Memory Unit

A Memory Unit is a collection of storage cells together with associated circuits needed to transfer information in and out of storage.

Word

The memory stores **binary information (1's and 0's)** in groups of **bits** called **words**. A word in memory is an entity of bits that move in and out of storage as a unit. A memory word is a group of 1's and 0's and may represent a number, an instruction code, one or more alphanumeric characters, or any other binary coded information.

Byte

A group of **eight bits** is called a **byte**. Most computer memories use words whose number of bits is a multiple of 8. Thus a 16-bit word contains two bytes, and a 32-bit word is made up of 4 bytes.

The capacity of memories in commercial computers is usually stated as the total number of bytes that can be stored.

Internal Structure of a Memory Unit

The internal structure of a memory unit is specified by the **number of words** it contains and the **number of bits** in each word. Special input lines called **address lines** select one particular word. Each word in memory is assigned an identification number, called an **address**, staring from 0 and continuing with 1, 2, 3, up to 2^k **- 1** where **k** is the number of address lines. The selection of a specific word inside the memory is done by applying the k-bit binary address to the address lines.

A **decoder** inside the memory accepts this address and opens the paths needed to select the bits of the specified word.

Computer memories may range from 1024 words, requiring an address of 10 bits, to 2^{32} words, requiring 32 address bits. It is customary to refer to the number of words (or bytes) in a memory with one of the letters:

- **K(Kilo)** is equal to 2^{10}
- **M(Mega)** is equal to 2^{20}
- **G(Giga)** is equal to 2^{30}

Two major types of memories are used in computer systems: **Random Access Memory (RAM)** and **Read Only Memory (ROM)**. These semiconductor memories are classified into **Random Access Memories (RAMs)** and **Sequential Access Memories (SAMs)** based on access time.

Memories constructed with shift registers, **Charged Coupled Devices (CCDs)**, or bubble memories are examples of SAMs. RAMs are categorized into ROMs, **Read Mostly Memories (RMMs)**, and **Read Write Memories (RWMs)**.

ROMs are of two types: **Masked Programmed ROMs** and **User Programmed PROMs**.

Two types of RMMs are **Erasable and Programmable (EPROM)** and **Electrically Erasable (EEPROM)**.

RWMs are **Static RAM (SRAM)** and **Dynamic RAM (DRAM)**. Static RAMs have memory cells as common Flip-Flops. Dynamic RAMs have memory cells that must be refreshed, read and written periodically to avoid loss of memory cells.

Answer the questions:

1. What is a **Memory Unit?**
2. What is a **Word**?
3. What is Byte?
4. What means **k**?
5. How many and which major types of memories are used in computer systems?