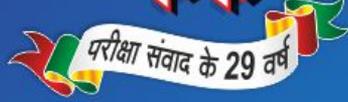


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A Fundamental Book
of Computer Knowledge

Computer

© Publisher
Edition - **First**
Edition Year - **2022**
Writer - **SSGC**
ISBN No.:
M.R.P.: **120/-**
Printed at -
Core Publishing Solution

Contact :

**Sam-Samayik
Ghatna Chakra**

188A/128, Allenganj, Churchlane,
Prayagraj (Allahabad)-211002
Ph.: 0532-2465524, 2465525
Mob.: 9335140296
e-mail : ssgcald@yahoo.co.in
Website : ssgcp.com
e-shop : shop.ssgcp.com

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Prepared Under the able guidance of

Sri Ratnesh Kumar Dixit

M Tech. (I.T.), MCA, OCA
(Admin, Developer)

Associate Writers :

- **Sudhakar Tiwari**
- **Shubham Gupta**
- **Jitendra**
- **Prabhakar Pandey**
- **Zubair Ahmad**
- **Vicky Raj**

Preface

The first “computers” were indeed people. The word originally meant an individual who solved difficult equations within minutes. Now we say these persons '**people with computer mind**'. It was only around 1945 that the word came to describe machinery. After that computing taken many platform shifts. The mainframe, the original computing platform, was dethroned by minicomputers, which in turn gave way to personal computers, which are now being pushed aside by hand-held devices and smartphones. With each advance step structure of computing became more distributed. Now it is turning into what has come to be called a “**cloud**” or collections of clouds.

The rise of cloud is more than just another platform shift. It will transform the information technology industry, and also profoundly change the way people work and companies operate. It will allow digital technology to penetrate every nook and cranny of the economy and of society.

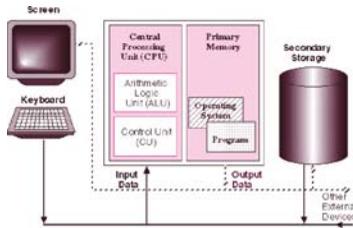
This is the reason why everyone should know about computer. Keeping this in mind this book is consolidated with entire basic knowledge of the subject. The information will also helpful to candidates appearing in competitive examinations.



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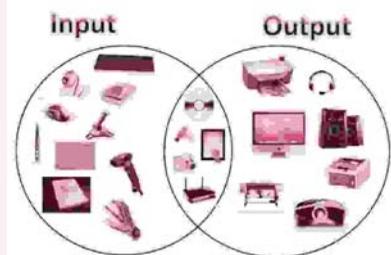
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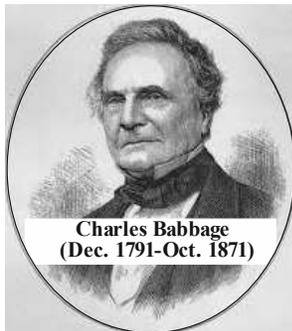
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Computer : An Introduction

General Introduction

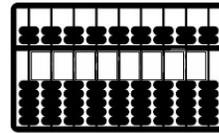
- The **electronic machine** which yields true and authentic results by performing mathematical and logical calculations involved in a program at a high speed, is called a **computer**.
- The word 'Computer' is derived from the English language word "**Compute**", which means 'to **calculate**'.
- According to the Oxford English Dictionary, the word 'Computer' was first used in 1613 by an English writer 'Richard Brathwait' in his book, titled, '**The Yong Mans Gleanings**'.
- **Babbage's 'Analytical Engine'** became the basis for modern computers. That is why "**Charles Babbage**" is called '**Father of Computer**'.



- The computer receives data through the input medium and after processing them stores the information at a determined place.
- In modern times, both analog and digital computers are used. Cable transistors and circuits, called hardware are used in computers. To operate those **hardware**, data and instructions are used which are known as **Software**.

Brief Developmental Chronology

- Developmental chronology (sequences) of computer is 3,000 years old. The early **Abacus** was invented in ancient Babylon between 2700-2300 BC, but its advance form was developed in **China**.
- **Abacus**
 - Abacus is a **frame of wires**. In this frame, plastic or metal balls are woven. Initially Abacus was used by traders to make calculations. This machine was used to add, subtract, multiply or divide digits.



