# Linux Programming: Assignment-1 (20-09-2025)

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1. **1. What is Linux Operating System (OS)? List three pros and cons of it. (CO1)**

Linux is an open-source operating system based on the UNIX model. It manages hardware resources, provides security, and allows users to run applications.  
  
**Pros:**  
1. Free and open-source (no license cost).  
2. Very secure compared to many other OS.  
3. Highly stable and rarely crashes.  
  
**Cons:**  
1. Not beginner-friendly; steep learning curve.  
2. Limited support for some commercial software (like MS Office).  
3. Hardware driver support is sometimes tricky.

1. **2. Differentiate between Linux, Mac, Android, and Windows OS with at least six unique features. (CO1)**

**- Linux**: Open-source, customizable, secure, widely used in servers, supports multiple distributions (Ubuntu, Fedora), strong community support.  
**- Mac (macOS):** Exclusive to Apple devices, elegant GUI, strong integration with iPhone/iPad, paid license, strong multimedia support, closed-source.  
- **Android:** Based on Linux kernel, designed for mobile devices, open-source with Google services, supports millions of apps, touch-optimized, most widely used mobile OS.  
**- Windows:** Paid OS, user-friendly GUI, widest software compatibility, dominant in PC market, closed-source, strong gaming support.

1. **3. Why is Linux preferred for Mainframe Servers for legacy application? (CO1)**

1. It is extremely stable and reliable (servers run for months/years without reboot).  
2. Offers strong security features.  
3. Cost-effective because it is open-source and doesn’t require expensive licenses.

1. **4. Explain the structure of the Linux File System with proper diagram. (CO2)**

Linux follows a hierarchical file system starting with the root directory '/'. Everything (files, devices, programs) exists under this root.  
  
Example using the tree command:  
/  
├── bin (essential commands)  
├── etc (configuration files)  
├── home (user files)  
├── lib (libraries)  
├── root (root user home)  
├── var (logs, variable data)  
└── usr (user applications)

1. **5. If Linux OS is open-source, how do companies like Red Hat still making money from it? (CO2)**

Companies like Red Hat don’t sell Linux itself (since it’s free). They make money by:  
- Providing enterprise-level support and maintenance services.  
- Offering training and certification programs.  
- Selling customized solutions with guaranteed stability and updates.  
- Partnering with corporations and governments that need reliable server solutions.

1. **6. Write the command to display today’s date and time (i.e., current System time). (CO1)**

date

1. **7. Which command is used to check how long the system has been running? (CO1)**

uptime

1. **8. What is the difference between shutdown -h now and halt? (CO1)**

- shutdown -h now → Safely shuts down the system, closing all processes properly before powering off.  
- halt → Immediately stops the CPU but may not safely close all processes.

1. **9. Compare init 0 and shutdown -h. Which is safer? Why? (CO1)**

- init 0 → Puts the system in runlevel 0 (halts the system).  
- shutdown -h → Gracefully shuts down, notifying users and stopping services safely.  
  
Shutdown -h is safer because it ensures processes are closed properly before shutdown.

1. **10. A system administrator accidentally powers off a Server machine without shutting it down properly. What problems can occur to the said Server? (CO2)**

- Data loss or corruption (unsaved work or database issues).  
- File system damage leading to boot problems.  
- Services may not restart properly on reboot.  
- Hardware stress due to sudden power cut.

## Brainstorming

**a) As Linux Kernel is open-source, can we build our own operating system?**  
Yes, since Linux Kernel is open-source, anyone can modify and build a custom OS. Examples include Android, Ubuntu, and Kali Linux.  
 **b) In order to do that, what are the stoppers, hurdles, and challenges?**  
- Requires deep technical knowledge.  
- Time-consuming and resource-heavy.  
- Compatibility issues with hardware and drivers.  
- Need for long-term support and updates.  
 **c) Is anyone in India working on this field? Find at least three to four engineers.**  
Yes, India has engineers working on open-source and Linux-based projects. Examples include:  
1. Kris Gopalakrishnan (Infosys, contributed to open computing projects).  
2. Nandan Nilekani (worked on Aadhaar project using open-source tech).  
3. Developers at C-DAC (Centre for Development of Advanced Computing) building Bharat Operating System Solutions – BOSS Linux.  
4. Open-source communities in India (FOSS.IN, ICFOSS Kerala).