CERTIFICATE

*This is to certify that Mr./Ms. ……. **Hemil…Chovatiya............*** *with enrolment no.* ***..........200303108003.................*** *has successfully completed* ***his****/her laboratory experiments in the* ***…..Operating System Laboratory (203105203)……*** *from the department of* ***........Information Technology(4ITA1)…............*** *during the academic year* ***........2021-2022.........***

Date of Submission: ....

Staff In charge: ....

Head of Department: ....

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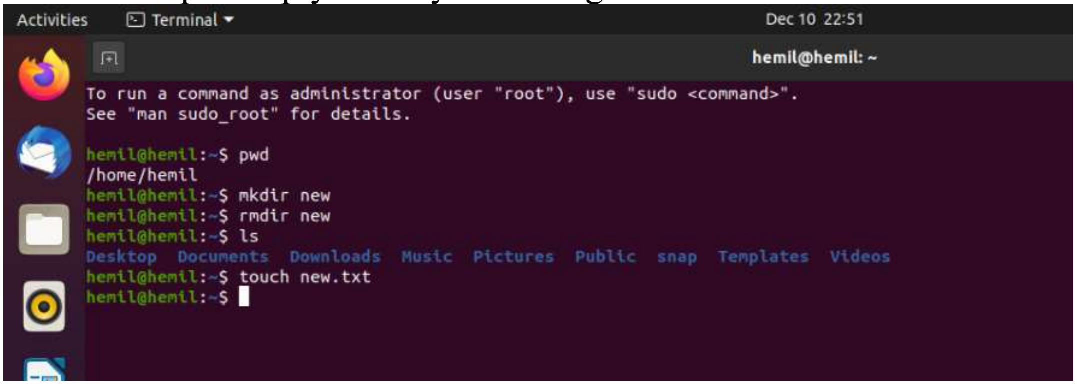
PRACTICAL 1

AIM: Study basics command of Linux.

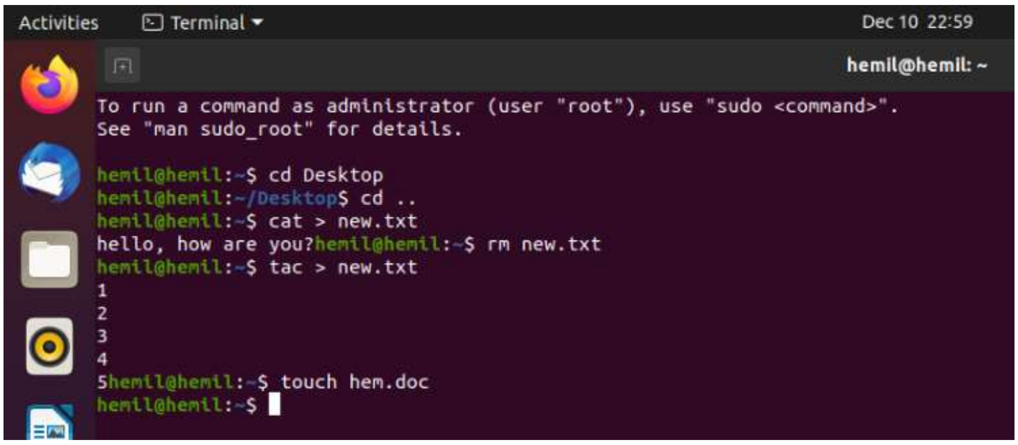
Linux Basic Commands:

1. pwd Command: The pwd command is used to display the location of the current working directory.
2. mkdir Command: The mkdir command is used to create a new directory under any directory.
3. rmdir Command: The rmdir command is used to delete a directory.
4. ls Command: The ls command is used to display a list of content of a directory.
5. touch Command: The touch command is used to create empty files. We can create multiple empty files by executing it once.