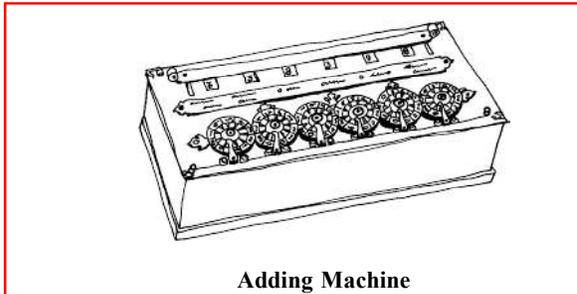
Abacus

Exam facts

- ❖ Father of Computer is- **Charles Babbage**
- ❖ Computer is an-
Electronic machine Automatic machine
- ❖ The first mechanical adding machine was invented by- **Blaise Pascal**
- ❖ The first fully electronic computer is known as- **ENIAC**
- ❖ The data stored in a computer are called-
Information
- ❖ The first calculation device was- **Abacus**
- ❖ CRAY-I is a- **Super computer**
- ❖ The world's first commercial successful super computer was made in- **1964**
- ❖ The name of the first computer manufactured in India is- **Siddharth**

❑ Adding Machine

- In the 17th century, a French mathematician, **Blaise Pascal** developed a mechanical calculation machine that was called Adding Machine because it could only add or subtract.
- This machine was used for working on the principle of **watch** and **odometer**. It had many toothed wheels which kept rotating. On those teeth, the numbers from 0 to 9 are printed.
- Each wheel had a place value such as ones, tens, hundreds etc. Each wheel completed a number on revolving around its preceding wheel.

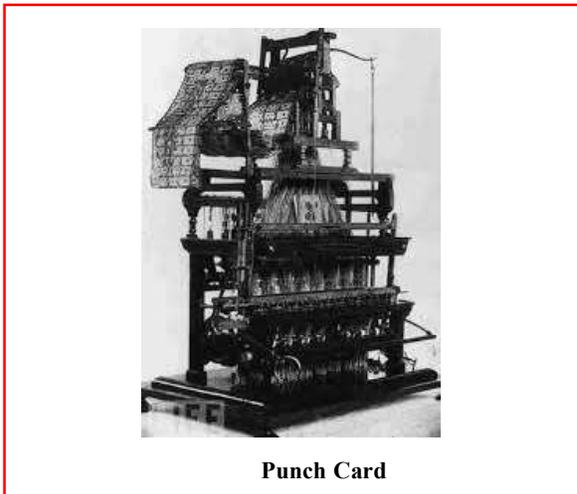


Adding Machine

- Blaise Pascal Adding Machine is called **Pascaline**. At present, this machine is used in the **speedometer** of a car or bike.

❑ Punch Card

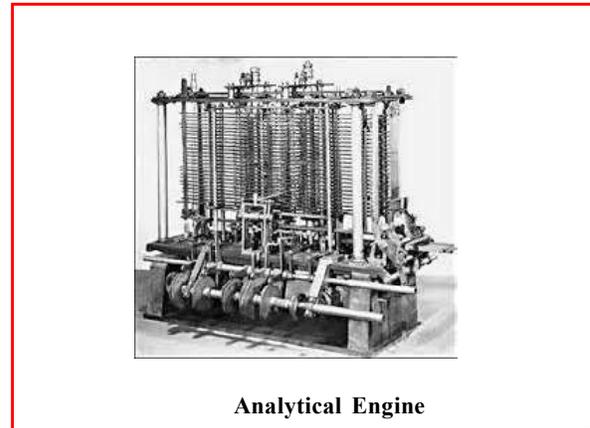
- In 1805, the **French Weaver Joseph Jacquard** invented this mechanical loom for weaving clothes. This loom automatically designed the clothes.
- The characteristics of this loom were that it controlled the design of the fabric with perforated punch cards and guided the threads by the presence or absence of holes on the punch card.



Punch Card

❑ Difference Engine

- The early period of the **nineteenth century** is known as the **Golden Age** in the history of computers.
- The English mathematician **Charles Babbage** developed a mechanical calculation machine which was named the Difference Engine which had gears and shafts run by steam.
- Subsequently, in 1837, Charles Babbage developed the **Analytical Engine** which was an improved form of the Difference Engine.



Analytical Engine

- Babbage's Analytical Engine became the basis for modern computers. That's why Charles Babbage is called 'Father of Computer'.

