LINUX PROGRAMMING ASSIGNMENT-1

1. What is Linux OS? State three pros and cons

Linux is an operating system built on the Unix model. It is open-source, meaning the source code is freely available for anyone to use, modify, and redistribute. It manages system hardware, software applications, and user processes.

Advantages

- Cost-effective – completely free to use, with no licensing fees.

- Highly reliable – known for stability and minimal crashes.

- Flexible – runs on diverse platforms, from laptops to supercomputers and servers.

Limitations

- Some commercial applications are not available for Linux.

- Beginners may find it difficult due to heavy reliance on command-line usage.

- Certain hardware devices may not have strong driver support.

2. Linux vs. macOS vs. Android vs. Windows

Criteria	Linux	macOS	Android	Windows
Licensing	Free and open(GPL)	Proprietary (Apple-owned)	Open-source base, Google-managed	Proprietary (Microsoft-owned)
Interface	Multiple desktops (GNOME, KDE, etc.)	Polished Apple UI	Touchscreen-optimized	Desktop based

Hardware Use	Servers, PCs, embedded systems	Only Apple devices	Smartphones, TVs, tablets	Wide range of desktops & laptops
Security	Strong permissions, open patches	Secure but closed	Varies by manufacturer	Frequent malware attacks
Software Management	Package managers (APT, YUM, Pacman)	App Store	Google Play Store	EXE/MSI, Microsoft Store
Major Usage	Servers, research, development	Creative industries	Mobile OS dominance	Business, home, gaming

3. Why is Linux preferred for Mainframe Servers?

- Handles massive workloads – scales efficiently for thousands of concurrent processes.

- Supports legacy systems – maintains backward compatibility through POSIX standards.

- Dependability – capable of running continuously for years without a reboot.

4. Linux File System Structure

Linux uses a **tree-like hierarchy** beginning at the root /.

Key Directories

- /bin – essential user commands

- /sbin – system-level commands

- /etc – configuration files

- /home – personal user directories

- /var – variable data (logs, cache)

- /usr – applications & libraries

- /tmp – temporary storage

5. How Red Hat earns revenue despite Linux being free

Red Hat earns revenue not from selling Linux, but from services:

- Enterprise subscriptions (Red Hat Enterprise Linux licensing)

- Technical support & training for businesses

- Consulting services for enterprise solutions

- Cloud & container platforms (e.g., OpenShift)

6. Command to display date and time
date

7. Command to check system uptime
uptime

8. Difference between shutdown -h now and halt

- shutdown -h now → Gracefully ends processes, unmounts drives, and powers off.

- halt → Immediately stops CPU operations without ensuring a clean shutdown.

9. Compare init 0 and shutdown -h. Which is safer?

- init 0 → Directly changes the runlevel to shutdown, minimal warnings.

- shutdown -h → Notifies users, safely ends processes, unmounts file systems.
  Note: shutdown -h (prevents corruption and data loss

10. Risks of powering off a server without shutdown

- Incomplete disk writes → filesystem corruption.

- Applications lose unsaved data.

- Databases face integrity issues.

- Hardware stress on storage devices.

<u>Brainstorming Section</u>

a) Can we build our own OS using the Linux kernel?

Yes. The Linux kernel is open-source, so new distributions can be built by customizing kernel, tools, and UI.

b) Challenges:

- Requires deep knowledge of kernels, drivers, and system internals.

- Complex package management & updates.

- Hard to build a strong user & developer community.

c) Indian engineers contributing in this area:

- Kushal Das – Fedora developer, Python contributor.

- Shakthi Kannan – Linux kernel & free software evangelist.

- Balbir Singh – Linux memory management (IBM/Red Hat).

- Harish Pillay – Linux Foundation & open-source advocate.

Submitted by:

UJWAL N K

ENG24CY0172

2nd year- 3C Cybersecurity