplication and division. Later in 1614 he also introduced logarithms.



EVOLUTION OF COMPUTER SYSTEMS

❑ **Pascaline**-Pascaline is a calculating machine developed by Blaise Pascal, a French Mathematician. It was the first device with an ability to perform additions and subtractions on whole numbers. The device is made up of interlocked cog wheels which contains numbers 0 to 9 on its circumference. When one wheel completes its rotation the other wheel moves by one segment. Pascal patented this device in 1647 and produced it on mass scale and earned a handful of money.

FIRST GENERATION (1940-1956)

- **UNIVAC-** The UNIVAC (universal automatic Computer) was the first digital computer invented by Mauchly and Ekert

In 1951, Eckert and Mauchly build the UNIVAC, which could calculate at the rate of 10,000 addition per seconds.

SECOND GENERATION (1956-1963)

Features :

Vacuum tubes were replaced by *transistors*.

Transistor is a small device that transfers electronic signals through resistors

The creation of transistor spark the production of a wave of second generation computer. Transistor was small devices use to transfer electronic signals across a resister. Transistors had many advantages compared to other hardware technology.

transistors were smaller than vacuum tubes

- they needed no warm up time
- consumed less energy
- generated much less heat
- faster and more reliable
-

THIRD GENERATION (1964-1971)

Features :

In this generation microelectronics technology was introduced that made it possible to integrate large number of circuit elements into very small surface of silicon known as chips. This new technology was called *INTEGRATED CIRCUIT INTEGRATED CIRCUIT*

Advantages A new concept in this generation was that of a family of computer which allowed computer to be upgraded and expanded as necessary. ·

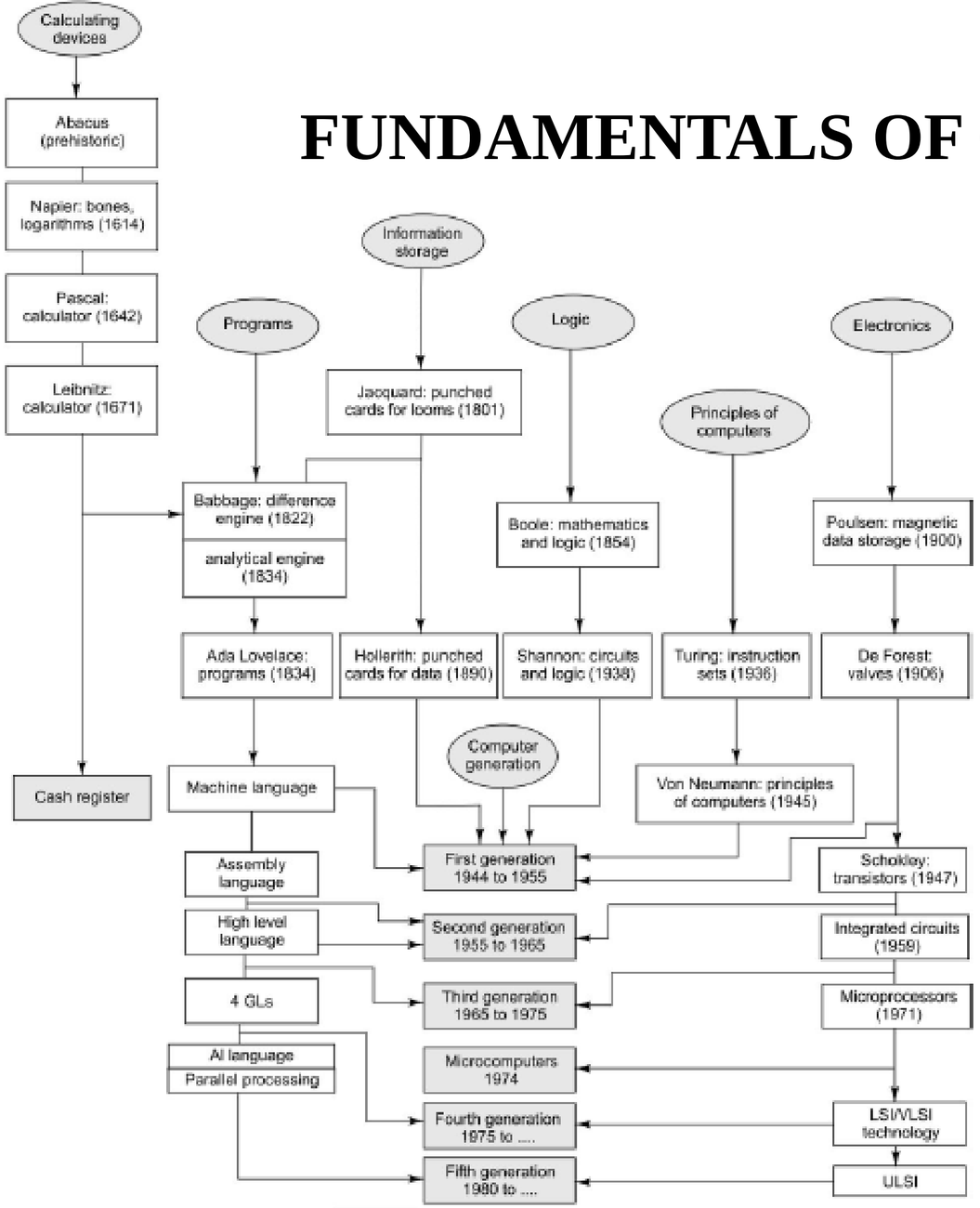
- Silicone chips were reliable, compact and cheaper.
- · Sold hardware and software separately which created the software industry.
- · customer service industry flourished (reservation and credit checks)