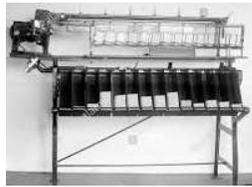
Exam facts

- ❖ Computers transforming data into information is called- **Process**
- ❖ Symbol and numerical information in computers are called- **Data**
- ❖ The computers used for personal purpose are called- **Micro computers**
- ❖ Thousands microprocessors are used in- **Super computers**
- ❖ Desktop and personal computers are called- **Micro computers**
- ❖ The thing which was used in the first electronic digital computer was- **Valve**
- ❖ Analytical Engine was invented by- **Charles Babbage**
- ❖ Who made greatest contribution to the development of computers was- **Von Neumann**
- ❖ Computer which is designed to fulfill the computing need of persons-

Personal computer

❑ Hollerith Census Tabulator

- In 1890, a machine was invented for the US Census, in which the punch cards were operated by electricity. It was an **electromechanical machine** designed to assist in summarizing information stored in punch cards.



Tabulating Machine

- In 1896, Herman Hollerith introduced the Punch Card and formed '**Tabulating Machine Company**' to make machines. In 1911, the company was rechristened as 'Computer Tabulating Recording Company'. It was again rechristened in 1924 as **IBM**. At present, it is the world's largest company producing computer hardware and software production.

❑ Z2

- The Z2, an electromechanical (mechanical and relay based) computer, was the first computer to be patented by German engineer Konrad Zuse in 1939. In 1941, Z3 the advanced version of Z2 was presented. Z3 was the **first programmable, automatic computer**. It was very large in size and was used in the Wing-Flutter Statistical Analysis at the German Aircraft Research Institute.

❑ Colossus

- Colossus was a set of computers developed by Tommy Flowers of England and some of his companions like British codebreakers in 1943-1945 to help in the cryptanalysis of the Lorenz cipher. The colossus is also known as **Electronic Digital Computer**.
- This colossus used thermionic valves (Vacuum tubes) to perform Boolean and Counting operations. It also used encrypted messages in Germany during the Second World War. These encrypted messages were used for decoding in Germany.

❑ MARK-I

- In 1944, **IBM** Engineer **Howard Aiken** developed a machine which was called **Automatic Sequence Controlled Calculator** (ASCC). Later this machine was named Mark-I by Harvard University's staff. It

was the **first general purpose electromechanical computer** that was used during the World War II. Mark-I had wire which in length ran 500 miles besides and 30 lakhs (Three Million) electronic connections.



Mark-1

- When **John Von Neumann** was working on the Manhattan Project, and needed to determine whether implosion was a viable choice to detonate the atomic bomb that would be used a year later, he designed one of the first programs to run on the Mark-I.
- The Mark-I also computed and printed mathematical tables, which had been the initial goal of British inventor **Charles Babbage** for his "**Analytical Engine**".
- When the Mark-I was disassembled in 1959, some portions of it are displayed in the Science Center as part of the **Harvard Collection of Historical Scientific Instruments**. Other portions of the original machine were transferred to IBM and the Smithsonian Institution.

❑ MANCHESTER BABY

- The world's first Electronic Stored Program Computer was Manchester Baby that was also called the **Small-Scale Experimental Machine** (SSEM). It was built in 1948 at the University of Manchester by **Frederic C. Williams, Tom Kilburn, and Geoff Tootill** of Victoria University. The Manchester Baby had a 32-bit word length and a memory of 32 words.

Chronology of Computer

- After the year 1940, there were many progressive developments in the features of the computer which are as follows—

- 1946 - The first computer **UNIVAC** (Universal Automatic Computer) was built by **Mauchly** and **Presper** for government applications.
- 1947 - **William Shockley**, **John Bardeen** and **Bell** discovered the **Transistor** which was used instead of **Vacuum Tube**.
- 1953 - **Grace Hopper** developed the first computer language **COBOL** (Common Business Oriented Language)
- 1954 - The **FORTRAN** (Formula Translation) programming language was developed under the leadership of **John Backus**.
- 1958 - **Jack Kilby** and **Robert Noyce** developed the **IC** (Integrated Circuit). It is also known as Chip.
- 1964 - **Douglas Engelbart** used **Mouse** and **GUI** (Graphical User Interface) technologies in the computer.
- 1969 - The **UNIX** Operating System which was written in **C** Language was developed in **Bell Laboratory**.
- 1970 - **Dynamic RAM** memory chips were used for the first time in computers.
- 1971 - IBM used **Floppy Disk** in computers.
- 1973 - **Robert Metcalfe** invented **Ethernet** to connect different computers to different hardware.
- 1981 - IBM made the **first Personal Computer** 'Acorn' in which **M.S. DOS** Operating System was used.
- 1983 - The first GUI based Personal Computer was **Apple's Lisa**.

