INTEGRATED CIRCUITS

Preamble

- In theoretical CS, a circuit is a model of computation in which input values proceed through a sequence of gates, each of which computes a function. Circuits of this type provides a generalization of Boolean circuits n a mathematical model of digital logic circuits.
- They are defined by the gates they contain and the values the gates can produce e.g the values in a Boolean circuits are Boolean values n the circuits include conjunction., disjunction…, negation….
- The values in an integer circuits are sets of integers, and the gates compute union, set intersection, set complement as well as arithmetic operations addition and multiplication.

Computer Circuits

- A circuit that is part of a computer. Logic gate, gate – a computer circuit with several inputs but only one output, that can be activated by particular combinations of inputs.

- ICS, microcircuit- a microelectric computer circuit incorporated into a chip or semiconductor, a whole system rather than a single component

- Computer circuitry, complete path or combination of interconnected paths for electron to flow in a computer.

- Computer circuits are binary in concept having only two possible states
- A computer's speed of operation depends on the design of its circuitry.

Circuit

- In electronics, a circuit is a closed path that allows electricity to flow from one point to another. It may include various electrical components such as transistors, resistors, and capacitors, but the flow is unimpeded by a gap or break in the circuit.
- In computing, the term circuit is used more liberally and may be used to reference a circuit board or an IC.
- The internal workings of computers and other electronic devices are comprised of these components, which may each contain hundreds or thousands of individual circuits.
- The large no f circuits inside computers allow them to route data to different locations and perform complex calculations. E.g a chip may route graphic operations to the GPU and other operations to the CPU.
- These processors contain logic gates that can rapidly open and close the circuits.
- Modern processors have so many circuits and transistors, they can perform billions of instructions every second.

Integrated Circuits(ICs)

- It is a small electrical circuit created using a **semiconductor** substance such as **silicon**.
- Also known as chip or micro
- It is built with the primary objective of embedding as many transistors as possible on a single semiconductor chip with nos reaching in the billions as of 2012.
- They are found in nearly every modern electronic devices, and allow compact technologies including computers and cell phones to be built.

Classes and Classification of ICs

- ICs can be classified into analog, digital and mixed signal.
- Digital ICs can contain billions of logic gates, flip-flops,, multiplexers, and other circuits in a few square millimeters.
- Classification: SSI (3-30 gates per chip)
  MSI (30-300 gates per chip)

Analog ICs

- Is a basic component in most electronic devices,
- The most basic circuit that is part of a larger electronics.
- Made up of semiconductors, inductors , capacitors, and resistors.
- It involves an output signal that follows a continuous input signal
- Examples are operational amplifiers, power management circuits, and sensors
- These circuits are what makes computers, cell phones, an digital devices work, and it can be found inside almost every consumer electronics available to mankind today.

Types of ICS

- There are five major types of Ics

i. DRAM (Dynamic random Access Memory)
ii. MPUs (Microprocessor Units)
iii. Application Specific Ics (ASIC)
iv. Digital Signal Processor (DSP)
v. Programmable memory chips (EPROMs)

DRAM (Dynamic Random Access Memory):

- Is a memory circuit.
- Is a type of ICs that is essential for modern computers. Most Pcs and laptops contain at least one DRAM ICs and many computers hold several.
- A DRAM circuit is able to store digital data while power is present, if power goes off, the information stored in the memory circuit is lost.
- The circuits commonly hold temporary computer information, such as words typed on a screen or data from a streaming video.

MPUs

- Are type of ICs that acts as the central processing area for a computer or other device.
- It is usually programmed with instructions that cannot be easily deleted, even if power is lost.
- These core instructions allow a device to perform properly when various inputs are received.

- Devices such as cell phones use microprocessors to execute important tasks such as connecting to a cellular network, while computers use microprocessor instructions to boot up and interface properly with attached hardware (connected peripherals).

To do

- Assignment: Look up the other types of the integrated circuits, know what characterized them, their features and uses.