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Roll no: 2023-BSE-077

Class: BSE5-B

Lab 7

Task 1 – Print & Filter Environment Variables

- task1 printenv all.png

```
sadafriaz@2023-bse-077:~$ printenv
SHELL=/bin/bash
CREDENTIALS_DIRECTORY=/run/credentials/getty@tty1.service
MEMORY_PRESSURE_WRITE=c29t2SAyMDAwMDAgMjAwMDAwMAA=
XDG_SEAT=seat0
PWD=/home/sadafriaz
LOGNAME=sadafriaz
XDG_SESSION_TYPE=tty
SYSTEMD_EXEC_PID=1447
HOME=/home/sadafriaz
LANG=en_US.UTF-8
LS_COLORS=rs=0:di=01;34:ln=01;36:mh=00:pi=40;33:so=01;35:do=01;35:bd=40;33:01:cd=40;33:01:or=40;31
x=01;32:*.tar=01;31:*.tgz=01;31:*.arc=01;31:*.arj=01;31:*.taz=01;31:*.lha=01;31:*.lz4=01;31:*.lzh=
1;31:*.zip=01;31:*.z=01;31:*.dz=01;31:*.gz=01;31:*.lrz=01;31:*.lz=01;31:*.lzo=01;31:*.xz=01;31:*.z
2=01;31:*.tz=01;31:*.deb=01;31:*.rpm=01;31:*.jar=01;31:*.war=01;31:*.ear=01;31:*.sar=01;31:*.rar=0
31:*.rz=01;31:*.cab=01;31:*.wim=01;31:*.swm=01;31:*.dwm=01;31:*.esd=01;31:*.avif=01;35:*.jpg=01;35
35:*.pbm=01;35:*.pgm=01;35:*.ppm=01;35:*.tga=01;35:*.xbm=01;35:*.xpm=01;35:*.tif=01;35:*.tiff=01;3
*.mov=01;35:*.mpg=01;35:*.mpeg=01;35:*.m2v=01;35:*.mkv=01;35:*.webm=01;35:*.webp=01;35:*.ogm=01;3
*.nuv=01;35:*.wmv=01;35:*.asf=01;35:*.rm=01;35:*.rmvb=01;35:*.flc=01;35:*.avi=01;35:*.fli=01;35:*
01;35:*.cgm=01;35:*.emf=01;35:*.ogv=01;35:*.ogx=01;35:*.aac=00;36:*.au=00;36:*.flac=00;36:*.m4a=00
36:*.ogg=00;36:*.ra=00;36:*.wav=00;36:*.oga=00;36:*.opus=00;36:*.spx=00;36:*.xspf=00;36:*=00;90:*
g-new=00;90:*.dpkg-old=00;90:*.dpkg-tmp=00;90:*.old=00;90:*.orig=00;90:*.part=00;90:*.rej=00;90:*
=00;90:*.ucf-dist=00;90:*.ucf-new=00;90:*.ucf-old=00;90:
MEMORY_PRESSURE_WATCH=/sys/fs/cgroup/system.slice/system-getty.slice/getty@tty1.service/memory.pre
INVOCATION_ID=58f3e087357a47e2aba3ea19dca8da0a
LESSCLOSE=/usr/bin/lesspipe %s %s
XDG_SESSION_CLASS=user
TERM=linux
LESSOPEN=| /usr/bin/lesspipe %s
USER=sadafriaz
SHLVL=1
XDG_VTNR=1
XDG_SESSION_ID=1
XDG_RUNTIME_DIR=/run/user/1000
XDG_DATA_DIRS=/usr/local/share:/usr/share:/var/lib/snapd/desktop
HUSHLOGIN=false
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/sna
DBUS_SESSION_BUS_ADDRESS=unix:path=/run/user/1000/bus
MAIL=/var/mail/sadafriaz
_=~/usr/bin/printenv
sadafriaz@2023-bse-077:~$ _
```