The year 1990 was very important for computers because in this year **HTTP** (Hyper Text Transfer Protocol) was developed. Presently, new technologies in computers are being developed and they are being applied every year.

Development of Computers in India

Development of Computer in India

Computer	Year	Specification
HEC-2M	1952	Indian Statistical Institute
TIFRAC	1956	Tata Institute of Fundamental Research Automatic Calculator
Siddarth	1967	Electronic Corporation of India
SAMEER	1984	Society for Applied Microwave Electronics Engineering & Research, Mumbai
C-DAC	1988	Center for Development of Advance Computing
Param	1988	C-DAC (Center for Development of Advanced Computing)
Param Yuva-II	2012	First Indian Super Computer

❑ HEC-2M

- ✳ The computer technology made its advent in the world in the later years of the 1940s, but the computer first entered India in 1952 at the Indian Statistical Institute (ISI), Kolkata. India bought its first computer in 1956 for 10 lakh rupees.
- ✳ The **first analog computer** to be installed at the ISI was the first computer in India. This computer could solve a matrix of 10 x 10. At the same time an analog computer was also installed at the Indian Institute of Science, Bangalore, which was used as a differential analyzer. Subsequently, in 1956, **India's first electronic digital computer HEC-2M** was installed at ISI Kolkata, and now, **India** became the second country in Asia after Japan to adopt computer technology.
- ✳ This **HEC-2M computer** played an important role in the formulation of the annual and five-year plans of the Planning Commission. Most importantly, this computer also proved useful in the design of the next generation of computers in India.

❑ TIFRAC

- TIFRAC stands for **Tata Institute of Fundamental Research Automatic Calculator**. It was the first computer developed in India, at the Tata Institute of Fundamental Research in Mumbai.
- Initially a TIFR Pilot Machine was developed in 1950s (operational in 1956). The development of the final machine started in 1955 and it was formally commissioned in 1960 and named **TIFRAC**, by the then Prime Minister of India, **Jawaharlal Nehru**. The full machine was in use until 1965.
- TIFRAC consisted of 2,700 vacuum tubes, 1,700 germanium diodes and 12,500 resistors. It had a 2,048 40-bit words of ferrite core memory. This machine was an early adopter of ferrite core memory.

❑ Siddharth

- The **first computer** made in India was 'Siddharth'. It was manufactured by Electronics Corporation of India in 1967 the chips used in that computer were made of silicon (Si).

❑ SAMEER

- The full form of SAMEER is **Society for Applied Microwave Electronics Engineering & Research**. The Electronics & Information Technology Department established a Laboratory SAMEER in Mumbai in 1984 to undertake central government mandated R & D work in the areas of Microwave Engineering & Electromagnetic Engineering Technology. SAMEER, active in Technology and Electromagnetic of Tata Institute of Fundamental Research (TIFR), is a sub-unit of Special Microwave Production Unit established in Mumbai in 1977.

❑ C-DAC

- C-DAC is considered to be India's first national initiative in the field of supercomputing based on parallel processing technology which stands for **Center for Development of Advance Computing**.
- C-DAC was created in November **1988**, originally as the Centre for Development of Advanced Computing Technology (**C-DACT**). The **National Centre for Software Technology, Electronic Research and Development Center** and **CEDTI** were merged into C-DAC in 2003. This was in response to issue of purchasing supercomputers from United States of America.
- After being denied a Cray supercomputer by the United States in 1988, due to concerns about its use for military purpose India launched a programme to develop an indigenous supercomputer and C-DAC was created as part of this programme.

- The main objective of this center is the designing and development of computers with more than 100 megaflops of high performance and production at commercial scale.

