LINUX PROGRAMMING

ASSIGNMENT-1

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

Linux is a free and open-source, Unix-like operating system kernel that powers a wide variety of distributions (Ubuntu, Fedora, Debian, etc.). It manages hardware, runs applications, and provides system services.

Pros:

1. Open-source & free – Anyone can use, modify, and distribute it.
2. High security – Strong user permissions and community-driven patches.
3. Stability & reliability – Rare crashes; widely used in servers.

Cons:

1. Learning curve – Not beginner-friendly compared to Windows.
2. Software compatibility – Some proprietary apps/games don't support Linux.
3. Driver support issues – Hardware vendors often focus on Windows drivers.

2. Differentiate between Linux, Mac, Android, and Windows OS with six unique features.

Feature	Linux	MacOS	Android	Windows
Source	Open-source	Closed-source (Apple)	Open-source (Linux kernel)	Closed-source
Cost	Free	Paid (Apple hardware)	Free with device	Paid license
Customization	Highly customizable	Very limited	Moderate	Limited
Security	Strong, fewer viruses	Strong (Apple ecosystem)	Moderate	More malware-prone
Usage	Servers, desktops,	Creative/design	Smartphones/	Business,

	embedded	industry	tablets	gaming
Hardware dependency	Runs on almost anything	Only Apple devices	Mobile devices	Wide range of PCs

3. Why is Linux preferred for Mainframe Servers for legacy application?

1. Stability: Linux can run for months/years without reboot, essential for mainframes.
2. Backward compatibility: Supports legacy applications with POSIX compliance.
3. Scalability & performance: Handles thousands of concurrent processes efficiently.

4. Explain the structure of the Linux File System with diagram.

Linux uses a hierarchical tree structure starting from the root '/'.

/ → Root directory
/bin → Essential binaries (ls, cp, mv)
/boot → Bootloader, kernel files
/etc → Configuration files
/home → User files & directories
/lib → Libraries for binaries
/var → Logs, cache, spool
/tmp → Temporary files
/usr → Applications, utilities

A simple tree diagram can be generated using the command: tree -L 1 /

5. If Linux is open-source, how do companies like Red Hat make money?

• Subscription model: Red Hat Enterprise Linux (RHEL) is sold with support & updates.
• Support & consulting: Enterprises pay for 24×7 expert help.

- Training & certification: Red Hat Certified Engineer (RHCE) courses.
- Partnerships: Provides solutions with IBM, cloud providers.

Thus, revenue comes from enterprise services, not selling Linux itself.

6. Command to display today's date and time.
Command to display today's data and time: date

7. Command to check how long the system has been running.
Command to check how long the system has been running: uptime

8. Difference between shutdown -h now and halt.
- shutdown -h now: Safely stops processes, unmounts filesystems, then halts.
- halt: Immediately stops the system, may skip safe shutdown steps.

9. Compare init 0 and shutdown -h. Which is safer? Why?
- init 0: Switches system runlevel to 0 (halt), not graceful.
- shutdown -h: Gracefully shuts down, closes apps safely.

Safer: shutdown -h (less risk of data corruption).

10. Problems if a server is powered off without shutdown.
- File system corruption (unsaved data lost).
- Database inconsistency.
- Hardware stress (improper cache flushing).
- Longer recovery time on reboot.

Brainstorming

a) Can we build our own OS from Linux Kernel?

Yes. Since Linux kernel is open-source, anyone can build a custom distribution (like Ubuntu, Arch, etc.).

b) Hurdles in doing this:

• Deep technical knowledge of kernel, drivers, and compilers.
• Hardware compatibility issues.
• Requires strong developer community & resources.
• Security & long-term maintenance challenges.

c) Engineers/Projects in India working on this field:

1. Raj Mathur (Indian Linux User's Group, Delhi).
2. Prof. B. Sudarshan (IIT Bombay – Linux kernel research).
3. Kishore Bhargava (FOSS/Linux evangelist).