- task1 grep shell home user.png

```
sadafriaz@2023-bse-077:~$ printenv | grep SHELL  
SHELL=/bin/bash  
sadafriaz@2023-bse-077:~$ printenv | grep HOME  
HOME=/home/sadafriaz  
sadafriaz@2023-bse-077:~$ printenv | grep USER  
USER=sadafriaz  
sadafriaz@2023-bse-077:~$
```

Task 2 – Export DB_ Variables Temporarily and Observe Scope*

Screenshots

- task2_exports_all.png

```
sadafriaz@2023-bse-077:~$ export DB_URL="postgres://db.example.local:5432/mydb"
sadafriaz@2023-bse-077:~$ export DB_USER="labuser"
sadafriaz@2023-bse-077:~$ export DB_PASSWORD="labpass123"
sadafriaz@2023-bse-077:~$
```

- task2_echoes_all.png

```
sadafriaz@2023-bse-077:~$ export DB_URL="postgres://db.example.local:5432/mydb"
sadafriaz@2023-bse-077:~$ export DB_USER="labuser"
sadafriaz@2023-bse-077:~$ export DB_PASSWORD="labpass123"
sadafriaz@2023-bse-077:~$ echo "$DB_URL"
postgres://db.example.local:5432/mydb
sadafriaz@2023-bse-077:~$ echo "$DB_USER"
labuser
sadafriaz@2023-bse-077:~$ echo "$DB_PASSWORD"
labpass123
sadafriaz@2023-bse-077:~$
```

- task2_printenv_grep_db.png

```
sadafriaz@2023-bse-077:~$ printenv | grep '^DB_'
DB_PASSWORD=labpass123
DB_USER=labuser
DB_URL=postgres://db.example.local:5432/mydb
sadafriaz@2023-bse-077:~$
sadafriaz@2023-bse-077:~$ _
```

- task2_after_restart_checks.png

```
sadafriaz@2023-bse-077:~$ echo "$DB_URL"
sadafriaz@2023-bse-077:~$ printenv | grep '^DB_'
sadafriaz@2023-bse-077:~$
```

Task 3 – Make DB_ Variables Persistent in ~/.bashrc*

- task3_bashrc_added.png

```
#Lab 7 persistent DB variables
export DB_URL="postgres://db.example.local:5432/mydb"
export DB_USER="labuser"
export DB_PASSWORD="labpass123"
~
```

- task3_source_and_verification.png

```

~/.bashrc" 7L, 1458 written
sadafriaz@2023-bse-077:~$ source ~/.bashrc
sadafriaz@2023-bse-077:~$
sadafriaz@2023-bse-077:~$ echo "$DB_URL"
postgres://db.example.local:5432/mydb
sadafriaz@2023-bse-077:~$ echo "$DB_USER"
labuser
sadafriaz@2023-bse-077:~$ echo "$DB_PASSWORD"
labpass123
sadafriaz@2023-bse-077:~$ printenv | grep '^DB_'
DB_PASSWORD=labpass123
DB_USER=labuser
DB_URL=postgres://db.example.local:5432/mydb
sadafriaz@2023-bse-077:~$ 

```

- task3_after_restart_persistent.png

```

sadafriaz@2023-bse-077:~$ echo "$DB_URL"
postgres://db.example.local:5432/mydb
sadafriaz@2023-bse-077:~$ printenv | grep '^DB_'
DB_PASSWORD=labpass123
DB_USER=labuser
DB_URL=postgres://db.example.local:5432/mydb
sadafriaz@2023-bse-077:~$ 

```

Task 4 – System-Wide Environment Variable, Welcome Script, and PATH

- task4_etc_environment_before.png

```

~/.bashrc 11L, 871B written
sadafriaz@2023-bse-077:~$ sudo cat /etc/environment

[sudo] password for sadafriaz:
Sorry, try again.
[sudo] password for sadafriaz:
PATH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin"
sadafriaz@2023-bse-077:~$ 