❑ Param

- The program was launched in India in the late 1980s, after America refused to provide '**Cray**' super computer to India.
- In 1988, a center (**C-DAC**) was established in **Pune** (India) with the objective of achieving self-reliance in the field of supercomputing for the purpose of advance computing development. The C-DAC stands for **Center for Development of Advanced Computing**.
- The **PARAM 8000** was the first machine in the PARAM series and was built by C-DAC Pune. A prototype was benchmarked at the 1990 Zurich Super-computing Show.
- It demonstrated that India had the second most powerful, publicly-demonstrated, supercomputer in the world after the United States.
- It was developed in 1991.
- The latest super computer in the PARAM 1 series was the **PARAM Yuva-II**. It was capable of executing the task at a maximum speed of 532 Teraflops (TFLOPS).
- After being denied Cray supercomputer as a result of technological restrictions, a program was started for the development of indigenous supercomputers and super computing technology in India is considered capable of developing nuclear weapons.

❑ PARAM Yuva-II

- PARAM Yuva-II was the **first Indian super computer**.
- It was a High Performance Computing (**HPC**) Cluster that was latest and fastest in the prestigious PARAM series of Supercomputers built in India.
- It achieved a speed of more than 500 TeraFlops and in terms of power efficiency, it was **ranked 33rd** in the list of the world's top Green 500 supercomputers till November 2012.
- The first sub-cluster of PARAM Yuva-II with a peak computing power of 529.4 TeraFlops (TFs) was ranked 69th in the Top500 list released in June 2013 at the International Supercomputing Conference held at **Leipzig, Germany**.
- This computer is a step towards building the future PetaFlop range of supercomputers in India because C-DAC achieved a significant milestone with **PARAM Yuva-II** being ranked **1st in India, 9th in the Asia Pacific Region** and **44th in the world**.
- Union Human Resource Development Minister **Prakash Javadekar** inaugurated the supercomputer **Ishaan** at **IIT Guwahati** on September 19, 2016. **Param Ishaan** was the first supercomputer in India, which exceeded the speed limit of 1TFLOP.

Exam facts

- ❖ The highest contribution to the development of the first digit computer's blue-print was from-
Charles Babbage
- ❖ The first generation computer invented was-
ENIAC, EDSEC (EDVAC), UNIVAC
- ❖ In the form of Internal Memory what was used in first generation computers- Magnetic Drum
- ❖ The Programming Languages made in first generation computers were-
Machine and Assembly Languages
- ❖ Machine Language is based on- **Only 0 and 1**
- ❖ First generation computers were based on
Vacuum Tube Technology
- ❖ The item used for storage in first generation computers was The item that was used for storage in first generation computers was-
Punch Card
- ❖ World Computer Literacy Day is observed on-
2nd December
- ❖ The device through which more than one person can work on a computer simultaneously-
Terminal
- ❖ Terminal is a type of-
Electromechanical Hardware

❑ Software Technology Parks of India

- ★ Software Technology Park of India (STPI) was established as an autonomous body and registered under the Societies Registration Act 1860, by the Ministry of Communications & Information Technology.
- ★ Government of India on 5th June 1991, with an objective of promoting IT/ITES industry (software exports) in India to implement STP/EHTP Scheme, set-up and managed infrastructural facilities including data com & incubation for startups and offered other services like technology assessment and professional training.

Classification of Computers

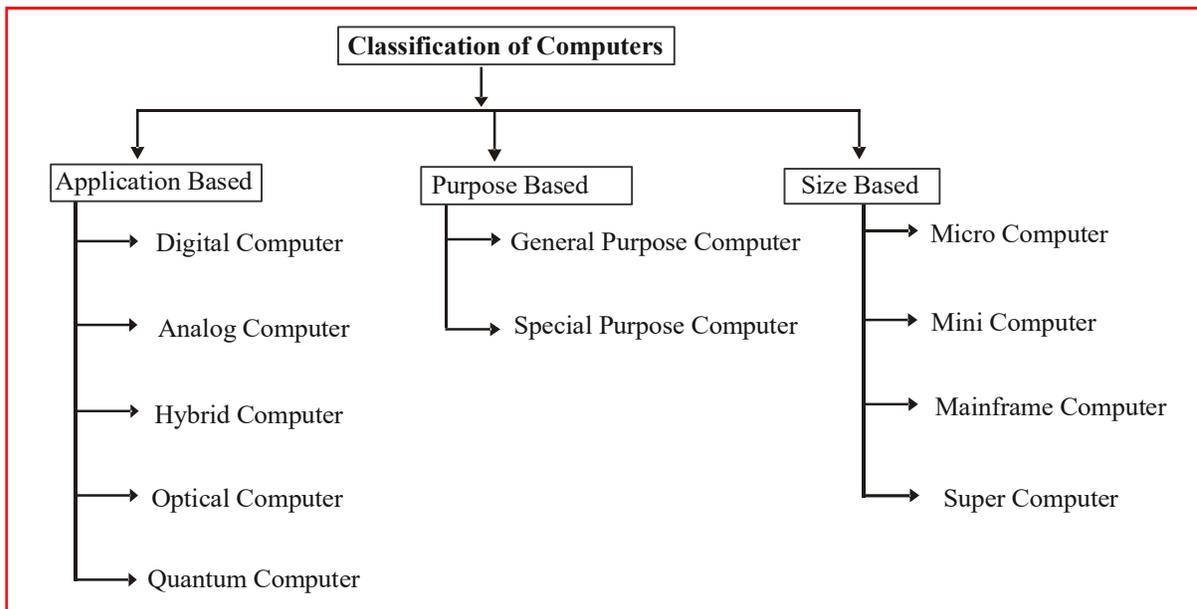
Computers can be classified on following basis-

