1. Define Operating System and Its Functionality

Operating System (OS):
The OS is system software that manages computer hardware and software resources, providing services to computer programs.

Functionality:

- **Process Management:** Manages the execution of processes.
- **Memory Management:** Allocates and manages memory for processes.
- **File System Management:** Controls access to files and directories.
- **Device Management:** Manages device communication via drivers.
- **Security and Access Control:** Protects data and resources through authentication and authorization.

2. What is the Long-Term Scheduler and Short-Term Scheduler? Write Differences

- **Long-Term Scheduler:**
  Decides which processes should be brought into the ready queue. It controls the degree of multiprogramming (i.e., the number of processes in memory).
- **Short-Term Scheduler:**
  Selects which process from the ready queue should be executed next by the CPU. It controls the CPU's allocation to processes.

Differences:

- **Frequency:** The long-term scheduler is invoked less frequently; the short-term scheduler is invoked very frequently.
- **Control:** Long-term scheduler controls the degree of multiprogramming, while the short-term scheduler controls the execution of processes.
- **Speed:** Long-term scheduling is slower, while short-term scheduling must be very fast.

3. What is a Process Control Block (PCB)?

A Process Control Block (PCB) is a data structure used by the OS to store all information about a process. This includes process state, program counter, CPU registers, memory management information, and I/O status information.

4. What Kind of Information is Saved in PCB During Context Switching?

During context switching, the PCB saves:

- **Process State:** The current state of the process (e.g., running, waiting).
- **Program Counter:** The address of the next instruction to execute.
- **CPU Registers:** The contents of all registers.
- **Memory Management Information:** Details about memory allocation.
- **I/O Status Information:** Information about I/O devices allocated to the process.

5. Diagram for Context Switching