1) What is Linux?

Ans: Linux is an open source operating system which runs on different devices like servers, computers and mobile devices. It is alternate for Windows OS and Mac Os. It was invented by Linus Torvalds in 1990.

Popular Linux distributions: Fedora, Ubuntu, Centos, Redhat and Suse Linux.

2) What is the difference between hard link and soft link?

Ans: First we will discuss link: A connection between a file name and actual data on disk. E.g. Shortcut of different programs in windows Desktop.

Link command in linx

```
# Hi I am Bharat and i am student of Devops Batch Feb2025.
#Tis is sample Link file

# Soft link syntax: ln -s
# Hard link syntax: ln (Remove -s)
~
~
~
~
~
~
~
```

Soft Link:

We can make multi soft links as per our convenience.

Link is removed if the original file is deleted.

We can edit the file by using soft link.

Inode number is different than the original file.

```
root@DESKTOP-GRR5G0K:/# ls
bin   dev  home  lib    lib64   lost+found  mnt  proc  run   snap        srv  tmp  var
boot  etc  init  lib32  libx32  media       opt  root  sbin  softlink1   sys  usr
root@DESKTOP-GRR5G0K:/# cat softlink1
# Hi I am Bharat and i am student of Devops Batch Feb2025.
#Tis is sample Link file

# Soft link syntax: ln -s
# Hard link syntax: ln (Remove -s)
root@DESKTOP-GRR5G0K:/#
```

Hard Link:

Deleting, renaming or removing the file will not affect the link.

```
root@DESKTOP-GRR5G0K:/# rm /home/Hardlink/hardlink.txt
root@DESKTOP-GRR5G0K:/# cat hardlink1
This is sample for Hard Link.

Hard link does not work on different devices or different platforms.
root@DESKTOP-GRR5G0K:/#
```

Inode numbers are same for link file as well as original file.

We can not esbalish hard link between two different devices like soft link works.

```
root@DESKTOP-GRR5G0K:/# ln /mnt/d/Devops/Bharat/hardlink.txt
ln: failed to create hard link './hardlink.txt' => '/mnt/d/Devops/Bharat/hardlink.txt': Invalid cross-device link
root@DESKTOP-GRR5G0K:/#
```

```
root@DESKTOP-GRR5G0K:/home/Hardlink# cat hardlink.txt
This is sample for Hard Link.

Hard link does not work on different devices or different platforms.
root@DESKTOP-GRR5G0K:/home/Hardlink# cd ..
root@DESKTOP-GRR5G0K:/home# cd ..
root@DESKTOP-GRR5G0K:/# ln /home/Hardlink/hardlink.txt hardlink1
root@DESKTOP-GRR5G0K:/# ls
bin   dev  hardlink1  init  lib32  libx32      media  opt   root  sbin  softlink1  sys  usr
boot  etc  home       lib   lib64  lost+found  mnt    proc  run   snap  srv        tmp  var
root@DESKTOP-GRR5G0K:/# cat hardlink1
This is sample for Hard Link.

Hard link does not work on different devices or different platforms.
root@DESKTOP-GRR5G0K:/#
```

3) What is Kernel in linux?

Ans: Kernel is the core of the operating system which acts like an interface between hardware and software. The kernel allocate and manages the system resources like cpu time, memory and I/O systems.

4) What is grep command used for in linux?

Ans: GREP stands for Global Regular Expression Print.

Grep command is used for search a particular string/keyword from a file and print lines matching a pattern. Like we we ctrl+f in windows OS for search, we use grep in linux.

e.g we have one file with name grep.txt and we need to find a word from the file.

```
root@DESKTOP-GRR5G0K:/home# cat devops/bharat/grep.txt
example for grep command.
grep is used for serach a string or keyword from a file.
```

From the above file we will find word “**search**”

Then we will follow below syntax.

-I argument is used to ignore the upper and lower case wile search.

5) Step1: Create user p1

We will create user with command “useradd p1”.

