LAB CYCLE - 4

EXPERIMENT NO:6 **DATE:**

SHELL SCRIPTING

AIM: Familiarization of shell script.

Shell Scripting is an open-source computer program that can be executed/ run on the Unix/Linux shell. Shell Scripting is a set of instructions to write a set of commands for the shell to execute. A shell script is a set of instructions / commands (program) designed to be run by the Unix/Linux shell. It is a command-line interpreter and typical operations performed by shell scripts include printing text & values, file manipulation, program execution, and printing text, etc. The most common shell used for scripting on Unixlike systems is the Bash shell (Bourne Again SHell).

Bash Syntax

• Bash scripts start with a shebang (#!/bin/bash) at the top to specify the interpreter.

• Commands and statements are written on separate lines or separated by semicolons(;).

• Comments start with a hash symbol (#) and are ignored by the shell.

• Variables are referenced using the $ symbol (e.g., $variable).

Environment variables

In Linux and Unix based systems environment variables are a set of dynamic named values, stored within the system that are used by applications launched in shells or subshells. In simple words, an environment variable is a variable with a name and an associated value. Environment variables allow you to customize how the system works and the behavior of the applications on the system. For example, the environment variable can store information about the default text editor or browser, the path to executable files, or the system locale and keyboard layout settings.

There are several commands available that allow you to list and set environment variables in Linux:

- env – The command allows you to run another program in a custom environment without modifying the current one. When used without an argument it will print a list of the current environment variables.
- printenv – The command prints all or the specified environment variables.
- set – The command sets or unsets shell variables. When used without an argument it will print a list of all variables including environment and shell variables, and shell functions.
- unset – The command deletes shell and environment variables.
- export – The command sets environment variables.

Variables

A shell variable is a character string in a shell that stores some value. It could be an integer, filename, string, or some shell command itself. Basically, it is a pointer to the actual data stored in memory. We have a few rules that have to be followed while writing variables in the script.

• Variables in Bash are assigned using the = sign without any spaces (e.g., variable=value).

• Variable names are case-sensitive and can contain letters, numbers, and underscores.

• To access the value of a variable, prefix it with $ (e.g., $variable).

Control Constructs

You can control the execution of Linux commands in a shell script with control constructs. Control constructs allow you to repeat commands and to select certain commands over others. If the test is successful, then the commands are executed. In this way, you can use control constructs to make decisions as to whether commands should be executed. There are two different kinds of control constructs**: loops** and **conditions**.

if

This block will process if specified condition is true.

Syntax:

```
        if [ expression ]
        then
                statement
```

for

The for loop operate on lists of items. It repeats a set of commands for every item in a list.

Syntax:

```
for <var> in <value1 value2 ... valuen>
do
   <command 1>
   <command 2>
   <etc>
done
```

while statement

Here command is evaluated and based on the result loop will executed, if command raise to false then loop will be terminated.

```
while <condition>
do
   <command 1>
   <command 2>
   <etc>
done
```

Aliases and functions

Aliases: User-defined shortcuts for commands or command sequences .Provide custom names or abbreviations for existing commands .Save time by reducing the need for typing long or complex commands .Particularly useful for frequently used or complicated commands. Enhance productivity and efficiency in executing commands.

Functions: Reusable blocks of code that perform specific tasks .Help organize and structure code logic .Accept input parameters (arguments) and can return results or perform actions .Promote code reuse and maintainability .Improve readability by encapsulating code into modular units .Widely used in programming languages to create flexible and reusable code.

Accessing command line arguments

Accessing command-line arguments allows programs to receive input directly from the command line when they are executed. Here's a short note on accessing command-line arguments:

- Command-line arguments are values or parameters provided to a program when it is run from the command line or terminal.
- They allow users to pass specific information to a program without modifying the source code.
- Command-line arguments are typically separated by spaces and follow the program name in the command line.
- In many programming languages, command-line arguments are accessible through the "argv" (argument vector) parameter of the main function or entry point of the program.
- The "argv" parameter is an array or list that holds the command-line arguments, with the first element usually being the program name itself.
- Programmers can access individual command-line arguments by indexing into the "argv" array or using language-specific methods.

Result: Familiarized with shell scripting.