FOURTH GENERATION (1971-PRESENT)

It took only 55 years for the 4 generations to evolve. The growth of the computer industry developed technologies of computer inventions. There are many types of computer models such as:

- ·Apple Macintosh
- · IBM
- · DELL
- ·ACER

FUNDAMENTALS OF COMPUTER



COMPUTING SYSTEM & CONCEPTS

➢ **Hardware:**

- The physical devices that make up the computer are called Hardware.
- The hardware units are responsible for entering, storing and processing the given data and then displaying the output to the users.
- The basic hardware units of a general purpose computer are keyboard, mouse, memory, CPU, monitor and printer.

➢ **Software:**

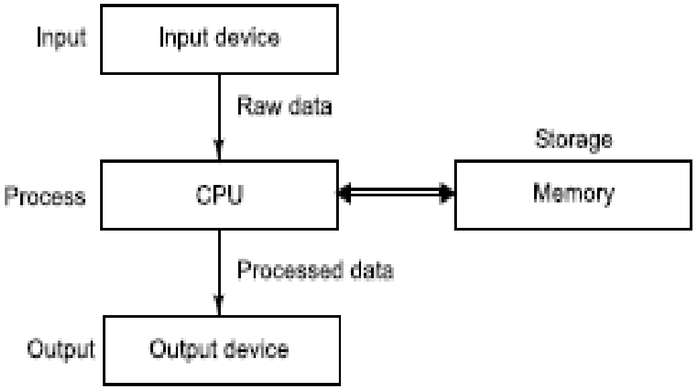
- The term software refers to a set of programs and instructions that help the computers in carrying out their processing.
- Software is very necessary for the proper functioning of a computer.
- There are mainly two types of software, viz. Application Software and System Software

➢ **Data:**

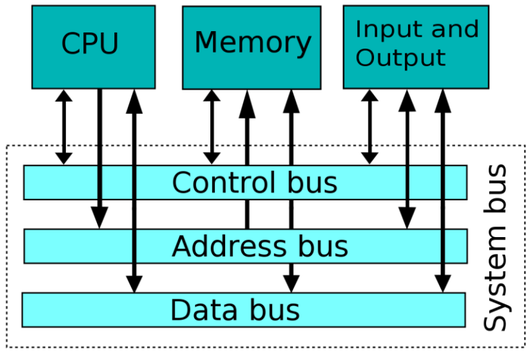
- Data refer to the raw facts and pieces of information that is usually entered into the computer system by the user, so as to generate the desired output and are of two types:
  - Qualitative data: The data, which are represented in words or text form
  - Quantitative data: The data, which are represented in numerical form

