1. **We know that an operating system is a program. Explain the main difference between an operating system and other non-operating system programs.**

The main difference between an operating system (OS) and other non-operating system programs is that while an OS can directly control a computer’s hardware, other non OS programs like application programs and libraries/utilities can only gain control over computer hardware through the OS.

The end users view the computer in terms of applicaitons programs like Microsoft Word etc. These application programs invoke changes in the computer hardware through system programs that are referred to as libraries/utilities. These system programs in turn invoke the OS. The OS masks the details of the hardware and acts as a mediator for application programs and system programs to access computer hardware.

1. **The operating system on your computer system shares the processor (assuming there is only one processor) with many other programs. However we understand that at any given moment, the processor can only execute the instructions from one program. Explain how could the operating system and several other programs could run on the same processor interleavely with each others.**

For the context of this question we will define a process as an instance of a computer program that is being executed. It contains program code and data associated with that code.

Multitasking is a method to allow multiple processes to share a processor and other system resources. Each processor executes a single task at a time. However, multitasking allows each processor to switch between tasks that are being executed without having to wait for each task to finish.

The operating system’s principal responsibility is controlling the execution of processes; this includes determining the interleaving pattern for execution and allocating resources to processes. This is done through process switching where a running process is interrupted and the OS assigns another process to the running state and turns control over to that process.

Process switching is done thorugh system interrupts. An example of a system interrupt is a clock interrupt that only allows processes to run in time slices. A time slice is a maximum amount of time that a process can execute before being interrupted.