```

- task4_echo_path_before.png

```

sadafriaz@2023-bse-077:~$ echo "$PATH"
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin
sadafriaz@2023-bse-077:~$ 
sadafriaz@2023-bse-077:~$ 

```

- task4_etc_environment_edit_vim.png

```

PATH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin"
class="CC-077"

~ 
~ 
~ 
~ 

```

- task4_etc_environment_after.png

```
"/etc/environment" 5L, 86B written
sadafriaz@2023-bse-077:~$ cat /etc/environment
PATH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin"
Class="CC-077"

sadafriaz@2023-bse-077:~$ _
```



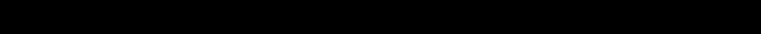
- task4_echo_class_and_path.png

```
sadafriaz@2023-bse-077:~$ echo "$PATH"
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin
sadafriaz@2023-bse-077:~$ echo $Class
CC-077
sadafriaz@2023-bse-077:~$
sadafriaz@2023-bse-077:~$
```



- task4_welcome_create_and_chmod.png

```
sadafriaz@2023-bse-077:~$ cat > ~/welcome <<'EOF'
>
> #!/bin/bash
>
> echo "Welcome to Cloud Computing $USER"
>
> EOF
sadafriaz@2023-bse-077:~$
sadafriaz@2023-bse-077:~$
sadafriaz@2023-bse-077:~$
sadafriaz@2023-bse-077:~$ chmod +x ~/welcome_
```



- task4_welcome_run_dot.png

```
sadafriaz@2023-bse-077:~$ ./welcome
Welcome to Cloud Computing sadafriaz
sadafriaz@2023-bse-077:~$
```



- task4_bashrc_source_and_welcome.png

```
".bashrc" 131L, 3900B written
sadafriaz@2023-bse-077:~$ source ~/.bashrc
sadafriaz@2023-bse-077:~$ cd ~
sadafriaz@2023-bse-077:~$ welcome
Welcome to Cloud Computing sadafriaz
sadafriaz@2023-bse-077:~$ _
```

Task 5 – Block and Allow SSH using UFW (Firewall)

- task5_ufw_enable_and_status.png

```
sadafriaz@2023-bse-077:~$ sudo ufw enable
[sudo] password for sadafriaz:
Firewall is active and enabled on system startup
sadafriaz@2023-bse-077:~$ sudo ufw status verbose
Status: active
Logging: on (low)
Default: deny (incoming), allow (outgoing), disabled (routed)
New profiles: skip
sadafriaz@2023-bse-077:~$
```

- task5_ufw_deny_22_and_status.png

```
sadafriaz@2023-bse-077:~$ sudo ufw deny 22/tcp
[sudo] password for sadafriaz:
Rule added
Rule added (v6)
sadafriaz@2023-bse-077:~$ sudo ufw status numbered
Status: active

      To              Action    From
      --              -----   ---
[ 1] 22/tcp          DENY IN  Anywhere
[ 2] 22/tcp (v6)     DENY IN  Anywhere (v6)

sadafriaz@2023-bse-077:~$ _
```

- task5_ssh_attempt_blocked.png

```
C:\Users\Lenovo>ssh sadafriaz@192.168.64.128
ssh: connect to host 192.168.64.128 port 22: Connection timed out

C:\Users\Lenovo>
```

- task5_ufw_allow_reload_status.png

```
sadafriaz@2023-bse-077:~$ sudo ufw deny 22/tcp
Skipping adding existing rule
Skipping adding existing rule (v6)
sadafriaz@2023-bse-077:~$ sudo ufw reload
Firewall reloaded
sadafriaz@2023-bse-077:~$ sudo ufw status
Status: active

      To              Action    From
      --              -----   ---
22/tcp           DENY IN  Anywhere
22/tcp (v6)     DENY IN  Anywhere (v6)

sadafriaz@2023-bse-077:~$ _
```