Startup scripts

A startup script is a set of instructions or commands that are executed automatically when a system or application starts up. It is a script or program designed to perform specific tasks during the initialization phase. Startup scripts can be used to set up system-wide settings, launch background processes, initialize services or modules, or perform any necessary tasks to prepare the environment for operation. They are commonly used in operating systems, web servers, database servers, and other software applications. Startup scripts are often executed in a specific order or sequence, ensuring that dependencies and prerequisites are met before proceeding.

Login and logout scripts

Login Scripts: Login scripts are executed when a user successfully logs into a system, typically after entering their username and password. They can be used to configure user-specific settings, perform authentication checks, set environment variables, or launch applications or services. They help customize the user experience and provide a consistent environment for each user. They can automate tasks such as mounting network drives, configuring network settings, or displaying personalized messages

Logout Scripts: Logout scripts are executed when a user logs out of a system or terminates their session. They are useful for performing cleanup tasks, saving user-specific data, or logging session statistics. Logout scripts can terminate background processes or services associated with the user's session. They allow administrators to enforce policies or execute actions when a user ends their session, ensuring security and system stability. Logout scripts can be used to perform tasks like clearing temporary files, closing network connections, or updating user activity logs.

Systemd

systemd refers to the systemd service management and initialization system available on Linux-based operating systems. Although shell scripts are typically separate from systemd, they can interact with systemd in a few ways:

- Service Management: Shell scripts can be used to create systemd service unit files or modify existing ones. These unit files define the behavior and configuration of a service
- Service Control: Shell scripts can use the systemctl command, which is part of systemd, to start, stop, restart, enable, disable, or query the status of services. By invoking systemctl with appropriate arguments, shell scripts can control the lifecycle of systemd-managed services.

System 5 init

System V (SysV) Init is a traditional and widely used init system in Unix-like operating systems. It is named after the original System V release of Unix. SysV Init follows a sequential and script-based initialization process during system startup and shutdown. Here are some key characteristics of SysV Init:

- Initialization Scripts: SysV Init relies on shell scripts located in the /etc/init.d/ directory. These scripts are responsible for starting, stopping, restarting, and managing system services and resources. Each script corresponds to a specific service or task.
- Run levels: SysV Init defines different run levels, which represent specific system states or modes. Common run levels include 0 (halt), 1 (single-user mode), 2-5 (multi-user mode with different configurations), and 6 (reboot). Each run level has associated scripts that are executed during system startup or shutdown.
- Run level Configuration: Run level configuration files determine which scripts are executed in each run level. These files, typically located in the /etc/rc.d/ or /etc/rc.d/rc*.d/ directories, consist of symbolic links to the corresponding init scripts. The naming convention of the symbolic links indicates the order in which the scripts are executed.

Limitations od system5 init

- slower startup times due to sequential execution.
- Lack of parallelization.
- Complex run level configuration management.

Result: Familiarized with shell scripting.

DATE:

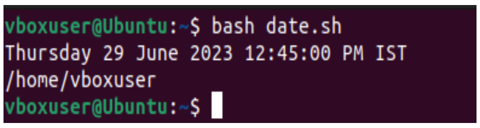
AIM: SHELL SCRIPT PROGRAM QUESTIONS

1. Write a script to show current date, time and current directory

SOURCE CODE

```
#!/bin/bash
date
var=$(date)
var=`date`
echo $pwd
```

OUTPUT



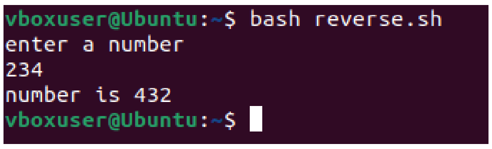
```
vboxuser@Ubuntu:~$ bash date.sh
Thursday 29 June 2023 12:45:00 PM IST
/home/vboxuser
vboxuser@Ubuntu:~$
```

2. Write a script to reverse of a number

SOURCE CODE

```
#!/bin/bash
echo enter n
read n
num=0
while [ $n -gt 0 ] do
num=$(expr $num \* 10)
k=$(expr $n % 10)
num=$(expr $num + $k)
n=$(expr $n / 10)
done
echo number is $num
```

OUTPUT



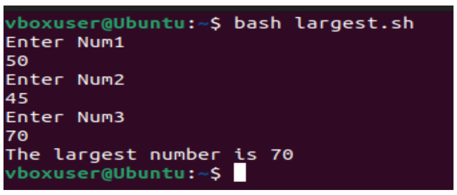
```
vboxuser@Ubuntu:~$ bash reverse.sh
enter a number
234
number is 432
vboxuser@Ubuntu:~$
```