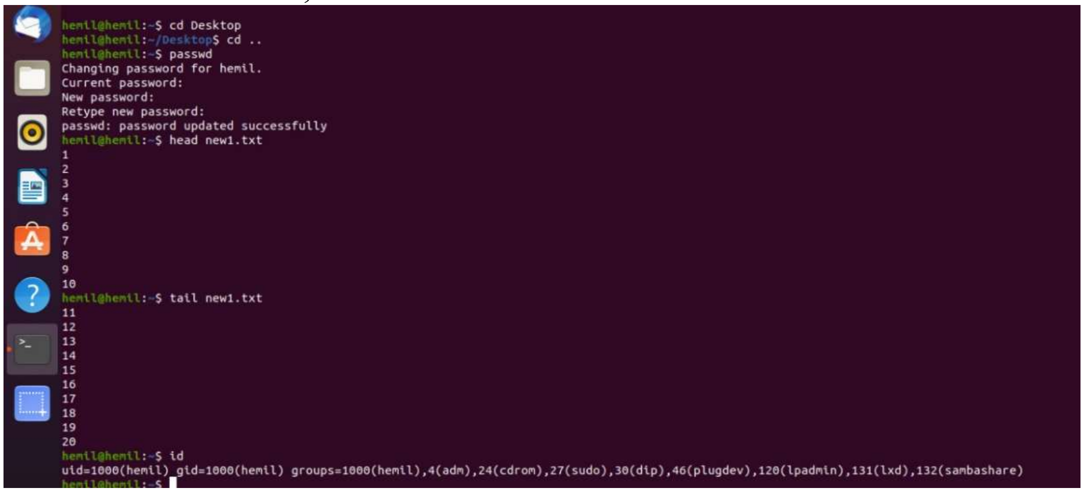
```
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

hemil@hemil:~$ pwd
/home/hemil
hemil@hemil:~$ mkdir new
hemil@hemil:~$ rmdir new
hemil@hemil:~$ ls
Desktop  Documents  Downloads  Music  Pictures  Public  snap  Templates  Videos
hemil@hemil:~$ touch new.txt
hemil@hemil:~$
```

6. cd Command: The cd command is used to change the current directory.
7. cat Command: The cat command is a multi-purpose utility in the Linux system. It can be used to create a file, display content of the file, copy the content of one file to another file, and more.
8. rm Command: The rm command is used to remove a file.
9. tac Command: The tac command is the reverse of cat command, as its name specified. It displays the file content in reverse order (from the last line).
10. cd .. command: This command is used to go Back to previous main folder.



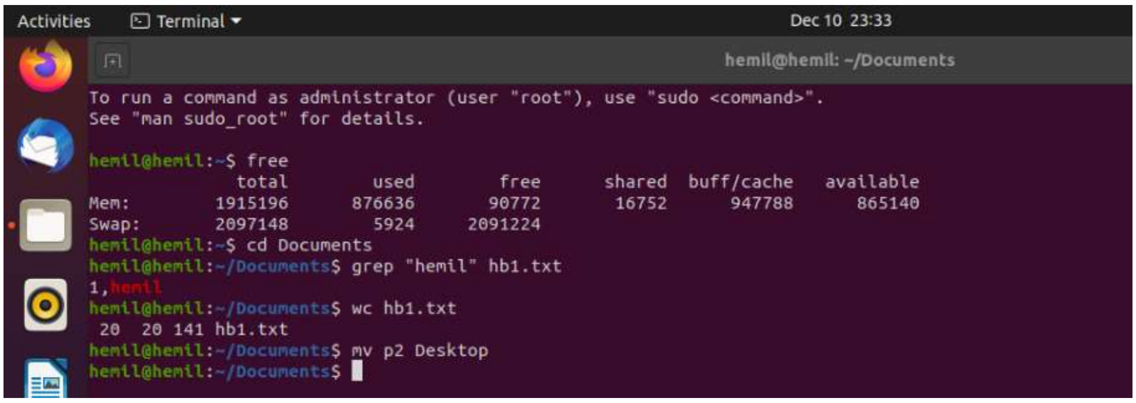
```
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

hemil@hemil:~$ cd Desktop
hemil@hemil:~/Desktop$ cd ..
hemil@hemil:~$ cat > new.txt
hello, how are you?hemil@hemil:~$ rm new.txt
hemil@hemil:~$ tac > new.txt
1
2
3
4
5hemil@hemil:~$ touch hem.doc
hemil@hemil:~$
```

11. head Command: The head command is used to display the content of a file. It displays the first 10 lines of a file.
12. tail Command: The tail command is similar to the head command. The difference between both commands is that it displays the last ten lines of the file content. It is useful for reading the error message.
13. passwd Command: The passwd command is used to create and change the password for a user.
14. id Command: The id command is used to display the user ID (UID) and group ID (GID).
15. su Command: The su command provides administrative access to another user. In other words, it allows access of the Linux shell to another user.



```
hemil@hemil:~$ cd Desktop
hemil@hemil:~/Desktop$ cd ..
hemil@hemil:~$ passwd
Changing password for hemil.
Current password:
New password:
Retype new password:
passwd: password updated successfully
hemil@hemil:~$ head new1.txt
1
2
3
4
5
6
7
8
9
10
hemil@hemil:~$ tail new1.txt
11
12
13
14
15
16
17
18
19
20
hemil@hemil:~$ id
uid=1000(hemil) gid=1000(hemil) groups=1000(hemil),4(adm),24(cdrom),27(sudo),30(dip),46(plugdev),120(lpadmin),131(lxd),132(sambashare)
hemil@hemil:~$
```

