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**1Q)A system has a file /etc/passwd. How would you use grep + tee to extract usernames and save them to a file while also displaying them on screen?**  
**sol)**

`cut -d: -f1 /etc/passwd | tee usernames.txt`

This extracts usernames, shows them on screen, and saves to usernames.txt.

**2Q). A binary isn't found in \$PATH. How would you use commands (which, find, locate) to troubleshoot and fix the issue?**  
**sol)**

1. Use 'which binary\_name' → checks PATH.
2. If not found, try 'find / -name binary\_name 2>/dev/null'.
3. Or use 'locate binary\_name' if updatedb is available.
4. If found, add directory to PATH using:  
`export PATH=$PATH:/path/to/binary`

**3Q)Write a command pipeline that finds all .log files modified in the last 24 hours in /var/log and saves results into log\_report.txt.**  
**sol)**

The following command would be used:

`find /var/log -name "*.log" -mtime -1 | tee log_report.txt`

**4Q)What is the difference between shutdown -r now and reboot?**  
**sol)**

`shutdown -r now` → issues a command to the system to cleanly shut down everything and then reboot right away. It will notify and inform any users currently logged on, cleanly kill services running on the system, and reboot.

`reboot` → is simply a shortcut command that instructs to reboot directly and it may not fully go through a shutdown process.

**5Q)How can you use the tee command to debug a script that generates both standard output and error messages?**  
**sol)**

**Run script with redirection:**

```
./script.sh 2>&1 | tee debug.log
```

This shows both normal output and errors live while saving them in debug.log.

**6Q) Explain any three real-world applications of Linux in industries.**

**sol)**

1) Web Servers = The majority of servers run on Linux (e.g. Apache, Nginx) due to its stability and security.

2) Cloud Platforms = AWS, Google Cloud, and Azure heavily rely on Linux-based virtual machines.

3) Cybersecurity = Distros like Kali Linux are commonly used for penetration testing and digital forensics.

**7Q) Differentiate application, system and utility software in the context of Linux environment.**

**sol)**

Application Software → Programs for user use (e.g., Firefox, LibreOffice).

System Software → Part of the OS itself, such the linux kernel which manages hardware.

Utility Software → Small programs which can manage the system (e.g., ls, cp, grep, cron).

**8Q) What are the key differences between open-source and proprietary operating systems?**

**sol)**

Open-source operating system == Free for anyone to use, modify, and distribute (examples: Linux). Source code is available for anyone to see.

Proprietary operating system == Closed-source, requires license or payment to use (examples: Microsoft Windows and macOS). Software is hidden.

Open-source gives you flexibility and a community of support behind it, while proprietary gives you a user experience that is polished and vendor support if needed.

**9Q) Write the command to display the system's kernel version.**

**sol)**

The following command is used :

```
uname -r
```

Example:

```
(raakin@Kali)-[~]  
└─$ uname -r  
6.12.25-amd64
```

**10Q)What is the difference between head and tail commands in text processing?  
sol)**

head == displays the first lines of a file (default = 10 lines). Example: head file.txt.

tail == displays the last lines of a file (default = 10 lines). Example: tail file.txt.

Both commands are useful for quickly previewing the contents of a file from the top or bottom.

Example:

1)head:

```
(raakin@Kali)-[~]  
$ head ping_log.txt  
PING google.com (172.217.26.14) 56(84) bytes of data.  
64 bytes from nrt20s02-in-f14.1e100.net (172.217.26.14): icmp_seq=1 ttl=118 time=49.9 ms  
64 bytes from nrt20s02-in-f14.1e100.net (172.217.26.14): icmp_seq=2 ttl=118 time=70.6 ms  
64 bytes from nrt20s02-in-f14.1e100.net (172.217.26.14): icmp_seq=3 ttl=118 time=102 ms  
64 bytes from nrt20s02-in-f14.1e100.net (172.217.26.14): icmp_seq=4 ttl=118 time=56.9 ms  
64 bytes from nrt20s02-in-f14.1e100.net (172.217.26.14): icmp_seq=5 ttl=118 time=82.7 ms  
64 bytes from nrt20s02-in-f14.1e100.net (172.217.26.14): icmp_seq=6 ttl=118 time=57.1 ms  
64 bytes from nrt20s02-in-f14.1e100.net (172.217.26.14): icmp_seq=7 ttl=118 time=70.9 ms  
64 bytes from nrt20s02-in-f14.1e100.net (172.217.26.14): icmp_seq=8 ttl=118 time=50.0 ms  
64 bytes from nrt20s02-in-f14.1e100.net (172.217.26.14): icmp_seq=9 ttl=118 time=67.1 ms
```

2)tail:

```
(raakin@Kali)-[~]  
$ tail ping_log.txt  
64 bytes from nrt20s02-in-f14.1e100.net (172.217.26.14): icmp_seq=2 ttl=118 time=70.6 ms  
64 bytes from nrt20s02-in-f14.1e100.net (172.217.26.14): icmp_seq=3 ttl=118 time=102 ms  
64 bytes from nrt20s02-in-f14.1e100.net (172.217.26.14): icmp_seq=4 ttl=118 time=56.9 ms  
64 bytes from nrt20s02-in-f14.1e100.net (172.217.26.14): icmp_seq=5 ttl=118 time=82.7 ms  
64 bytes from nrt20s02-in-f14.1e100.net (172.217.26.14): icmp_seq=6 ttl=118 time=57.1 ms  
64 bytes from nrt20s02-in-f14.1e100.net (172.217.26.14): icmp_seq=7 ttl=118 time=70.9 ms  
64 bytes from nrt20s02-in-f14.1e100.net (172.217.26.14): icmp_seq=8 ttl=118 time=50.0 ms  
64 bytes from nrt20s02-in-f14.1e100.net (172.217.26.14): icmp_seq=9 ttl=118 time=67.1 ms  
64 bytes from nrt20s02-in-f14.1e100.net (172.217.26.14): icmp_seq=10 ttl=118 time=90.7 ms  
64 bytes from nrt20s02-in-f14.1e100.net (172.217.26.14): icmp_seq=11 ttl=118 time=51.4 ms
```