3. Write a script to largest among three numbers

SOURCE CODE

```
#!/bin/bash
echo "Enter Num1"
read num1
echo "Enter Num2"
read num2
echo "Enter Num3"
read num3
if [ $num1 -gt $num2 ] && [ $num1 -gt $num3 ]
then
   echo "The largest number is" $num1
elif [ $num2 -gt $num1 ] && [ $num2 -gt $num3 ]
then
   echo "The largest number is" $num2
else
   echo "The largest number is" $num3
fi
```

OUTPUT



```
vboxuser@Ubuntu:~$ bash largest.sh
Enter Num1
50
Enter Num2
45
Enter Num3
70
The largest number is 70
vboxuser@Ubuntu:~$
```

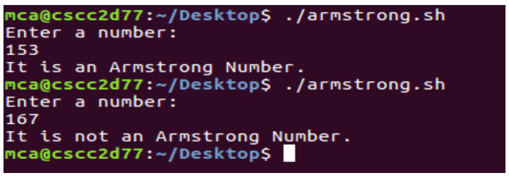
4. Write a script check whether the number is Armstrong or not.

SOURCE CODE

```
#!/bin/bash
echo "Enter a number: "
read c
x=$c
```

```
sum=0
r=0
n=0
while [ $x -gt 0 ]
do
r=`expr $x % 10`
n=`expr $r \* $r \* $r`
sum=`expr $sum + $n`
x=`expr $x / 10`
done
if [ $sum -eq $c ]  then
        echo "It is an Armstrong Number."
else
        echo "It is not an Armstrong Number."
fi
```

OUTPUT



```
mca@cscc2d77:~/Desktop$ ./armstrong.sh
Enter a number:
153
It is an Armstrong Number.
mca@cscc2d77:~/Desktop$ ./armstrong.sh
Enter a number:
167
It is not an Armstrong Number.
mca@cscc2d77:~/Desktop$
```

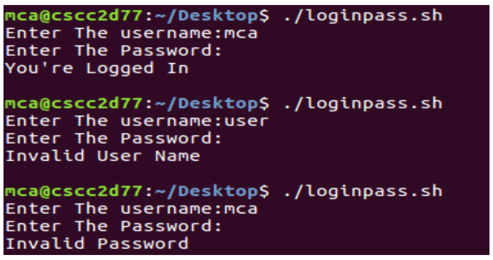
5. Write a script to check password and login

SOURCE CODE

```
#!/bin/bash
read -p "Enter The username:" username
read -sp "Enter The Password:" password
if [[ $username == "mca"  && $password == "mca" ]]  then
echo -e "\nYou're Logged In\n"
elif [ $username != "mca" ]  then
  echo -e "\nInvalid User Name\n"
```

```
else
  echo -e "\nInvalid Password\n"
fi
```

OUTPUT



```
mca@cscc2d77:~/Desktop$ ./loginpass.sh
Enter The username:mca
Enter The Password:
You're Logged In

mca@cscc2d77:~/Desktop$ ./loginpass.sh
Enter The username:user
Enter The Password:
Invalid User Name

mca@cscc2d77:~/Desktop$ ./loginpass.sh
Enter The username:mca
Enter The Password:
Invalid Password
```

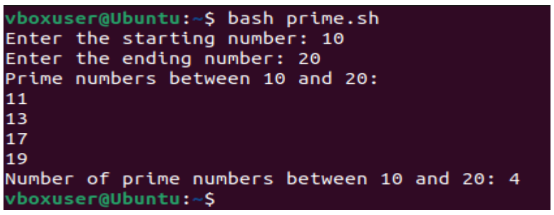
6. Write a script to count the prime numbers in specific range

SOURCE CODE

```
#!/bin/bash
is_prime() {
    if [ $1 -lt 2 ]; then
        return 1
    fi
    for ((i = 2; i <= $1 / 2; i++)); do
        if [ $(( $1 % i )) -eq 0 ]; then
            return 1
        fi
    done
    return 0
}
read -p "Enter the starting number: " start
read -p "Enter the ending number: " end
count=0
echo "Prime numbers between $start and $end:"
for ((num = start; num <= end; num++)); do
    if is_prime $num; then
```

```
        ((count++))
        echo $num
    fi
done
echo "Number of prime numbers between $start and $end: $count"
```

