

SUBJECT: CLOUD COMPUTING

LAB#07

TASK#01:

```

sana058sana1:"% printenv
SHELL=/bin/bash
CREDENTIALS_DIRECTORY=/run/credentials/getty@tty6.service
MEMORY_PRESSURE_WRITE=c29t2SayMDAwMDAGMjAwMDAwMAA=
XDG_SEAT=seat0
PKD=/home/sana058
LOGNAME=sana058
XDG_SESSION_TYPE=ttty
SYSTEMD_EXEC_PID=1957
HOME=/home/sana058
LANG=en_US.UTF-8
LS_COLORS=rs=0:di=01;34:ln=01;36:mh=00:pi=00;33:so=01;35:do=01;35:bd=04;33:01:cd=04;33;01:or=04;31;01:mi=00:su=37;41:sg=30;43:ca=00:tw=30;42:ow=34;42:st=37;44:e
x=01;32*:*.tar=01;31*:*.taz=01;31*:*.arc=01;31*:*.arj=01;31*:*.lha=01;31*:*.lzh=01;31*:*.lzm=01;31*:*.tlz=01;31*:*.txz=01;31*:*.t7z=01;31*:*.t7z=01;31*:*.
t1p=01;31*:*.t2=01;31*:*.deb=01;31*:*.rpm=01;31*:*.jar=01;31*:*.war=01;31*:*.ear=01;31*:*.sar=01;31*:*.rar=01;31*:*.cpio=01;31*:*.7z=01;31*:*.
pzm=01;31*:*.cab=01;31*:*.wm=01;31*:*.sum=01;31*:*.dum=01;31*:*.swd=01;31*:*.aif=01;35*:*.jog=01;35*:*.joeg=01;35*:*.mjpg=01;35*:*.mjpeg=01;35*:*.gif=01;35*:*.bmp=01;35*:*.
pbm=01;35*:*.pgm=01;35*:*.ppm=01;35*:*.tga=01;35*:*.xbm=01;35*:*.xpm=01;35*:*.tif=01;35*:*.tiff=01;35*:*.png=01;35*:*.svg=01;35*:*.mng=01;35*:*.pcx=01;35*:*.
mov=01;35*:*.mpg=01;35*:*.mpeg=01;35*:*.m2v=01;35*:*.mkv=01;35*:*.webm=01;35*:*.webp=01;35*:*.ogm=01;35*:*.mp4=01;35*:*.m4v=01;35*:*.mpq=01;35*:*.vob=01;35*:*.qt=01;35*:*.
nuv=01;35*:*.uvv=01;35*:*.ast=01;35*:*.rm=01;35*:*.rmvb=01;35*:*.flc=01;35*:*.avi=01;35*:*.fli=01;35*:*.flv=01;35*:*.gl=01;35*:*.dl=01;35*:*.xcf=01;35*:*.xud=01;35*:*.yuv=
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*:*.mid=00;36*:*.midi=00;36*:*.mka=00;36*:*.mp3=00;36*:*.mpc=00;36*:*.
ogg=00;36*:*.ra=00;36*:*.wav=00;36*:*.oga=00;36*:*.opus=00;36*:*.spx=00;36*:*.xspf=00;36*:*.k*'=00;90*:#=00;90*:*.bak=00;90*:*.crdownload=00;90*:*.dpkg-dist=00;90*:*.dpk
g-new=00;90*:*.dpkg-old=00;90*:*.dpkg-tmp=00;90*:*.old=00;90*:*.orig=00;90*:*.part=00;90*:*.rej=00;90*:*.rpmnew=00;90*:*.rpmorig=00;90*:*.rpmsave=00;90*:*.swp=00;90*:*.tmp
=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@tty6.service/memory/pressure
INVOCATION_ID=107784965f374dfdaad1209d9f258b5ae
LESSCLOSE=/usr/bin/lesspipe %s %s
XDG_SESSION_CLASS=user
TERM=linux
LESSOPEN=| /usr/bin/lesspipe %s
SHELL=/
XDG_VTNR=6
XDG_SESSION_ID=3
XDG_RUNTIME_DIR=/run/user/1000
XDG_DATA_DIRS=/usr/share/gnome:/usr/local/share:/usr/share:/var/lib/napd/desktop
HUSHLOGIN=FALSE
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin
DBUS_SESSION_BUS_ADDRESS=unix:path=/run/user/1000/bus
MAIL=/var/mail/sana058
=/usr/bin/printenv

```

```
sana050@sana1:~$ printenv | grep SHELL
SHELL=/bin/bash
sana050@sana1:~$ printenv | grep HOME
HOME=/home/sana050
sana050@sana1:~$ printenv | grep USER
USER=sana050
```

