Gaurav Gupta

  2018UIC3093

Digital Circuit & System

Assignment - 8

Q. 1 What is the difference between RAM and ROM?

RAM and ROM both are the primary memory.

RAM or Random access memory :

a volatile memory or temporary memory. The content or data stored in RAM deletes automatically when the power supply goes off. RAM requires continuous electrical power to retain its data. Once the data get deleted, we can’t recover it back unlike the secondary memory. In secondary memory like hard disk, we can recover the data back again if the data get deleted.

CPU can directly access any address location in RAM. That is why it is called random access memory. Due to random access, it is very quickly accessible. So, it is very fast as compared to secondary storage. RAM stores only those data which has to be currently processed. It can be used in both reading and writing mode. Basically, RAM is used for buffering purpose i.e. RAM is used when input-output operations are performed.

ROM or Read-only memory :

is a non-volatile memory. The content or data stored in ROM remains permanently until it is re-written. So it doesn’t depend on power. The data in ROM retains same until it is being altered by a user.

Unlike RAM, CPU can’t access the data directly from the ROM. At first, data gets transferred to the RAM and then CPU can access it. The capacity of ROM is comparatively smaller than RAM. It is also slower and cheaper than RAM. The CPU can only read the data from ROM. CPU can’t write or modified the data stored in ROM.

The ROM is mainly used for storing some instruction that the computer requires at the time of booting. So, if you don’t know about booting then it is a self-starting process where the necessary programs are loaded into the computer memory after power on or restart. It is generally used to store firmware data like BIOS for the hardware which are normally written in ROM at the time of manufacturing of the computer.

## **Major difference between RAM and ROM in tabular form:**

| **RAM** | **ROM** |
| --- | --- |
| RAM is a volatile memory. | ROM is a non-volatile memory. |
| It is a read-write memory. | It is a read only memory. |
| It is used to store currently processing data by the CPU temporarily. | It stores the data or programs which are required during booting. |
| CPU can easily modify the data stored in RAM. | CPU can’t modify the data stored in ROM. |
| Size of RAM is normally in between 64MB to 32GB. | Size of ROM is comparatively smaller than RAM. |
| There are two types of RAM – SRAM and DRAM. | There are three types of ROM- PROM, EPROM and EEPROM. |
| RAM is expensive. | ROM is comparatively cheaper than RAM. |
| It is used in buffering purpose. | It is not used in buffering purpose. |

Q. 2 Compare the SRAM with the DRAM

Both DRAM (Dynamic Random Access Memory) and SRAM (Static Random Access Memory) are types of Random Access Memory (RAM). RAM is a semiconductor device internal to the integrated chip that stores the processor that a microcontroller or other processor will use constantly to store variables used in operations while performing calculations. RAM refers to the hardware that provides the memory locations referred to in software as registers. As of this writing, all commonly used RAM is volatile, which means that everything in volatile memory is lost when power is removed. You can think of RAM as working memory where variables are stored while the CPU performs calculations. RAM is much faster to access than external memory and is a critical component to the speed of the processor chip.

The architectural difference between the two is that DRAM uses transistors and capacitors in an array of repeating circuits (where each circuit is one bit), whereas SRAM uses several transistors in a circuit to form one bit.

**DRAM**

DRAM stores data by [“writing a charge to the capacitor by way of an access transistor” and was invented in 1966 by Robert Dennard at IBM](http://www-03.ibm.com/ibm/history/ibm100/us/en/icons/dram/) and was patented in 1967.

DRAM uses capacitors that lose charge over time due to leakage, even if the supply voltage is maintained. Since the charge on a capacitor decays when a voltage is removed, DRAM must be supplied with a voltage to retain memory (and is thus volatile). Capacitors can lose their charge a bit even when supplied with voltage if they have devices nearby (like transistors) that draw a little current even if they are in an “off” state; this is called capacitor leakage. Due to capacitor leakage, DRAM needs to be refreshed often.

**SRAM**

SRAM does not use capacitors. SRAM uses several transistors in a cross-coupled flip-flop configuration and does not have the leakage issue and does not need to be refreshed.

But SRAM still needs constant power to maintain the state of charge and thus is volatile like DRAM. Since SRAM uses several transistors (see Figure 3) per bit of memory versus DRAM, which uses one transistor and capacitor per bit, DRAM is less expensive.  DRAM uses a different process than SRAM, so discussing size is an apples-to-oranges comparison in some respects, depending upon the optimization goal. DRAM is at least ten times slower than SRAM. SRAM is faster and typically used for cache, DRAM is less expensive and has a higher density and has a primary use as main processor memory.