OUTPUT



```
vboxuser@Ubuntu:~$ bash prime.sh
Enter the starting number: 10
Enter the ending number: 20
Prime numbers between 10 and 20:
11
13
17
19
Number of prime numbers between 10 and 20: 4
vboxuser@Ubuntu:~$
```

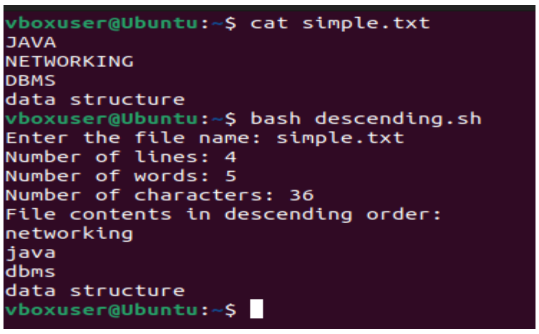
7. Write a script to convert the contents of a given file from uppercase to lowercase and also count the number of lines, words and characters of the resultant file. Also display the resultant file in descending order.

SOURCE CODE

```
#!/bin/bash
read -p "Enter the file name: " file_name
if [ -f "$file_name" ];
then
    lowercase_file="${file_name%.*}_lowercase.txt"
    tr '[:upper:]' '[:lower:]' < "$file_name" > "$lowercase_file"
    lines=$(wc -l < "$lowercase_file")
    words=$(wc -w < "$lowercase_file")
    characters=$(wc -m < "$lowercase_file")
    echo "Number of lines: $lines"
    echo "Number of words: $words"
    echo "Number of characters: $characters"
    echo "File contents in descending order:"
    sort -r "$lowercase_file"
```

```
else
    echo "File not found."
fi
```

OUTPUT



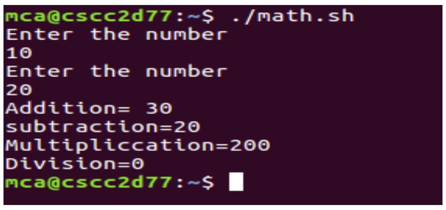
```
vboxuser@Ubuntu:~$ cat simple.txt
JAVA
NETWORKING
DBMS
data structure
vboxuser@Ubuntu:~$ bash descending.sh
Enter the file name: simple.txt
Number of lines: 4
Number of words: 5
Number of characters: 36
File contents in descending order:
networking
java
dbms
data structure
vboxuser@Ubuntu:~$ 
```

8. Write a script to perform following basic math operation as: Addition, subtraction, multiplication, division

SOURCE CODE

```
#!/bin/bash
echo Enter the number
 read a
 echo Enter the number
 read b
 c=`expr $a + $b`
 echo Addition= $c
 d=`expr $a - $b`
 echo subtraction=$b
 e=`expr $a \* $b`
 echo Multipliccation=$e
```

OUTPUT



```
mca@cscc2d77:~$ ./math.sh
Enter the number
10
Enter the number
20
Addition= 30
subtraction=20
Multipliccation=200
Division=0
mca@cscc2d77:~$ 
```

9. Read 3 marks of a student and find the average. Display the grade of the student based on the average. (if..then..elif..fi)

S >= 90% A < 90%, but >= 80%

B < 80%, but >= 60%

P < 80%, but >= 40%

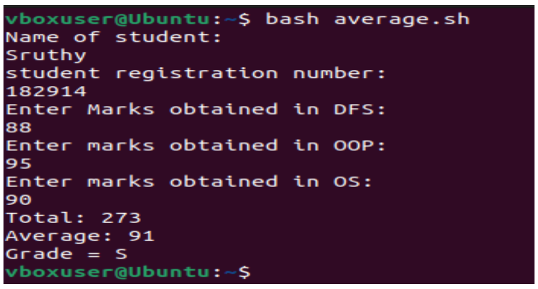
F < 40%

SOURCE CODE

```
#!/bin/bash
echo "Name of student:"
read name
echo "student registration number:"
read student registration number
echo "Enter Marks obtained in DFS: "
read m1
echo "Enter marks obtained in OOP: "
read m2
echo "Enter marks obtained in OS: "
read m3
total=`expr $m1 + $m2 + $m3`
avg=`expr $total / 3`
echo "Total: $total"
echo "Average: $avg"
if [ $avg -ge 90 ]  then
echo "Grade = S"
elif [ $avg -le 90 ] && [ $avg -ge 50 ]  then
echo "Grade = A"
elif  [ $avg -le 80 ] && [ $avg -ge 60 ]  then
echo "Grade = B"
elif [ $avg -le 80 ] && [ $avg -ge 40 ]  then
```

```
echo "Grade = P"
else
echo "Grade = F"
fi
```