TASK#02:

```
sana050@sana1:~$ export DB_URL="postgres://db.example.local:5432/mydb"
sana050@sana1:~$ export DB_USER="labuser"
sana050@sana1:~$ export DB_PASSWORD="labpass123"
sana050@sana1:~$ echo "$DB_URL"
postgres://db.example.local:5432/mydb
sana050@sana1:~$ echo "$DB_USER"
labuser
sana050@sana1:~$ echo "$DB_PASSWORD"
labpass123
```

```
sana058@sana1:~$ printenv | grep '^DB'
DB_PASSWORD=labpass123
DB_USER=labuser
DB_URL=postgres://db.example.local:5432/mydb
DBUS_SESSION_BUS_ADDRESS=unix:path=/run/user/1000/bus
```

```
sana058@sana1:~$ echo "DB_URL"
DB_URL
sana058@sana1:~$ printenv | grep '^DB'
DBUS_SESSION_BUS_ADDRESS=unix:path=/run/user/1000/bus
```

TASK#03:

```
# Alias definitions.
# You may want to put all your additions into a separate file like
# ~/.bash_aliases, instead of adding them here directly.
# See /usr/share/doc/bash-doc/examples in the bash-doc package.

if [ -f ~/.bash_aliases ]; then
    . ~/.bash_aliases
fi

# enable programmable completion features (you don't need to enable
# this, if it's already enabled in /etc/bash.bashrc and /etc/profile
# sources /etc/bash.bashrc).
if ! shopt -oq posix; then
    if [ -f /usr/share/bash-completion/bash_completion ]; then
        . /usr/share/bash-completion/bash_completion
    elif [ -f /etc/bash_completion ]; then
        . /etc/bash_completion
    fi
fi
# Lab 7 persistent DB variables
export DB_URL="postgres://db.example.local:5432/mydb"
export DB_USER="labuser"
export DB_PASSWORD="labpass123"
~
-- INSERT --
```

```
sana058@sana1:~$ source ~/.bashrc
echo "$DB_URL"sana058@sana1:~$ echo "$DB_URL"
postgres://db.example.local:5432/mydb
ecsana058@sana1:~$ echo "$DB_USER"
labuser
sana058@sana1:~$ echo "$DB_PASSWORD"
labpass123
sana058@sana1:~$ printenv | grep '^DB_'
DB_PASSWORD=labpass123
DB_USER=labuser
DB_URL=postgres://db.example.local:5432/mydb
```

```
sana1 login: sana058
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 02:33:48 PM UTC 2025

System load:  0.0               Processes:            234
Usage of /:   20.7% of 47.93GB   Users logged in:     1
Memory usage: 10%              IPv4 address for ens3: 192.168.188.128
Swap usage:   0%

Expanded Security Maintenance for Applications is not enabled.

12 updates can be applied immediately.
To see these additional updates run: apt list --upgradable

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

The list of available updates is more than a week old.
To check for new updates run: sudo apt update

sana058@sana1:~$ echo "DB_URL"
DB_URL
sana058@sana1:~$ printenv | grep '^DB'
DB_PASSWORD=labpass123
DB_USER=labuser
DB_URL=postgres://db.example.local:5432/mydb
DBUS_SESSION_BUS_ADDRESS=unix:path=/run/user/1000/bus
sana058@sana1:~$
```

TASK#04:

```
sana058@sana1:~$ sudo cat /etc/environment
[sudo] password for sana058:
PATH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin"
sana058@sana1:~$
```

```
sana058@sana1:~$ echo "$PATH"
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin
```

```
PATH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin"
Class="CC-5B-SANATARIQ-058"
```

```
~
```

```
sana058@sana1:~$ sudo cat /etc/environment
PATH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin"
Class="CC-5B-SANATARIQ-058"
```

```
sana058@sana1:~$ echo "$Class"
CC-5B-SANATARIQ-058
sana058@sana1:~$
sana058@sana1:~$ echo "$PATH"
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin
sana058@sana1:~$
```

```
sana058@sana1:~$ cat > ~/Desktop/welcome <<'EOF'
> #!/bin/bash
>
> echo "Welcome to Cloud Computing $USER"
>
> EOF
sana058@sana1:~$ chmod +x ~/Desktop/welcome
```

```
sana058@sana1:~$ ls -l ~/Desktop/welcome
-rwxrwxr-x 1 sana058 sana058 54 Nov  6 14:48 /home/sana058/Desktop/welcome
```

```
sana058@sana1:~$ cd ~/Desktop
sana058@sana1:~/Desktop$ ./welcome
Welcome to Cloud Computing sana058
sana058@sana1:~/Desktop$
```

```
# Add Desktop to PATH for Lab7 welcome
PATH="$PATH:$HOME/Desktop"
export PATH
EOF
~
~
~
""~/bashrc" 126L, 3999B written
sana058@sana1:~/Desktop$ _
```

```
sana058@sana1:~$ source ~/.bashrc
sana058@sana1:~$ echo "$PATH"
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/home/sana058/Desktop
sana058@sana1:~$
sana058@sana1:~$ which welcome
/home/sana058/Desktop/welcome
```