16. Free command: It gives information about used and unused memory usage and swap memory of a system
17. grep command: to perform text searches for a defined criteria of words or strings
18.wc command: It is used to find out number of lines, word count, byte and characters count in the files specified in the file arguments.
19.mv command: mv is used to move one or more files or directories from one place to another in a file system.
20. PING command:it is used to check the network connectivity between host and server/host



```
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

hemil@hemil:~$ free
              total        used        free      shared  buff/cache   available
Mem:        1915196      876636       90772       16752      947788      865140
Swap:       2097148        5924     2091224
hemil@hemil:~$ cd Documents
hemil@hemil:~/Documents$ grep "hemil" hb1.txt
1,hemil
hemil@hemil:~/Documents$ wc hb1.txt
 20  20 141 hb1.txt
hemil@hemil:~/Documents$ mv p2 Desktop
hemil@hemil:~/Documents$
```

PRACTICAL 2

AIM: Study the basics of shell programming.

THEORY:

1. What is the shell script?

A Shell provides you with an interface to the Unix system. It gathers input from you and executes programs based on that input. When a program finish executing, it displays that program's output.

Shell is an environment in which we can run our commands, programs, and shell scripts. There are different flavours of a shell, just as there are different flavours of operating systems. Each flavour of shell has its own set of recognized commands and functions.

2. Type of shell script.

In Unix, there are two major types of shells −
• Bourne shell − If you are using a Bourne-type shell, the $ character is the default prompt.
• C shell − If you are using a C-type shell, the % character is the default prompt.
The Bourne Shell has the following subcategories −
• Bourne shell (sh)
• Korn shell (ksh)
• Bourne Again shell (bash)
• POSIX shell (sh)
The different C-type shells follow –
• C shell (csh)
• TENEX/TOPS C shell (tcsh)

3. Creating shell files.

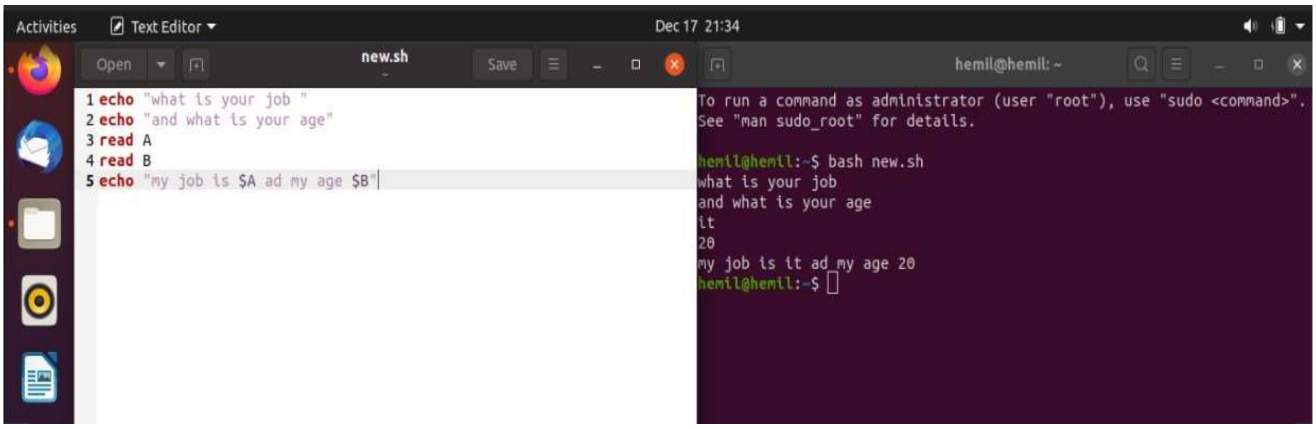
1. Start the script with **#! /bin/sh**
2. Write some code.
3. Save the script file as **filename.sh**
4. For executing the script type bash filename.sh

Command: #/bin/sh

4. touch command: It is used to create a file without any content. The file created using touch command is empty. This command can be used when the user doesn't have data to store at the time of file creation.
Syntax: touch_ filename.txt

5. cat command: It is used to create the file with content.
Syntax: cat > filename.txt

6. Text editor: Bash will execute as a different process. This way, changes that occur while the file is being executed cannot affect your shell.
Ex: bash _ filename.sh



```
echo "what is your job "
echo "and what is your age"
read A
read B
echo "my job is $A ad my age $B"
```

```
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

hemil@hemil:~$ bash new.sh
what is your job
and what is your age
it
20
my job is it ad my age 20
hemil@hemil:~$
```