- task5_ssh_success_after_allow.png

```
C:\Users\Lenovo>ssh sadafriaz@192.168.64.128
sadafriaz@192.168.64.128's password:
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.8.0-86-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro

System information as of Thu Nov  6 04:46:28 PM UTC 2025

System load:  0.04          Processes:           233
Usage of /:   56.7% of 17.83GB  Users logged in:      1
Memory usage: 10%          IPv4 address for ens33: 192.168.64.128
Swap usage:   0%

* Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s
just raised the bar for easy, resilient and secure K8s cluster deployment.

https://ubuntu.com/engage/secure-kubernetes-at-the-edge

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

7 additional security updates can be applied with ESM Apps.
Learn more about enabling ESM Apps service at https://ubuntu.com/esm

Last login: Sat Oct 25 19:08:24 2025 from 192.168.64.1
sadafriaz@2023-bse-077:~$
```

Task 6 – Configure SSH Key-Based Login from Windows Host

task6_windows_sshkey_and_list.png

```
PS C:\Users\Lenovo> ssh-keygen -t ed25519 -f $env:USERPROFILE\.ssh\id_lab7 -C "lab_key"
Generating public/private ed25519 key pair.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in C:\Users\Lenovo\.ssh\id_lab7.
Your public key has been saved in C:\Users\Lenovo\.ssh\id_lab7.pub.
The key fingerprint is:
SHA256:KNeJNm1fY0oH7xC9f0BBLtoDKiWaX7pMuQNZOZOUUE lab_key
The key's randomart image is:
+--[ED25519 256]--+
|   o...
| . o + .
| . . . o + +
| .Eoo . B * o
|B= . = B S . .
|+B ..+ + = .
|=.=o o +
| *o. +
| o.
+---[SHA256]---+
PS C:\Users\Lenovo> ls $env:USERPROFILE\.ssh

Directory: C:\Users\Lenovo\.ssh

Mode                LastWriteTime         Length Name
----                -----        ----
-a---- 11/6/2025 9:23 AM        444 id_ed25519
-a---- 11/6/2025 9:23 AM         90 id_ed25519.pub
-a---- 10/6/2025 11:16 AM        464 id_ed25519_lab2
-a---- 10/6/2025 11:16 AM       109 id_ed25519_lab2.pub
-a---- 11/7/2025 5:00 AM        444 id_lab7
-a---- 11/7/2025 5:00 AM         90 id_lab7.pub
```

task6_windows_known_hosts_cleared_and_empty.png

```
PS C:\Users\Lenovo> type $env:USERPROFILE\.ssh\id_lab7.pub
ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAID4Bwur8otY/stdzkMPKEW+rIRo0NNkrQjUS3wzBeHqn lab_key
PS C:\Users\Lenovo>
```

task6_server_clear_authorized_keys.png

```
sadafriaz@2023-bse-077:~$ mkdir -p ~/.ssh
sadafriaz@2023-bse-077:~$ chmod 700 ~/.ssh
sadafriaz@2023-bse-077:~$ > ~/.ssh/authorized_keys
sadafriaz@2023-bse-077:~$ _
```

task6_server_add_key_and_show.png

```
sadafriaz@2023-bse-077:~$ echo "ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAID4Bwur8otY/stdzkMPKEW+rIRo0NNkrQjUS3wzBeHqn lab_key" >> ~/.ssh/authorized_keys
sadafriaz@2023-bse-077:~$ chmod 600 ~/.ssh/authorized_keys
sadafriaz@2023-bse-077:~$ cat ~/.ssh/authorized_keys
ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAID4Bwur8otY/stdzkMPKEW+rIRo0NNkrQjUS3wzBeHqn lab_key
sadafriaz@2023-bse-077:~$ _
```