OUTPUT



```
vboxuser@Ubuntu:~$ bash average.sh
Name of student:
Sruthy
student registration number:
182914
Enter Marks obtained in DFS:
88
Enter marks obtained in OOP:
95
Enter marks obtained in OS:
90
Total: 273
Average: 91
Grade = S
vboxuser@Ubuntu:~$
```

10. Read the name of an Indian state and display the main language according to the table. For other states, the output may be "Unknown". Use "|" to separate states with same language (case..esac)

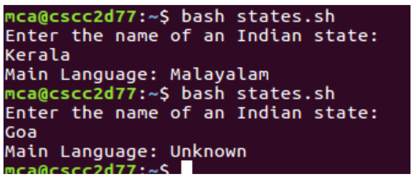
State	**Main language**
Andhra Pradesh	Telugu
Assam	Assamese
Bihar	Hindi
Himachal Pradesh	Hindi
Karnataka	Kannada
Kerala	Malayalam
Lakshadweep	Malayalam
Tamil Nadu	Tamil

SOURCE CODE

```
#!/bin/bash
echo "Enter the name of an Indian state:"
read -r state
state=$(echo "$state" | tr '[:upper:]' '[:lower:]')
case $state in
  "andhra pradesh")
```

```
    echo "Main Language: Telugu"       ;;
  "assam")
    echo "Main Language: Assamese"    ;;
  "bihar")
    echo "Main Language: Hindi"          ;;
  "himachal pradesh")
    echo "Main Language: Hindi"           ;;
  "karnataka")
    echo "Main Language: Kannada"       ;;
  "kerala" | "lakshadweep")
    echo "Main Language: Malayalam"    ;;
  "tamil nadu")
    echo "Main Language: Tamil"            ;;
  *)
    echo "Main Language: Unknown"      ;;
esac
```

OUTPUT



```
mca@cscc2d77:~$ bash states.sh
Enter the name of an Indian state:
Kerala
Main Language: Malayalam
mca@cscc2d77:~$ bash states.sh
Enter the name of an Indian state:
Goa
Main Language: Unknown
mca@cscc2d77:~$
```

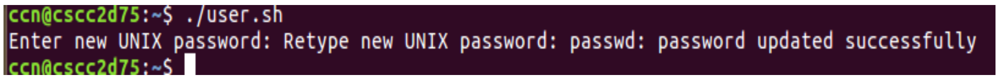
11. Change the home folder of all users whose name start with stud from /home/username to /usr/username. Also change the password of username to username123 (e.g., /home/stud25 changes to /usr/stud25 and his/her password changes to stud25123) - (Use for .. in)

SOURCE CODE

```
#!/bin/bash
for username in /home/stud*; do
   username=$(basename "$username")
   new_home="/usr/$username"
```

```
    sudo usermod -m -d "$new_home" "$username"

    new_password="${username}123"

    echo -e "$new_password\n$new_password" | sudo passwd "$username"

done
```

OUTPUT



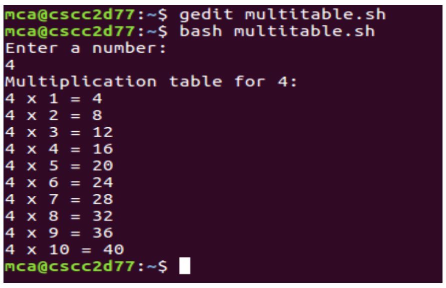
```
ccn@cscc2d75:~$ ./user.sh
Enter new UNIX password: Retype new UNIX password: passwd: password updated successfully
ccn@cscc2d75:~$
```

12. Read a number and display the multiplication table of the number up to 10 lines. -(Use for((..)))

SOURCE CODE

```
#!/bin/bash

echo "Enter a number:"

read number

echo "Multiplication table for $number:"

for ((i = 1; i <= 10; i++)); do

    result=$((number * i))

    echo "$number x $i = $result"

done
```

OUTPUT



```
mca@cscc2d77:~$ gedit multitable.sh
mca@cscc2d77:~$ bash multitable.sh
Enter a number:
4
Multiplication table for 4:
4 x 1 = 4
4 x 2 = 8
4 x 3 = 12
4 x 4 = 16
4 x 5 = 20
4 x 6 = 24
4 x 7 = 28
4 x 8 = 32
4 x 9 = 36
4 x 10 = 40
mca@cscc2d77:~$
```

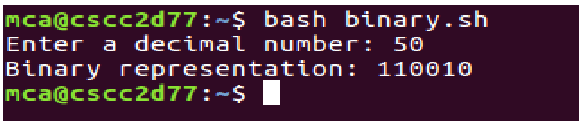
13. Read a Decimal number. Convert it to Binary and display the result. -(Use while).