1. Based on Application
2. Based on Purpose
3. Based on Size

❑ BASED ON APPLICATION

On the basis of application, computers can be divided into five types:-

1. Digital Computer
2. Analog Computer
3. Hybrid Computer
4. Optical Computer
5. Quantum Computer



1. DIGITAL COMPUTER

- The meaning of the digit is **number**. Digital computers calculate on digits.
- Digital computers transform data and programs into electronic form by converting them into the binary number of 0 and 1. A binary digit is called a bit.
- All instructions and data are stored in digital computer in the form of **binary number**.
- The **first electronic digital computer** was developed in late 1940s and was used primarily for numerical computations.



Digital Computer

- A **Digital computer** can be considered as a digital system that performs various computational tasks such as operating on data, including magnitudes, letters, and symbols, that are also expressed in binary code—i.e. only the two digits 0 and 1.

2. ANALOG COMPUTER

- An analog computer is a computer which is used to process **analog data**.
- In an analog computer, with the help of electronic circuits, a physical quantity is converted into electrical signals.
- This computer accepts information in physical form such as temperature, pressure etc. which are received in a continuous form of physical quantities and performed calculations with the help of measures.



Analog Computer

- Analog computer is quite different from the digital computer, which makes use of symbolic numbers to represent results.
- Speedometer, Voltmeter, Thermometer, Sundial, etc, are examples of analog devices.
- The memory of an analog computer is short. These computers do not obtain 100% accurate results.
- Analog computers are used in industrial and scientific applications, like control systems and aircraft, and have been replaced largely by digital computers due to the wide range of complexities involved.

3. HYBRID COMPUTER

- A Hybrid computer is a **combination of functions of an analog computer and a digital computer**.
- It offers the functionalities of both a digital and an analog computer. It is well known for its ability to blend analog and digital features of both categories of computers.
- They are used in large industries manufacturing medical devices besides business firms. It can be used to incorporate logical operations as well as provide efficient processing of differential equations. E.C.G. machine is an example of a hybrid computer.



Hybrid Computer

- A hybrid computer is manufactured in such a way that its components enable the device to operate in a faster and accurate manner.
- The advantages of a hybrid computer are availability of both analog and digital computations on a single unit with an efficient processing speed.
- A hybrid computer is individually designed and integrated, taking into consideration the field of its application and processing requirements.

4. OPTICAL COMPUTER

- An optical computer is a device that uses the **photons** in visible light or infrared (IR) beams, rather than electric current, to perform digital computations.
- The photons generated by ‘visible light’ or ‘infrared beam’ are used by optical computers. Visible-light and IR beams, unlike electric currents, pass through each other without interacting.
- Several laser beams can be shone to enable their paths to intersect, but there is no interference among the beams, even when they are confined essentially to two dimensions. It is noteworthy that electrons are used for calculations in traditional computers.
- The **use** of photons in comparing of electrons helps in achieving ‘higher bandwidth’. Optical computer is also called ‘photonic computer’.
- Optical technology is used in CD-ROM drives and their relatives such as most photocopiers, laser printers and scanners. However, none of these devices is fully optical.

5. QUANTUM COMPUTER

- The computers working on the **quantum mechanics** method are called quantum computers.
- In quantum and traditional computers, the information stored codified in the form of ‘binary digits’ or ‘bits’ (1.....0.....).