task6_ssh_passwordless_login.png

```
PS C:\Users\Lenovo> ssh sadafriaz@192.168.64.128
Enter passphrase for key 'C:\Users\Lenovo/.ssh/id_ed25519':
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.8.0-86-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:        https://ubuntu.com/pro

System information as of Thu Nov  6 06:09:55 UTC 2025

 System load:  0.08           Processes:          233
 Usage of /:   56.7% of 17.83GB  Users logged in:     1
 Memory usage: 10%            IPv4 address for ens33: 192.168.64.128
 Swap usage:   0%

* Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s
 just raised the bar for easy, resilient and secure K8s cluster deployment.

      https://ubuntu.com/engage/secure-kubernetes-at-the-edge

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

7 additional security updates can be applied with ESM Apps.
Learn more about enabling ESM Apps service at https://ubuntu.com/esm

Last login: Thu Nov  6 16:46:29 2025 from 192.168.64.1
sadafriaz@2023-bse-077:~$
```

task6_ssh_with_identity_file.png

```
PS C:\Users\Lenovo> ssh -i $env:USERPROFILE\.ssh\id_ed25519 sadafriaz@192.168.64.128
Enter passphrase for key 'C:\Users\Lenovo\.ssh\id_ed25519':
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.8.0-86-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro

System information as of Thu Nov  6 06:14:04 PM UTC 2025

System load:  0.0          Processes:           243
Usage of /:   56.7% of 17.83GB  Users logged in:      1
Memory usage: 11%          IPv4 address for ens33: 192.168.64.128
Swap usage:   0%

* Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s
just raised the bar for easy, resilient and secure K8s cluster deployment.

https://ubuntu.com/engage/secure-kubernetes-at-the-edge

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

7 additional security updates can be applied with ESM Apps.
Learn more about enabling ESM Apps service at https://ubuntu.com/esm

Last login: Thu Nov  6 18:14:05 2025 from 192.168.64.128
sadafriaz@2023-bse-077:~$
```

Exam Evaluation Questions

Q1 – Quick Environment Audit

- EE_q1_env_all.png

```
sadafriaz@2023-bse-077:~$ printenv
SHELL=/bin/bash
CREDENTIALS_DIRECTORY=/run/credentials/getty@tty1.service
MEMORY_PRESSURE_WRITE=c29tZSAyMDAwMDAgMjAwMDAwMAA=
XDG_SEAT=seat0
PWD=/home/sadafriaz
LOGNAME=sadafriaz
XDG_SESSION_TYPE=tty
SYSTEMD_EXEC_PID=1554
HOME=/home/sadafriaz
LANG=en_US.UTF-8
LS_COLORS=rs=0:di=1;34:ln=1;36:mh=00:pi=40;83:so=01;35:do=01;35:bd=40;3
x=01;32*:tar=01;31*:tgz=01;31*:arc=01;31*:arj=01;31*:taz=01;31*:lha
1;31*:zip=01;31*:z=01;31*:d2=01;31*:gz=01;31*:lrz=01;31*:lz=01;31*
2=01;31*:tz=01;31*:deb=01;31*:rpm=01;31*:jar=01;31*:war=01;31*:ear=
31*:rz=01;31*:cab=01;31*:wim=01;31*:swm=01;31*:dwm=01;31*:esd=01;3
35*:pbm=01;35*:pgm=01;35*:ppm=01;35*:tga=01;35*:xbm=01;35*:xpm=01;3
*:mov=01;35*:mpg=01;35*:mpeg=01;35*:m2v=01;35*:mkv=01;35*:webm=01;3
*:nuv=01;35*:wmv=01;35*:asf=01;35*:rm=01;35*:rmvb=01;35*:flc=01;35*
01;35*:cgm=01;35*:emf=01;35*:ogg=01;35*:ogx=01;35*:aac=00;36*:au=0
36*:ogg=00;36*:ra=00;36*:wav=00;36*:oga=00;36*:opus=00;36*:spx=00;3
g=new=00;90*:dpkg-old=00;90*:dpkg-tmp=00;90*:old=00;90*:orig=00;90*:
=00;90*:ucf-dist=00;90*:ucf-new=00;90*:ucf-old=00;90*
MEMORY_PRESSURE_WATCH=/sys/fs/cgroup/system.slice/system-getty.slice/gett
INVOCATION_ID=0299594bf1fd34b5aa6a485ca6cc58b54
LESSCLOSE=/usr/bin/lesspipe %s %
XDG_SESSION_CLASS=user
TERM=linux
LESSOPEN=| /usr/bin/lesspipe %
USER=sadafriaz
SHLVL=1
XDG_VTNR=1
XDG_SESSION_ID=1
XDG_RUNTIME_DIR=/run/user/1000
XDG_DATA_DIRS=/usr/local/share:/usr/share:/var/lib/snapd/desktop
HUSHLOGIN=FALSE
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/snap/b
DBUS_SESSION_BUS_ADDRESS=unix:path=/run/user/1000/bus
MAIL=/var/mail/sadafriaz
Class=CC-077
/_/usr/bin/printenv
sadafriaz@2023-bse-077:~$
```