PRACTICAL 3

AIM: Write a Shell script to print given numbers sum of all digits

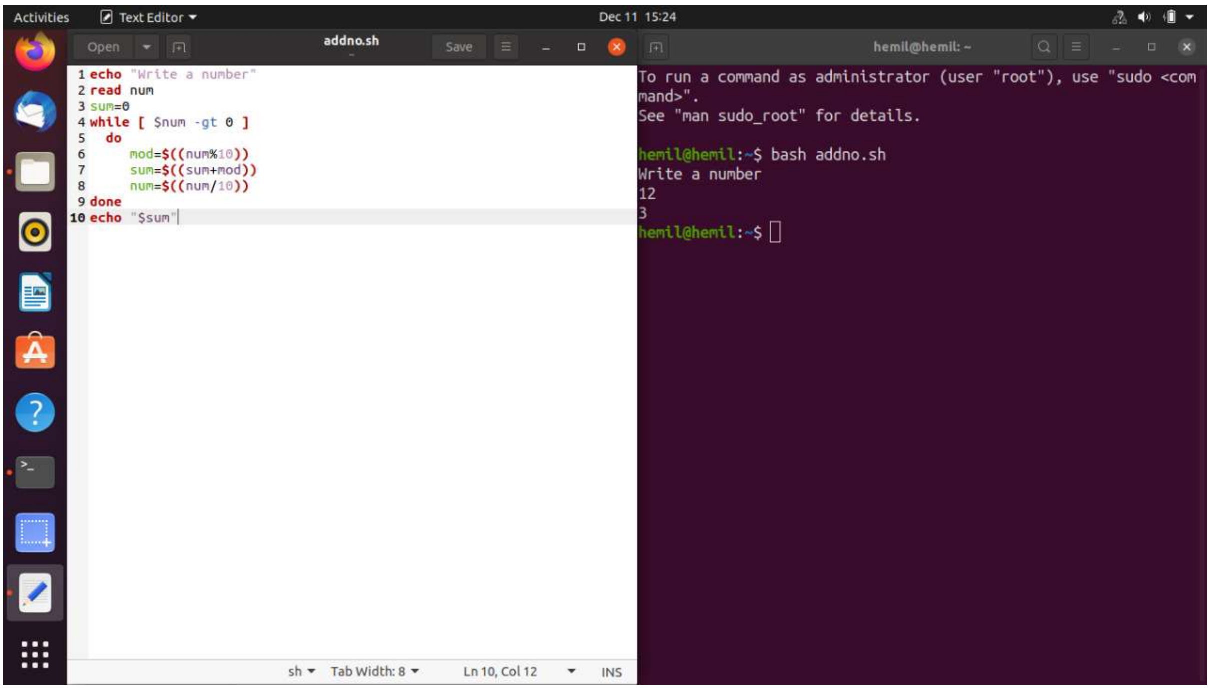
Algorithm:

General Algorithm for sum of digits in a given number:

1. Get the number as input
2. Declare a variable to store the sum and set it to 0
3. Repeat the next two steps till the number is not 0
4. Get the rightmost digit of the number with help of the remainder '%' operator by dividing it by 10 and add it to sum.
5. Divide the number by 10 with help of '/' operator to remove the rightmost digit.
6. Print or return the sum

Code :

