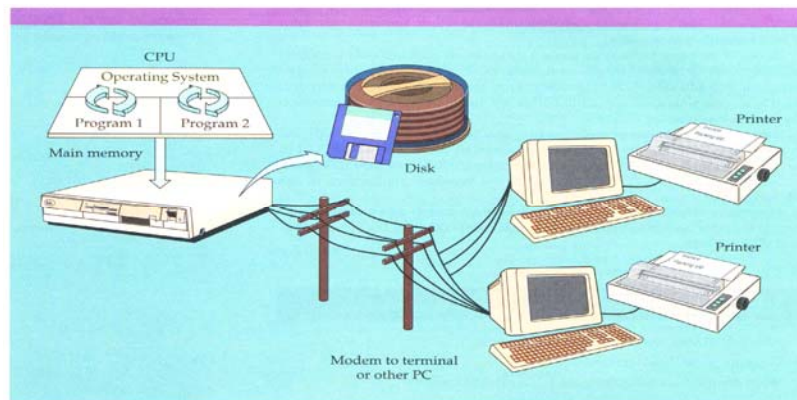


## 5-1-2 Operating Systems Maximize Processing efficiency

One of the primary purposes of an operating system is to ensure that a computer's resources are used as efficiently and effectively as possible.

- **Multiprogramming and multitasking**

With multiprogramming, several application programs are placed in the computer's main memory at the same time and the CPU, under control of the operating system, divides its time between these programs. See flg. Fig.



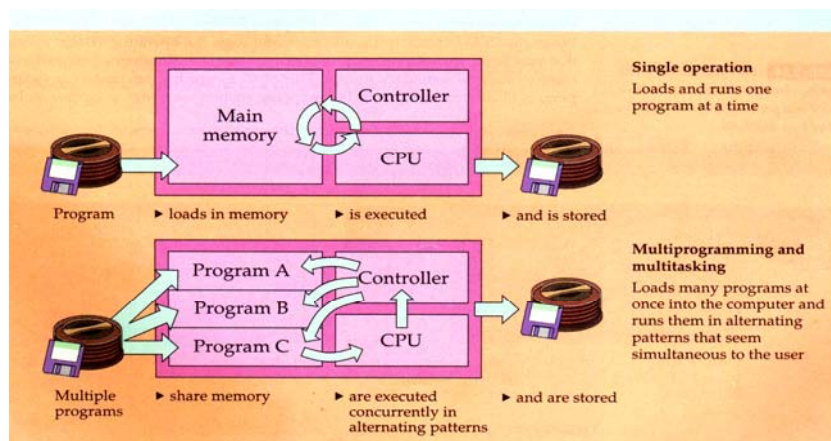
The operating system enables the CPU to execute one program for a brief period of time and to then switch to another, and so forth, until each program is completed. New programs are then loaded into available portions of main memory, and the multiprogramming process is repeated. All of these tasks are performed in such a way that users may not even know that other people are running programs at the same time.

When a computer system performs multiprogramming operations, it must divide main memory into separate areas. An application is placed in a separate area in main memory is called **partition**. An operating system with multiprogramming capability ensures that partitions are kept separate, so that one application cannot interfere with the others that being processed concurrently.

Also, operating system often assigns priorities to the various tasks submitted to the CPU in order for important tasks to be executed before those of less urgency.

Multiprogramming is accomplished through a series of **system interrupts**, which cause execution of a program to be temporarily suspended when resources and devices are being used by other programs.

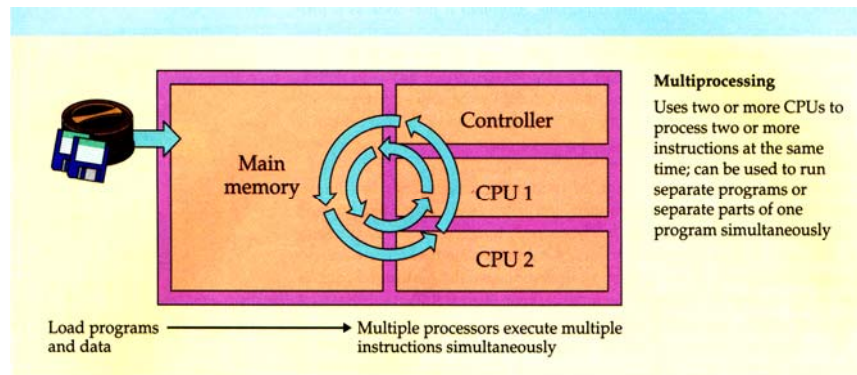
Multitasking is really a variation of multiprogramming. Multitasking allow *one user* to access *several programs* (print a word processing file, sort a database, and recalculate data in a spreadsheet) at the same time, if the operating system allows multitasking. See flg. Fig.



IN summary, multitasking permits a single user to perform many tasks at one time. While multiprogramming is usually applied to situations when several users want to access different programs and data - or even the same programs and data - at the same time.

- **Multiprocessing**

It involves linking two or more CPUs to optimize the handling of data (flg. fig.). While one CPU is executing one set of instructions, another CPU can be executing a different set at the same time. It is used to execute several programs simultaneously because parallel processors or multiple CPUs are being used.



**Note:** this technique differs from multiprogramming, which executes one program at a time but switches quickly among the different programs currently in memory.

### 5-1-3 Other Tasks Performed by Operating Systems

- **Memory Management:** It is a component of system S/W, specifically refers to the following:
  - Allocating memory to programs.
  - Protecting memory so that one program does not have access to the storage space used by another.
  - Giving higher priority to some programs.
  - Making the most effective use of a computer's memory.
- **Interfacing with Translators:**

The system software controls how translators access source programs, translate them,