- EE_q1_env_filters.png

```
_~/usr/bin/printenv
sadafriaz@2023-bse-077:~$ printenv | grep PATH
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/snap/bin:/home/sadafriaz/Desktop
sadafriaz@2023-bse-077:~$ printenv | grep LANG
LANG=en_US.UTF-8
sadafriaz@2023-bse-077:~$ printenv | grep PWD
PWD=/home/sadafriaz
sadafriaz@2023-bse-077:~$
```

Q2 – Short-Lived Student Info

- EE_q2_exports.png

```
sadafriaz@2023-bse-077:~$ export STUDENT_NAME="Sadaf Riaz"
sadafriaz@2023-bse-077:~$ export STUDENT_ROLL_NUMBER="077"
sadafriaz@2023-bse-077:~$ export STUDENT_SEMESTER="5"
sadafriaz@2023-bse-077:~$ _
```

- EE_q2_echoes.png

```
sadafriaz@2023-bse-077:~$ echo $STUDENT_NAME $STUDENT_ROLL_NUMBER $STUDENT_SEMESTER
Sadaf Riaz 077 5
sadafriaz@2023-bse-077:~$ 
sadafriaz@2023-bse-077:~$ _
```

- EE_q2_printenv_grep.png

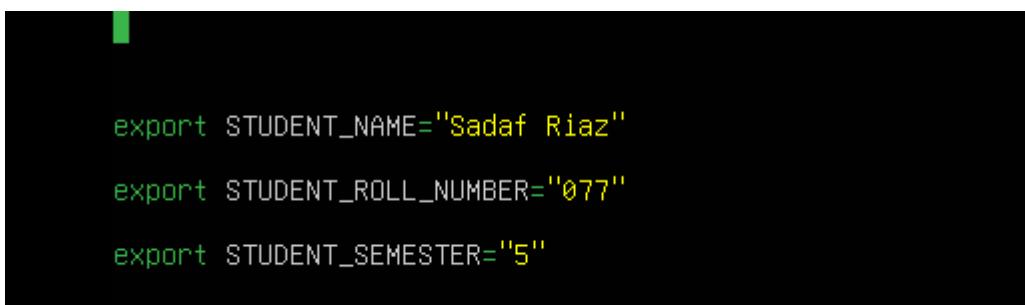
```
sadafriaz@2023-bse-077:~$ printenv | grep STUDENT_
STUDENT_NAME=Sadaf Riaz
STUDENT_SEMESTER=5
STUDENT_ROLL_NUMBER=077
sadafriaz@2023-bse-077:~$ 
sadafriaz@2023-bse-077:~$
```

