

Operating System

**ASSIGNMENT 2**

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**COURSE:** Operating System

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**QUESTION # 01**

***Identify*** the key differences between Single-Level Directory, Two-Level Directory, and Tree-Structured Directories in an operating system. Provide examples of scenarios where each directory structure might be most effective.

**Key Differences in Directory Structures:**

1. **Single-Level Directory**:

All files are stored in one directory. Simple, but filenames must be unique.

**Best for**: Small, single-user systems (e.g., early personal computers).

1. **Two-Level Directory**:

Each user has their own directory. Allows same filename for different users, but no subdirectories.

**Best for**: Multi-user systems with simple file management (e.g., university computing systems).

1. **Tree-Structured Directory**:

Allows directories within directories (nested structure). Complex, with better file organization.

**Best for**: Large, complex systems (e.g., modern operating systems like Windows, Linux).

**QUESTION # 02**

***Identify*** the key components of a typical file-system structure. How these components work together to manage files and directories within an operating system. Provide examples to illustrate your explanation.

**Key Components of a Typical File-System Structure:**

1. **Boot Control Block** (Boot Sector/Volume Boot Record)
   * Contains information to boot the system (e.g., the location of the operating system kernel).
   * **Example**: The first sector of a disk, like the Master Boot Record (MBR), helps boot the computer.
2. **Volume Control Block** (Superblock)
   * Holds metadata about the file system such as block size, number of free blocks, and file system type.
   * **Example**: In Linux, the superblock stores information on a partition’s layout and free space.
3. **Directory Structure** (File Control Block)
   * Manages the organization of files and directories, storing file names, locations, permissions, and attributes.
   * **Example**: A directory on a Linux system lists the files inside a folder, showing details like permissions and file sizes.
4. **File Control Block (FCB)**
   * Contains the details of a specific file, such as its size, location on disk, permissions, and last modification time.
   * **Example**: The inode structure in Linux is an FCB, containing metadata about a file but not the file name.
5. **Free Space Management**
   * Keeps track of free and allocated space on the disk, ensuring efficient space utilization.
   * **Example**: A bitmap or free-space list tracks which blocks are free to be allocated for new files.