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A) History & Development of Computers-

The biggest milestone in the achievement of mankind has been the discovery of numbers. In early ages man used pebbles and stones for counting purposes. The discovery of zero in India gave real boost to development of numbering system. Later Egyptians introduced symbols for ten, and powers of ten in recording number in the year 3400 before Christ.

The earliest and simplest calculating device called Abacus, consisting of heads strung on rods was used in Greece and Egypt in *450* before Christ. In 200 BC, Greeks devised a system of written numbers based on ten using alphabetic symbols to represent the numbers. For writing purposes, wax was spread on a wooden plate and a metal stylus used to scratch the wax surface.

In 100 BC a form of pocket abacus was used by Romans, though counting with pebbles on a table or counting board was still the more common method of calculating. Developments in number systems continued. Decimal point was introduced in 1492 in Italy. In 1614 John Napier, a Scottish mathematician introduced concept of logarithms, a method of multiplying and dividing numbers quickly and accurately by performing additions and subtractions. In 1617, a mechanical aid known as Napier's bone for multiplication and division was introduced. In 1620, Gunter's scale used with dividers as slide rule was introduced. In 1645, Pascal's adding machine—a device with eight counter wheels linked by ratchets for carry over was introduced.

Bissaker's straight slide rule was first used in 1654. In 1694, a calculating device (Von Leibnitz's stepped cylinder reckoner) capable of handling the four basic arithmetic operations was introduced. In 1812 Charles Babbage introduced a calculating machine (Difference Engine) capable of computing mathematical and statistical tables using difference theory. In 1837, Babbage's Analytical Engine was developed. It was a design for a digital computer.

Since early ages, man has always been thinking of producing devices which can simplify the chores of doing arithmetic and processing information, In the eighteenth century, mechanical calculators capable of performing mathematical operations were developed. In 1833, Charles Babbage developed a "calculating engine" based totally on mechanical principles. This machine worked on the principle that the mathematical equations can be solved by dividing the complete job into simple steps of addition and sub traction etc. and performing various steps one after other in a sequential manner.

In fact, this is the principle on which the present day computers are working. Thus really speaking, the history of computers began with Charles Babbage. The second major event took place in the last quarter of 19th century when Herman Hollerith, an American statistician devised machines that used punched cards as carriers of information. Another landmark occurred in 1944 when an electro-mechanical machine, *(51* feet long and 8 feet high) considered as the first approximation to Babbage's analytical engine was developed by Aiken, an American. Soon with the development of electronic technology of valves—the vacuum glass tubes, it became obsolete.

However, development of digital electronics in mid-1940 gave real boost to the field of development of computers and it became possible to automate the operation of the machine built by Charles Babbage. It became possible to code and store the data to be operated upon as well as the instructions for controlling the machine operations. The world's first electronic computer was developed in 1945, named Electronic Numerical Integrator and Calculator (ENIAC).

It was about 15 meters long and 2 meters high. It contained 19,000 small bottle- sized valves, which constituted the machine's central processing unit (CPU). It consumed about 200 kilowatt power. This machine did not have any facility for storing programs, and the instructions had to be fed into it by a readjustment of switches and wires. The concept of stored program was adopted in 1949. The main store or memory which is directly accessible to CPU for instructions and data, in

the first generation machine was made of a device called magnetic drum. The machines developed in nineteen fifties contained miles of wires, thousands of electronic components, lakh of soldered joints and as such these were extremely bulky, very power consuming and highly unreliable.

Thermoinic valves were soon replaced by transistors (germanium and silicon semiconductors), thereby reducing size and power consumption. In fact the invention of the transistor in 1947 heralded the era of miniaturization and paved the way for development of second generation of computers (First generation was with thermionic valves—the vacuum glass tubes containing metal strips which performed various functions such as amplification of an electric current). Transistors compared to valves are much smaller, more reliable and far more versatile. Transistors are electronic switches, made of semiconductors—-the materials which are neither good conductors of electricity nor bad ones (like silicon).

The transistors could do all the functions of vacuum tubes, are much more reliable than vacuum tube, occupy much less space, are easy to handle, consume less power and are less costly. The fully transistorised computer with its CPU made of transistors and memory made of magnetic cores (strings of small iron rings) appeared on the market in the early sixties. Later attempts were to develop discrete components like resistances, capacitors, etc. and interlink them into an electronic circuit on a single piece of semiconductor. Such components, known as ICs (integrated circuits) were perfected in *1959.*

Invention of integrated circuit (IC) complete electronic circuit fabricated on a single piece of pure silicon of size 3 mm x 3 mm x l mm in 1959 gave birth to third generation computer. In the case of integrated circuits, all the components like capacitors, resistors, amplifiers are gathered on the same piece of silicon that earlier had only the transistors. Such integration is done by introducing some impurities (of other metals) in very thin, very pure wafers of silicon.

The complete circuit is then etched on the wafer by a process that resembles photography or by using electron beams for very complex circuits. An intricate, maze like pattern is finally produced on the wafer and the electrons pass through the tracks on the maze. Such machines with CPU and main store made of I.C. chips, appeared on the market in the second half of the sixties. Earlier ICs contained small number of components and with gradual development, present day ICs accommodate very large number of components on a single chip, known as very large scale integrated circuits (VLSI). These chips resulted in smaller size, more reliable, less power consuming and less expensive computers.

The invention of integrated circuits made the real beginning of developments that led to present day microprocessor based computers on chips. The circuits on chips with time grew in complexity and the computer's powers increased tremendously; size and cost decreased. Almost every four years, the number of components that could be put on a chip increased by a factor of 10. The chip graduated from small scale integration (upto 10 components per chip) to medium scale integration (10-100 components), large scale integration (100-1000 components) to very large scale integration (VLSI) having more than 1000 components on a single chip. Today chips (5 mm sq and 03 mm thick) can accommodate more than 100,000 electronic components. This gave birth to fourth generation computers.

Microprocessor (computer on a chip) also called microcomputer became reality in 1970 when the memory of central processing unit could also be achieved on the integrated circuit, thus dispensing with the slower and bulky magnetic memories. Advances in memory chips have tremendously improved the capacity and efficiency of computers. The first memory silicon chip was produced in 1971 and it could store only 1024 bits (one kilobit or 1 KB) of information. The chips produced today are so sophisticated that single chip can store *256* KB of information. Attempts are to develop bubble chips which will be able to store upto 2560 KB.

End of Preview.

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