- EE_q2_after_restart.png

```
sadafriaz@2023-bse-077:~$ echo $STUDENT_NAME $STUDENT_ROLL_NUMBER $STUDENT_SEMESTER
sadafriaz@2023-bse-077:~$ printenv | grep STUDENT_
sadafriaz@2023-bse-077:~$
```

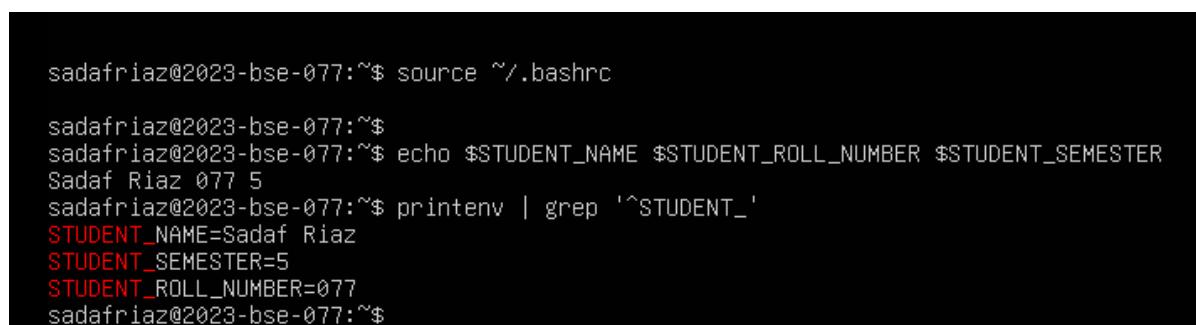
Q3 – Make It Sticky (Persistence Check for Student Info)

- EE_q3_bashrc_editor.png



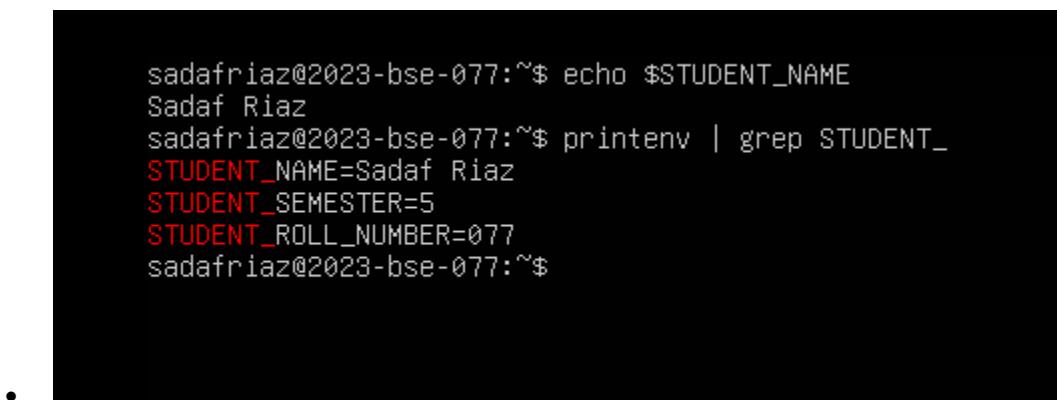
```
export STUDENT_NAME="Sadaf Riaz"
export STUDENT_ROLL_NUMBER="077"
export STUDENT_SEMESTER="5"
```

- EE_q3_after_source.png



```
sadafriaz@2023-bse-077:~$ source ~/.bashrc
sadafriaz@2023-bse-077:~$ echo $STUDENT_NAME $STUDENT_ROLL_NUMBER $STUDENT_SEMESTER
Sadaf Riaz 077 5
sadafriaz@2023-bse-077:~$ printenv | grep '^STUDENT_'
STUDENT_NAME=Sadaf Riaz
STUDENT_SEMESTER=5
STUDENT_ROLL_NUMBER=077
sadafriaz@2023-bse-077:~$
```