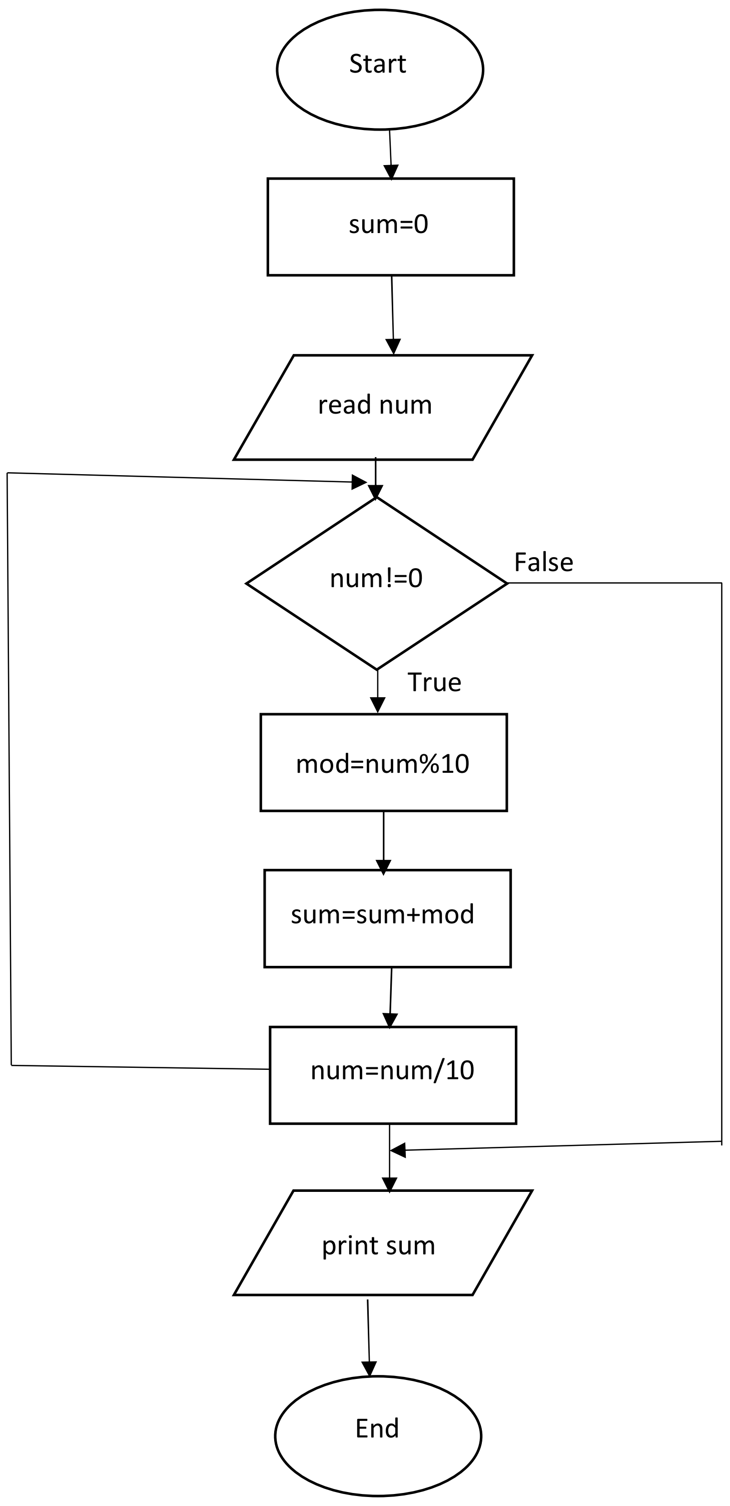
Output:



```
echo "Write a number"
read num
sum=0
while [ $num -gt 0 ]
  do
     mod=$((num%10))
     sum=$((sum+mod))
     num=$((num/10))
done
echo "$sum"
```

```
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

hemil@hemil:~$ bash addno.sh
Write a number
12
3
hemil@hemil:~$
```

Flowchart:


Start
sum=0
read num
num!=0
False
True
mod=num%10
sum=sum+mod
num=num/10
print sum
End

PRACTICAL 4

AIM: Write a shell script to validate the entered date. (e.g., Date format is: dd-mm-yyyy)

Algorithm:

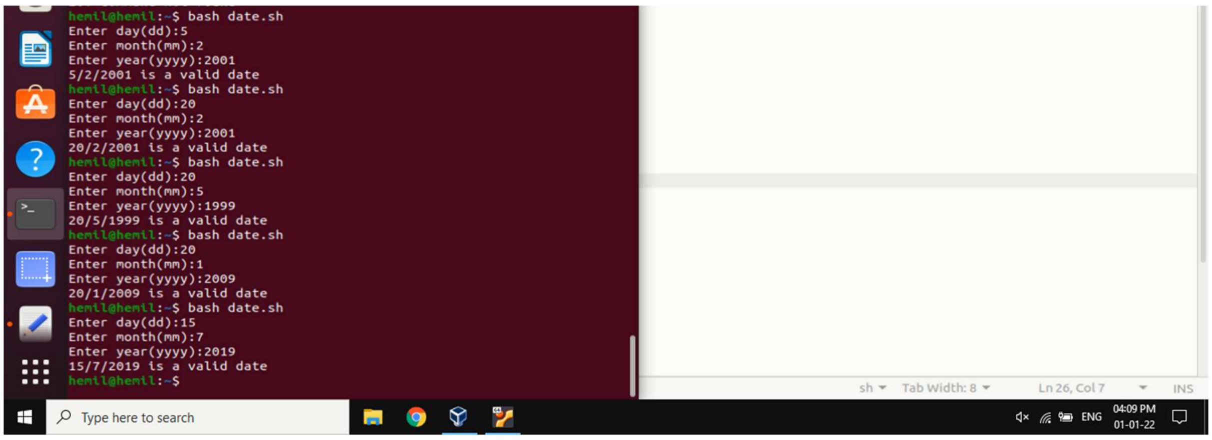
- Enter date in DD/MM/YYYY Format.
- Check year validation, if year is not valid print error.
- If year is valid, check month validation (i.e., month is between 1 to 12), if month is not valid print error.
- If month is valid, then finally check day validation with leap year condition, here we will day range from 1 to 30, 1 to 31, 1 to 28 and 1 to 29.
- If day is valid print date is correct otherwise print error.