TASK#05:

```
sana058@sana1:~$ sudo ufw enable
udo ufw sta[sudo] password for sana058:
Sorry, try again.
[sudo] password for sana058:
Firewall is active and enabled on system startup
```

```
sana058@sana1:~$ sudo ufw status verbose
Status: active
Logging: on (low)
Default: deny (incoming), allow (outgoing), deny (routed)
New profiles: skip
```

```
sana058@sana1:~$ sudo ufw deny proto tcp to any port 22
Rule added
Rule added (v6)
sana058@sana1:~$ sudo ufw status numbered
Status: active

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

```
C:\Users\Sana>ssh sana058@192.168.188.128
ssh: connect to host 192.168.188.128 port 22: Connection timed out
```

```
sana058@sana1:~$ sudo ufw allow proto tcp to any port 22
Rule updated
Rule updated (v6)
sana058@sana1:~$ sudo ufw reload
Firewall reloaded
sana058@sana1:~$ sudo ufw status
Status: active
```

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

```
C:\Users\Sana>ssh sana058@192.168.188.128
sana058@192.168.188.128'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 03:12:37 PM UTC 2025

System load:  0.0               Processes:            237
Usage of /:   20.7% of 47.93GB  Users logged in:     1
Memory usage: 10%              IPv4 address for ens33: 192.168.188.128
Swap usage:   0%
```

TASK#06:

```
sana058@sana1:~$ ssh-keygen -t ed25519 -f ~/.ssh/id_ed25519 -C "lab_key"
-l ~/.ssh
Generating public/private ed25519 key pair.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/sana058/.ssh/id_ed25519
Your public key has been saved in /home/sana058/.ssh/id_ed25519.pub
The key fingerprint is:
SHA256:ZCNJ+CtwIghgPtdk/4FVHCbBsW0RtxjD95P4qU36od8 lab_key
The key's randomart image is:
+--[ED25519 256]--+
|o.  +. o**+.    |
|+   =...o*=+    |
|oo . 000+=* + .  |
|o = . .+0000 +   |
|. +   .S. . o    |
| . .          +   |
| .            =.   |
|              o..o |
|.oo E           |
+-----[SHA256]-----+
```

```
sana058@sana1:~$ ls -la ~/.ssh
total 16
drwx----- 2 sana058 sana058 4096 Nov  6 15:15 .
drwxr-x--- 22 sana058 sana058 4096 Nov  6 15:01 ..
-rw----- 1 sana058 sana058    0 Sep 30 14:39 authorized_keys
-rw----- 1 sana058 sana058  444 Nov  6 15:15 id_ed25519
-rw-r--r-- 1 sana058 sana058   89 Nov  6 15:15 id_ed25519.pub
```

```
sana058@sana1:~$ cat ~/.ssh/id_ed25519.pub
ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAIJE3W5Vhe2WTWyn0qQfAe965dZBJt1DExBBm9CC7JSdI lab_key
```

```
sana058@sana1:~$ cat ~/.ssh/authorized_keys || true
sana058@sana1:~$ mkdir -p ~/.ssh
d 70sana058@sana1:~$ chmod 700 ~/.ssh
sana058@sana1:~$ echo "ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAIJE3W5Vhe2WTWyn0qQfAe965dZBJt1DExBBm9CC7JSdI lab_key" >> ~/.ssh/authorized_keys
sana058@sana1:~$ chmod 600 ~/.ssh/authorized_keys
sana058@sana1:~$ cat ~/.ssh/authorized_keys
ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAIJE3W5Vhe2WTWyn0qQfAe965dZBJt1DExBBm9CC7JSdI lab_key
sana058@sana1:~$ ~~~~~
```

```
C:\Users\Sana>ssh sana058@192.168.188.128
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 03:51:00 PM UTC 2025

System load:  0.0          Processes:           237
Usage of /:   20.7% of 47.93GB Users logged in:          1
Memory usage: 10%         IPv4 address for ens33: 192.168.188.128
Swap usage:   0%

Expanded Security Maintenance for Applications is not enabled.