We can check user details with “id p1”

```
root@DESKTOP-GRR5G0K:/home# useradd p1
useradd: user 'p1' already exists
root@DESKTOP-GRR5G0K:/home# id p1
uid=1002(p1) gid=1002(p1) groups=1002(p1)
root@DESKTOP-GRR5G0K:/home#
```

Step 2: He should be part of 3 groups g1,g2,g3.

First we will create 3 groupsg1,g2,g3.

We can see group list with “compgen -g” and see user list with “compgen -u”

```
root@DESKTOP-GRR5G0K:/home# groupadd g1
root@DESKTOP-GRR5G0K:/home# groupadd g2
root@DESKTOP-GRR5G0K:/home# groupadd g3
root@DESKTOP-GRR5G0K:/home# compgen -g
root
daemon
bin
systemd-coredump
devops
grafana
prometheus
p1
g1
g2
g3
root@DESKTOP-GRR5G0K:/home# x`
```

Now we will add user to groups with command “usermode -G g1,g2,g3 p1”

```
root@DESKTOP-GRR5G0K:/etc# id p1
uid=1002(p1) gid=1002(p1) groups=1002(p1),1003(g1),1004(g2),1005(g3)
root@DESKTOP-GRR5G0K:/etc#
```

Step3: whenever he creates a file automatically in the group section of file grp g1 should come.

First we will switch to user p1 with command “su p1”

```
root@DESKTOP-GRR5G0K:/etc# su p1
$
```

Then we will change the permission for the user to “rwx” for the user and also make owner by chwon command.

Chmod command we will use for give permissions.

We have the number 4+2+1=7

4=read

2-write

1-executable

Like below you can see that user p1 has created a gile grep.txt with user g1

```
$ ls -ltr
total 141636
-rw-r--r-- 1 root root 145024678 Feb 19 03:46 grafana-enterprise_11.5.2_amd64.deb
-rw-r--r-- 1 root root         0 Mar 10 19:05 myscript.sh
-rwxrwxrwx 1 p1   g1           0 Mar 20 21:21 grep.txt
drwxr-xr-x 2 root root      4096 Mar 20 21:30 bharat
```

7. Step1: Create directory /tmp/bg as root user and create files inside it.

```
root@DESKTOP-GRR5G0K:/# cd tmp/
root@DESKTOP-GRR5G0K:/tmp# ls
snap-private-tmp
systemd-private-d712bb145d7740d384ef943c6a42b380-ModemManager.service-7wqlIh
systemd-private-d712bb145d7740d384ef943c6a42b380-grafana-server.service-D1q86g
systemd-private-d712bb145d7740d384ef943c6a42b380-systemd-logind.service-wAhpwg
systemd-private-d712bb145d7740d384ef943c6a42b380-systemd-resolved.service-2Jh3kg
root@DESKTOP-GRR5G0K:/tmp# mkdir bg
root@DESKTOP-GRR5G0K:/tmp#
```

Step2: “abhi” should be the owner of the directory. He should be able to create files and delete files inside the directory and also he should be able to add content to all files inside the directory.

For it we will create a user abhi and give him permission to the bg directory so that he could able to create files in it. We will use chown command to make owner abhi to the bd directory.

```
root@DESKTOP-GRR5G0K:/tmp/bg# chown abhi bg
```

```
drwxr-xr-x  2 abhi root 4096 Mar 20 22:54 bg/
```

After then abhi can create files in bg directory.

```
$ id
uid=1003(abhi) gid=1006(abhi) groups=1006(abhi)
$ touch abhi.txt
$ ls
abhi.txt  bh.txt
$ ls -s
total 0
0 abhi.txt  0 bh.txt
$ ls -ltr
total 0
-rw-rw-r-- 1 abhi abhi 0 Mar 20 22:54 bh.txt
-rw-rw-r-- 1 abhi abhi 0 Mar 20 22:57 abhi.txt
$
```

8. You suspect that a particular process is consuming excessive CPU resources on your Linux server. How would you identify and terminate this process?