Code:

```
dd=0
mm=0
yy=0
days=0
echo -n "Enter day(dd):"
read dd
echo -n "Enter month(mm):"
read mm
echo -n "Enter year(yyyy):"
read yy
if [ $mm -le 0 -o $mm -gt 12 ];
then
echo "$mm is invalid month."
exit 1
fi
case $mm in
1) days=31;;
2) days=28;;
3) days=31;;
4) days=30;;
5) days=31;;
6) days=30;;
7) days=31;;
8) days=31;;
```

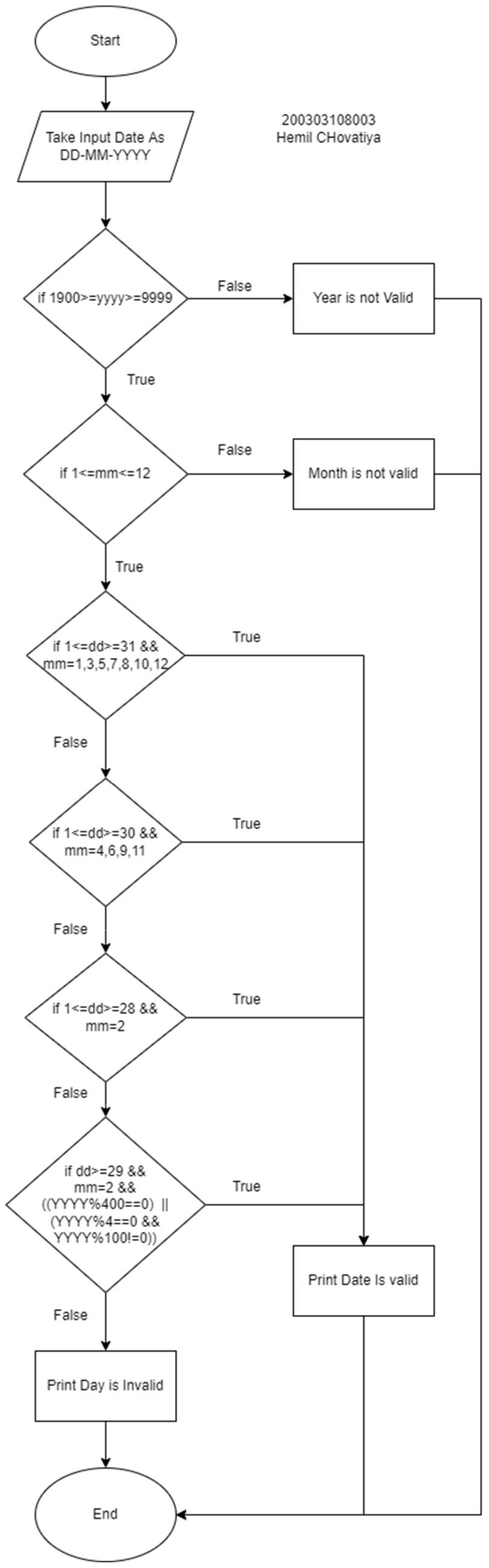
```
9) days=30;;
10) days=31;;
11) days=30;;
12) days=31;;
*) days=-1;;
esac
if [ $mm -eq 2 ];
then
if [ $((yy % 4)) -ne 0 ] ; then
:
elif [ $(yy % 400) -eq 0 ] ; then
days=29

elif [ $((yy % 100)) -eq 0 ] ; then
:
else
days=29
fi
fi
if [ $dd -le 0 -o $dd -gt $days ];
then
echo "$dd day is invalid"
exit 3
fi
echo "$dd/$mm/$yy is a valid date"
```

Output:



```
hemil@hemil:~$ bash date.sh
Enter day(dd):5
Enter month(mm):2
Enter year(yyyy):2001
5/2/2001 is a valid date
hemil@hemil:~$ bash date.sh
Enter day(dd):20
Enter month(mm):2
Enter year(yyyy):2001
20/2/2001 is a valid date
hemil@hemil:~$ bash date.sh
Enter day(dd):20
Enter month(mm):5
Enter year(yyyy):1999
20/5/1999 is a valid date
hemil@hemil:~$ bash date.sh
Enter day(dd):20
Enter month(mm):1
Enter year(yyyy):2009
20/1/2009 is a valid date
hemil@hemil:~$ bash date.sh
Enter day(dd):15
Enter month(mm):7
Enter year(yyyy):2019
15/7/2019 is a valid date
hemil@hemil:~$
```

Flowchart:


Start
Take Input Date As DD-MM-YYYY
200303108003
Hemil CHovatiya
if 1900>=yyyy>=9999
False
Year is not Valid
True
if 1<=mm<=12
False
Month is not valid
True
if 1<=dd>=31 && mm=1,3,5,7,8,10,12
True
False
if 1<=dd>=30 && mm=4,6,9,11
True
False
if 1<=dd>=28 && mm=2
True
False
if dd>=29 && mm=2 && ((YYYY%400==0) || (YYYY%4==0 && YYYY%100!=0))
True
Print Date Is valid
False
Print Day is Invalid
End