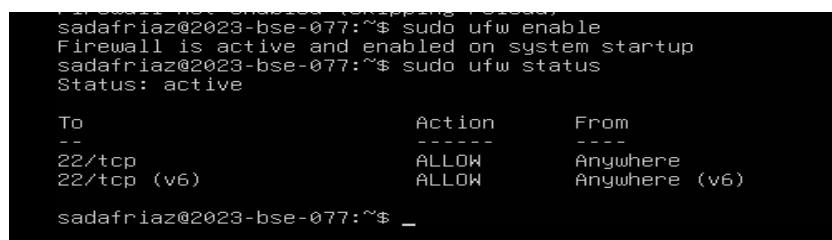
- EE_q3_after_restart.png



```
sadafriaz@2023-bse-077:~$ echo $STUDENT_NAME
Sadaf Riaz
sadafriaz@2023-bse-077:~$ printenv | grep STUDENT_
STUDENT_NAME=Sadaf Riaz
STUDENT_SEMESTER=5
STUDENT_ROLL_NUMBER=077
sadafriaz@2023-bse-077:~$
```

Q4 – Firewall Rules: Block and Restore Ping (ICMP)

- EE_q5_ufw_enable_status.png



```
sadafriaz@2023-bse-077:~$ sudo ufw enable
Firewall is active and enabled on system startup
sadafriaz@2023-bse-077:~$ sudo ufw status
Status: active

To                         Action      From
--                         --         --
22/tcp                      ALLOW      Anywhere
22/tcp (v6)                  ALLOW      Anywhere (v6)

sadafriaz@2023-bse-077:~$ _
```

- EE_q5_ufw_deny_ping_status.png

```
sadafriaz@2023-bse-077:~$ sudo ufw deny proto icmp from any to any
ERROR: Unsupported protocol 'icmp'
sadafriaz@2023-bse-077:~$ sudo ufw status numbered
Status: active

      To              Action    From
      --              -----   ---
[ 1] 22/tcp          ALLOW IN  Anywhere
[ 2] 22/tcp (v6)    ALLOW IN  Anywhere (v6)

sadafriaz@2023-bse-077:~$ _
```

- EE_q5_ping_blocked.png

```
PS C:\Users\Lenovo> ping 192.168.64.128

Pinging 192.168.64.128 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.64.128:
  Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
PS C:\Users\Lenovo>
```

- EE_q5_ufw_allow_ping_status.png

```
# ok icmp co

sadafriaz@2023-bse-077:~$ sudo ufw --force reset
Backing up 'user.rules' to '/etc/ufw/user.rules.20251107_085715'
Backing up 'before.rules' to '/etc/ufw(before.rules.20251107_085715'
Backing up 'after.rules' to '/etc/ufw/after.rules.20251107_085715'
Backing up 'user6.rules' to '/etc/ufw/user6.rules.20251107_085715'
Backing up 'before6.rules' to '/etc/ufw(before6.rules.20251107_085715'
Backing up 'after6.rules' to '/etc/ufw(after6.rules.20251107_085715'

sadafriaz@2023-bse-077:~$ sudo ufw enable
Firewall is active and enabled on system startup
sadafriaz@2023-bse-077:~$ sudo ufw status
Status: active
sadafriaz@2023-bse-077:~$
```

- EE_q5_ping_success.png

```
Windows PowerShell
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Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\Users\Lenovo> ping 192.168.64.128

Pinging 192.168.64.128 with 32 bytes of data:
Reply from 192.168.64.128: bytes=32 time=3ms TTL=64
Reply from 192.168.64.128: bytes=32 time=1ms TTL=64
Reply from 192.168.64.128: bytes=32 time<1ms TTL=64
Reply from 192.168.64.128: bytes=32 time=1ms TTL=64

Ping statistics for 192.168.64.128:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 3ms, Average = 1ms
PS C:\Users\Lenovo>
```