➢ **People**

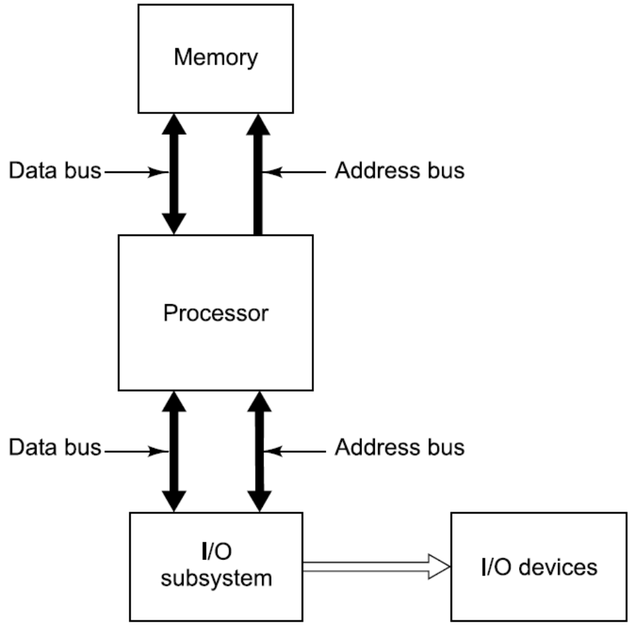
- Computer systems are designed by the people, for the people.
- People, therefore, include the people who design and build hardware and software (known as systems people) and the people who actually use computer systems for their applications (known as users)



THE BUS

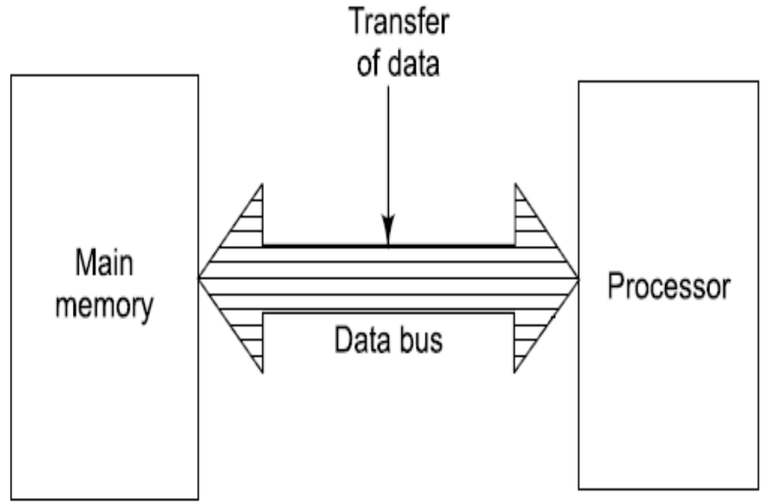


- A bus is a set of wires that is used to connect the different internal components of the computer system for the purpose of transferring data as well addresses amongst them.
- There may be several buses in a computer system.
- A bus can either be a serial bus or a parallel bus.
- In serial bus, only one bit of data is transferred at a time amongst the various hardware components.
- On the other hand, in parallel bus, several bits of data can be transferred at a time amongst the various hardware components.
- The speed of any type of bus is measured in terms of the number of bits transferred per second, between two components.
- Figure shows a bus system used in a computer system.
- The figure depicts the two different types of buses according to the type of operations performed by them.
- These buses are **data bus and the address bus**.
- Apart from data and address bus, a third type of bus known as control bus also exists in the computer system.
- The control bus manages the transfer of data and addresses among various components by transferring appropriate control signals.



DATA BUS

- Data bus in a computer system is used to transfer data amongst the different internal components.
- The speed of the data bus also affects the overall processing power of a computer system.
- Modern computer systems use 32-bit data buses for data transfer.
- This means that these buses are capable of transferring 32 bits of data at a time.
- Figure shows the data bus implemented between the main memory and the processor of a computer system.
- The figure shows that a bidirectional data bus is implemented between the main memory and the processor of the computer system.
- The bidirectional data bus allows the transfer of data in both the directions.
- The data bus is generally bidirectional in nature in most computer systems.



ADDRESS BUS

- The address bus is also known as memory bus.
- It transfers the memory addresses for read and write memory operations.
- It contains a number of address lines that determine the range of memory addresses that can be referenced using the address bus.
- For example, a 32-bit address bus can be used to reference 232 memory locations.
- Like data bus, the address bus can also be a serial or a parallel bus.
- Figure shows the address bus, used for transferring memory locations between processor and memory.
- The figure shows that the address bus between the main memory and the processor of a computer system is unidirectional.
- However, an address bus may also be bidirectional.
- For example, the address bus between the processor and the I/O system is bidirectional