Quantum Computer

- The devices that **perform quantum computations** are known as **quantum computers**.
- Quantum computers use **qubits**, which are typically sub-atomic particles such as electrons or photons. Generating and managing qubits is a scientific and engineering challenge.

- Qubits have some quirky quantum properties meaning a connected group of them can provide way more processing power or exploitation than the same number of binary bits. One of those properties is known as **superposition** and the other is called **entanglement** which is used to perform computation.
- Quantum computing appeared in 1980 when physicist **Paul Benioff** proposed a quantum mechanical model of the Turing machine.
 - There are several types of quantum computers including the quantum circuit model, quantum turning machine, adiabatic quantum computer, one-way quantum computer etc.
 - The most widely used model is the quantum circuit, based on the quantum bit, or ‘**qubit**’. A qubit can be in 1 or 0 quantum state, or in a superposition of the 1 and 0 states. When it is measured, it is always 0 or 1.
 - The probability of outcome depends on the qubit’s quantum state immediately prior to measurement.
 - Due to capacity increment in bits, quantum computers have been proved **very fast** and powerful.

❑ BASED ON PURPOSE

- On the basis of purpose, computers fall into of two types –
 1. General Purpose Computer
 2. Special Purpose Computer

1. GENERAL PURPOSE COMPUTER

- A general-purpose computer is a computer system that can be programmed to **perform general tasks**.
- The capacity of these computers’ **CPU** (Central Processing Unit) is limited. These are used to prepare records in school, college and office.
- These computers have the ability (capacity) to perform general work, such as creating database, preparing letters and documents by using **word processing**.
- General-purpose computers are designed to enable users or devices to interact in a variety of ways to meet a broad range of needs.

2. SPECIAL PURPOSE COMPUTER

- ❖ Special purpose computers are prepared to perform special tasks. It means they are designed to perform a **specific task**, and most of the time they are used only to **process a particular task**.
- ❖ The capacity of these computers' CPU is determined according to those assigned special works. For example Special-purpose computers are used in Film Industry for editing Film. Apart from this, they are also used in the fields of meteorology, agricultural science, war, space science, high graphic video games, a navigational system of aircrafts, petroleum exploration, weather forecasting, satellite launch/tracking, automotive industries, traffic lights control system and washing machines, etc.
- ❖ These computers are also known as **Dedicated Computers** because they are meant to perform a single task over and over again.
- ❖ If we compare both types of purpose computers, Special purpose computers have little similar features as that of general-purpose computers. But due to the **absence of versatility**, these computers completely differ from general ones.

Exam facts

- ❖ The thing used in second generation computers is-
Transistor
- ❖ The Transistor was invented by-
William Shockley
- ❖ High Level Languages like COBOL and FORTRAN developed during-
Second generation
- ❖ Magnetic Tape as a memory was used during-
Second generation
- ❖ Integrated Circuit (IC) was used during-
Third generation
- ❖ IC was invented by-
Jack Kilby
- ❖ The language used in third generation was-
High Level Language

- ❖ Massive development that occurred during third generation was- **Online System**
- ❖ Third generation computers were incorporated in- **A single chip**
- ❖ The microprocessor was used during-
Fourth generation computers
- ❖ The operating system MS DOS was used first time during- **Fourth generation computers**
- ❖ The earliest supercomputer manufactured in India was- **PARAM Computer**
- ❖ Refers to the conversion from analog to digital
Digitalization term
- ❖ Super computers are equipped with and in size. Processing capacity,
very large
- ❖ Jaguar super computer was made by- **Cray**
- ❖ India's first electronic computer HEC-2M was installed at India Statistical Institute, Calcutta (Now Kolkata) in- **1956**
- ❖ The first super computer developed in 1976 was-
Cray-1

❑ BASED ON SIZE

On the basis of size, computers can be divided into four types:-

1. Micro Computer
2. Mini Computer
3. Mainframe Computer
4. Super Computer

1. MICRO COMPUTER

- ❖ An electronic device with a **microprocessor as Central Processing Unit (CPU)**, is called **Microcomputer**. It was developed in the 70s. These computers are cheap and light in weight.



Micro Computer

Microcomputers are used in homes and for small business. These computers are also called **Personal Computers (PC)** and fall into following categories-

घटना चक्र



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