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To check for new updates run: sudo apt update

Last login: Thu Nov  6 15:45:14 2025 from 192.168.188.1
```

EXAM EVALUATION QUESTIONS:

QUESTION#01:

```
sana058@sana1:~$ printenv | grep PATH
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin:/home/sana058/Desktop
sana058@sana1:~$ printenv | grep LANG
LANG=en_US.UTF-8
sana058@sana1:~$ printenv | grep PWD
PWD=/home/sana058
```

QUESTION#02:

```
sana058@sana1:~$ export STUDENT_NAME="Sana Aurakzai"
sana058@sana1:~$ export STUDENT_ROLL_NUMBER="CS1234"
sana058@sana1:~$ export STUDENT_SEMESTER="Fall2025"
sana058@sana1:~$ echo "$STUDENT_NAME"
Sana Aurakzai
ho sana058@sana1:~$ echo "$STUDENT_ROLL_NUMBER"
CS1234
hosana058@sana1:~$ echo "$STUDENT_SEMESTER"
Fall2025
```

```
sana058@sana1:~$ printenv | grep '^STUDENT_'
STUDENT_NAME=Sana Aurakzai
STUDENT_SEMESTER=Fall2025
STUDENT_ROLL_NUMBER=CS1234
```

```
sana058@sana1:~$ echo "$STUDENT_NAME"
Sana Aurakzai
sana058@sana1:~$ printenv | grep '^STUDENT_'
sana058@sana1:~$ _
```

QUESTION#03:

```
sana058@sana1:~$ cat >> ~/.bashrc <<'EOF'
> export STUDENT_NAME="Sana Aurakzai"
>
> export STUDENT_ROLL_NUMBER="CS1234"
>
> export STUDENT_SEMESTER="Fall2025"
>
> EOF
sana058@sana1:~$ tail -n 8 ~/.bashrc
PATH="$PATH:$HOME/Desktop"
export PATH
export STUDENT_NAME="Sana Aurakzai"

export STUDENT_ROLL_NUMBER="CS1234"

export STUDENT_SEMESTER="Fall2025"
```

```
sana058@sana1:~$ echo "$STUDENT_NAME"
Sana Aurakzai
sana058@sana1:~$
sana058@sana1:~$ echo "$STUDENT_ROLL_NUMBER"
hCS1234
osana058@sana1:~$
sana058@sana1:~$ echo "$STUDENT_SEMESTER"
Fall2025
```

```
sana058@sana1:~$ printenv | grep '^STUDENT_'
STUDENT_NAME=Sana Aurakzai
STUDENT_SEMESTER=Fall2025
STUDENT_ROLL_NUMBER=CS1234
```

```

Ubuntu 24.04.3 LTS sana1 tty5

sana1 login: sana058
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 Mon Nov 10 02:35:58 PM UTC 2025

System load:  0.0               Processes:    229
Usage of /:   20.7% of 47.93GB  Users logged in: 1
Memory usage: 10%              IPv4 address for ens33: 192.168.188.128
Swap usage:   0%

Expanded Security Maintenance for Applications is not enabled.

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The list of available updates is more than a week old.
To check for new updates run: sudo apt update

sana058@sana1:~$ echo "$STUDENT_NAME"
Sana Aurakzai
sana058@sana1:~$
sana058@sana1:~$ printenv | grep '^STUDENT_'
STUDENT_NAME=Sana Aurakzai
STUDENT_SEMESTER=Fall2025
STUDENT_ROLL_NUMBER=CS1234
sana058@sana1:~$ _

```

QUESTION#04:

```

sana058@sana1:~$ sudo ufw --force enable
[sudo] password for sana058:
Firewall is active and enabled on system startup
sana058@sana1:~$ sudo ufw status verbose
Status: active
Logging: on (low)
Default: deny (incoming), allow (outgoing), deny (routed)
New profiles: skip

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

```

```

C:\Users\Sana>ping 192.168.188.128

Pinging 192.168.188.128 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.188.128:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

```



```
sana058@sana1:~$ sudo ufw status numbered
Status: active

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

sana058@sana1:~$ ping -c 3 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=128 time=58.7 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=128 time=44.5 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=128 time=45.5 ms

--- 8.8.8.8 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2004ms
rtt min/avg/max/mdev = 44.497/49.557/58.681/6.464 ms
```

```
C:\Users\Sana>ping 192.168.188.128

Pinging 192.168.188.128 with 32 bytes of data:
Reply from 192.168.188.128: bytes=32 time<1ms TTL=64
Reply from 192.168.188.128: bytes=32 time<1ms TTL=64
Reply from 192.168.188.128: bytes=32 time<1ms TTL=64
Reply from 192.168.188.128: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.188.128:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```