We will use top/htop command to check the system resources utilization. From that we will see high cpu usage application. E.g we have grafana in below image.

```
top - 23:02:04 up  1:44,  1 user,  load average: 0.00, 0.00, 0.00
Tasks:  58 total,   1 running,  57 sleeping,   0 stopped,   0 zombie
%Cpu(s):  0.5 us,  0.4 sy,  0.0 ni, 99.1 id,  0.0 wa,  0.0 hi,  0.0 si,  0.0 st
MiB Mem :   2905.6 total,   2084.5 free,    518.4 used,    302.8 buff/cache
MiB Swap:   3000.0 total,   3000.0 free,      0.0 used.   2230.7 avail Mem

    PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM     TIME+ COMMAND
    371 grafana   20   0 1608724 208468 134056 S   3.7   7.0   3:29.71 grafana
      1 root      20   0  170276  12208   8328 S   0.0   0.4   0:06.45 systemd
      2 root      20   0    2776   1920   1796 S   0.0   0.1   0:00.06 init-systemd(Ub
      8 root      20   0    2788    132    132 S   0.0   0.0   0:00.04 init
     74 root      19  -1   68544  19700  18484 S   0.0   0.7   0:02.28 systemd-journal
```

After the we will note the “pid” of particular process and will use “kill” command to terminate the process. We can see in below image that grafan service has been terminated now.

```
root@DESKTOP-GRR5G0K:/tmp# kill 371
root@DESKTOP-GRR5G0K:/tmp# top
top - 23:04:23 up  1:47,  1 user,  load average: 0.00, 0.00, 0.00
Tasks:  57 total,   1 running,  56 sleeping,   0 stopped,   0 zombie
%Cpu(s):  0.1 us,  0.0 sy,  0.0 ni, 99.8 id,  0.1 wa,  0.0 hi,  0.0 si,  0.0 st
MiB Mem :   2905.6 total,   2157.1 free,    446.1 used,    302.4 buff/cache
MiB Swap:   3000.0 total,   3000.0 free,      0.0 used.   2303.1 avail Mem

    PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM     TIME+ COMMAND
      1 root      20   0  170276  12208   8328 S   0.0   0.4   0:06.46 systemd
      2 root      20   0    2776   1920   1796 S   0.0   0.1   0:00.06 init-systemd(Ub
      8 root      20   0    2788    132    132 S   0.0   0.0   0:00.04 init
     74 root      19  -1   68544  19700  18484 S   0.0   0.7   0:02.29 systemd-journal
    100 root      20   0   22452   7628   4036 S   0.0   0.3   0:00.77 systemd-udevd
    124 systemd+  20   0   19088   7616   6736 S   0.0   0.3   0:01.26 systemd-network
    271 root      20   0   85588    236     56 S   0.0   0.0   0:00.00 snapfuse
    277 root      20   0  298860   5744    328 S   0.0   0.2   0:00.87 snapfuse
    286 root      20   0   85588   2248     32 S   0.0   0.1   0:00.00 snapfuse
    293 root      20   0  225124    548    268 S   0.0   0.0   0:00.04 snapfuse
    298 root      20   0   85588   2256     44 S   0.0   0.1   0:00.00 snapfuse
    304 root      20   0  594332  15008    268 S   0.0   0.5   0:13.45 snapfuse
    313 systemd+  20   0   25588  13116   8184 S   0.0   0.4   0:00.77 systemd-resolve
    319 root      20   0  237336   9348   6472 S   0.0   0.3   0:00.41 accounts-daemon
    320 message+  20   0    7572   4652   3848 S   0.0   0.2   0:00.27 dbus-daemon
    325 root      20   0   29876  18388  10172 S   0.0   0.6   0:00.83 networkd-dispat
    326 root      20   0  232736   6856   6164 S   0.0   0.2   0:00.09 polkitd
    327 syslog    20   0  224352   4552   3780 S   0.0   0.2   0:00.26 rsyslogd
    335 root      20   0 1469164  42920  19600 S   0.0   1.4   0:04.80 snapd
    342 root      20   0   17512   7628   6740 S   0.0   0.3   0:00.89 systemd-logind
    343 root      20   0  393356  12260  10376 S   0.0   0.4   0:00.43 udisksd
    361 root      20   0  315100  11272   9520 S   0.0   0.4   0:00.54 ModemManager
    377 root      20   0    8548   2964   2748 S   0.0   0.1   0:00.04 cron
```