SOURCE CODE

```
#!/bin/bash

echo "Enter a decimal number: "

read number

binary_number=""
```

```
while [ "$number" -gt 0 ];  do
    binary_number="$binary_number$((number % 2))"
    number=$((number / 2))
done
echo "Binary representation: $binary_number"
```

OUTPUT



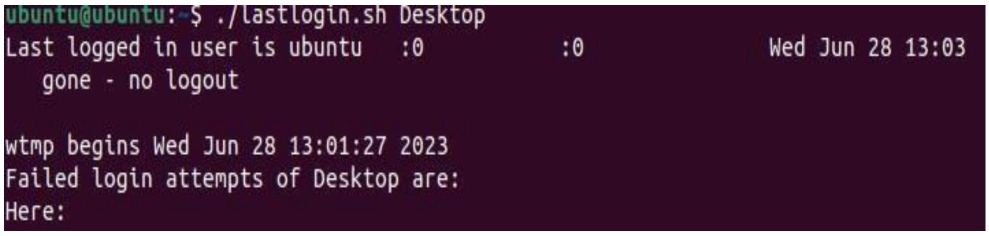
```
mca@cscc2d77:~$ bash binary.sh
Enter a decimal number: 50
Binary representation: 110010
mca@cscc2d77:~$
```

14. Look at the system log files. Write a shell script to extract the last login details of aparticular user and list out all failed logins.Store the results to a file. The user nameshould be given as a command line argument.

SOURCE CODE

```
#! /bin/bash
 if [ $# -eq 0 ]
then
    echo "Please try again with a valid argument";
   exit
fi
   lastLogin=$(last -n 1);
   echo "Last logged in user is $lastLogin"
   loginAttempts=$(sudo cat /var/log/auth.log | grep $1 | grep failed)
  echo "Failed login attempts of $1 are:"
  echo "Here: $loginAttempts"
```

OUTPUT



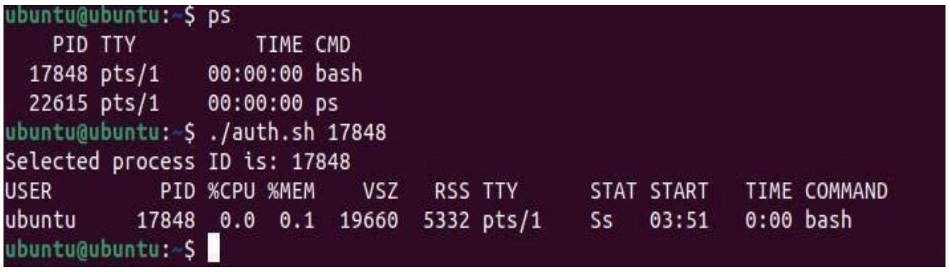
```
ubuntu@ubuntu:~$ ./lastlogin.sh Desktop
Last logged in user is ubuntu   :0          :0              Wed Jun 28 13:03
   gone - no logout

wtmp begins Wed Jun 28 13:01:27 2023
Failed login attempts of Desktop are:
Here:
```

15.Write a shell script to display the details of a particular process currently running. Assumethat you have necessary permissions. The process name/id is to be given as a command line argument.

<u>SOURCE CODE</u>

```
#! /bin/bash
if [ $# -eq 0 ]
then
    echo "Please try again with a valid argument";
    exit
fi
echo "Selected process ID is: $1"
ps -q $1 -axu
```

<u>OUTPUT</u>



```
ubuntu@ubuntu:~$ ps
    PID TTY          TIME CMD
  17848 pts/1    00:00:00 bash
  22615 pts/1    00:00:00 ps
ubuntu@ubuntu:~$ ./auth.sh 17848
Selected process ID is: 17848
USER         PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
ubuntu     17848  0.0  0.1  19660  5332 pts/1    Ss   03:51   0:00 bash
ubuntu@ubuntu:~$ 
```

RESULT: The scripts has run successfully and output has obtained.