PRACTICAL 5

AIM: Write a shell script to check entered string is palindrome or not

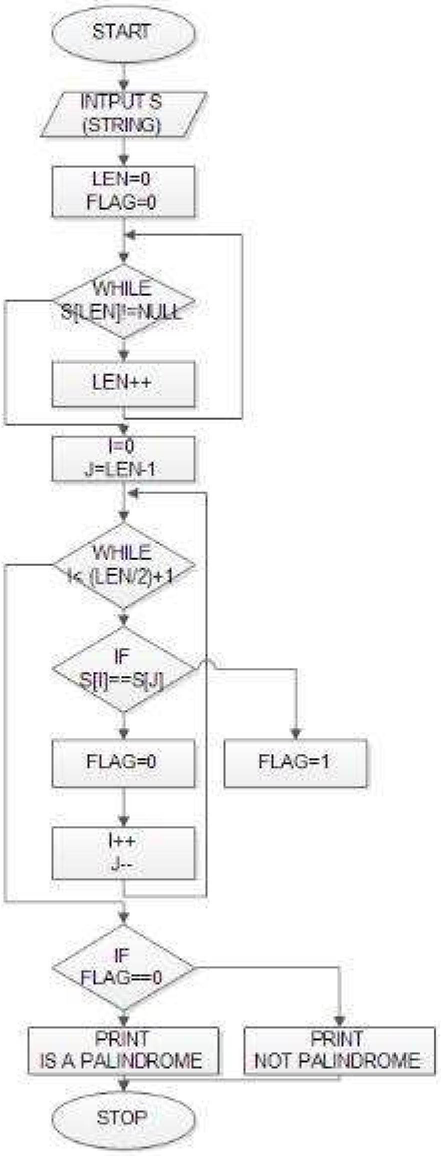
Algorithm:

```
▪ Input a String
▪ Initialize Len to zero , Flag to zero
▪ While String[Len] is not equal to NULL
▪   Increment Len
▪ Initialize I to zero , J to Len-1
▪ If va1 equal to rev
▪       Print Key Is a Palindrome
▪ else
▪       Print Key Is Not a Palindrome
▪ Stop
```

Detailed Algorithm:

```
Step 1:  Input S (string)
Step 2:  Len = 0 , Flag =0
Step 3:  While (S[Len] != NULL)
               Len++
Step 4:  I = 0 , J = Len-1
Step 5:  While ( I < (Len/2)+1 )
               If ( S[I] == S[J] )
                     Flag=0
               else
                     Flag=1
               I++ , J–
Step 6:     If ( Flag == 0 )
                  Print Key Is a Palindrome
            else
                  Print Key Is Not a Palindrome
Step 7: End
```

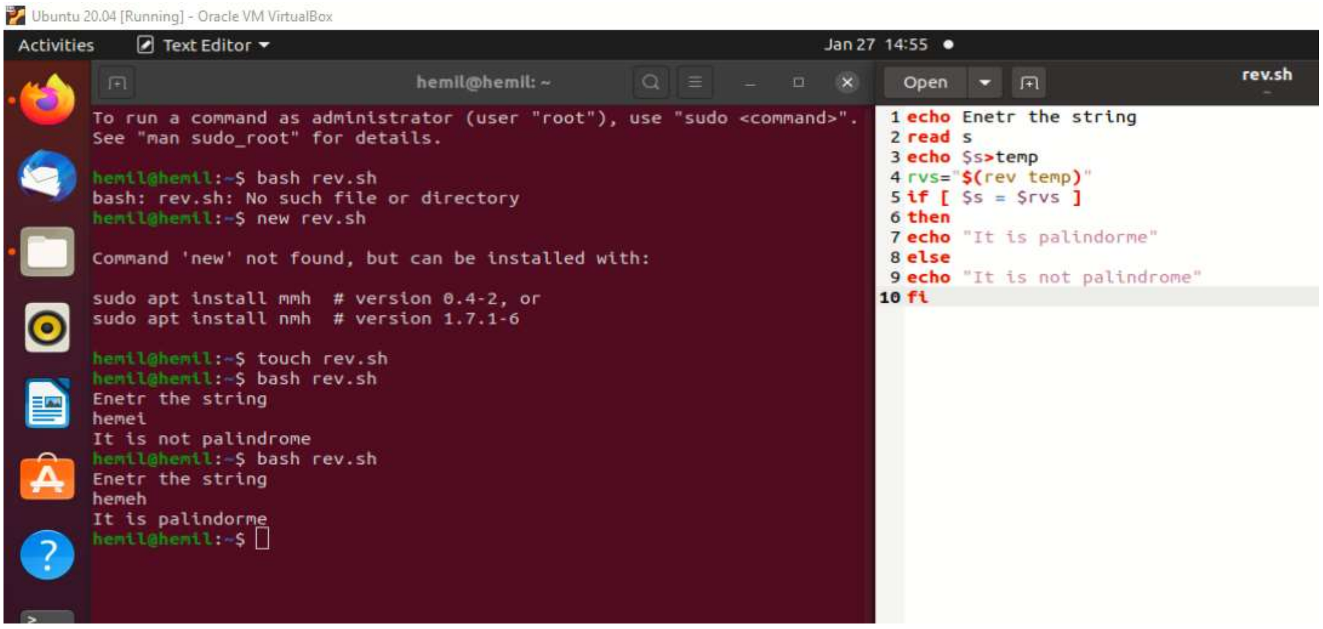
Flow Chart:


START
INTPUT S (STRING)
LEN=0 FLAG=0
WHILE S[LEN]!=NULL
LEN++
I=0 J=LEN-1
WHILE I< (LEN/2)+1
IF S[I]==S[J]
FLAG=0
FLAG=1
I++ J--
IF FLAG==0
PRINT IS A PALINDROME
PRINT NOT PALINDROME
STOP

Code:

```
echo Enter the value of string
read s
echo $s>temp
rvs="$(rev temp)"
if [ $s = $rvs ]
then
echo "it is palindrome"
else
echo " it is not a Palindrome"
fi
```

Output:



```
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

hemil@hemil:~$ bash rev.sh
bash: rev.sh: No such file or directory
hemil@hemil:~$ new rev.sh

Command 'new' not found, but can be installed with:

sudo apt install mmh  # version 0.4-2, or
sudo apt install nmh  # version 1.7.1-6

hemil@hemil:~$ touch rev.sh
hemil@hemil:~$ bash rev.sh
Enetr the string
hemel
It is not palindrome
hemil@hemil:~$ bash rev.sh
Enetr the string
hemeh
It is palindorme
hemil@hemil:~$
```

```
echo Enetr the string
read s
echo $s>temp
rvs="$(rev temp)"
if [ $s = $rvs ]
then
echo "It is palindorme"
else
echo "It is not palindrome"
fi
```

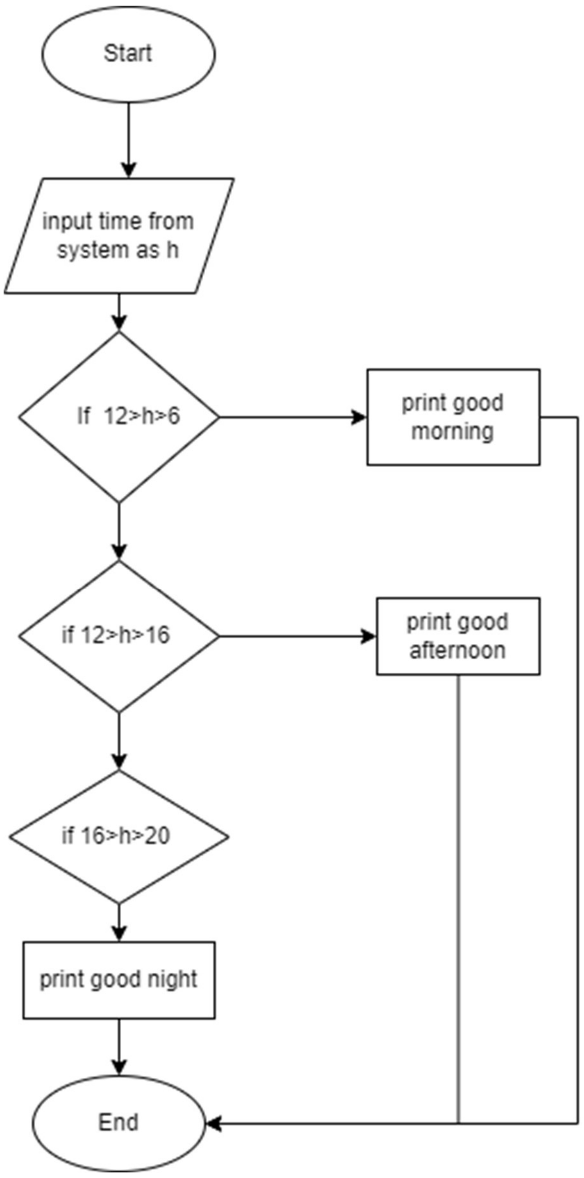
PRACTICAL 5 B

AIM: Write a Shell script to say Good morning/Afternoon/ Evening as you log in to system.

Algorithm:

1. Take input date from system in hour as h
2. If 12>h>6 then print good morning
3. Else if 12>h>16 then print good afternoon
4. Else if 16>h>20 then print good evening
5. Else print good night

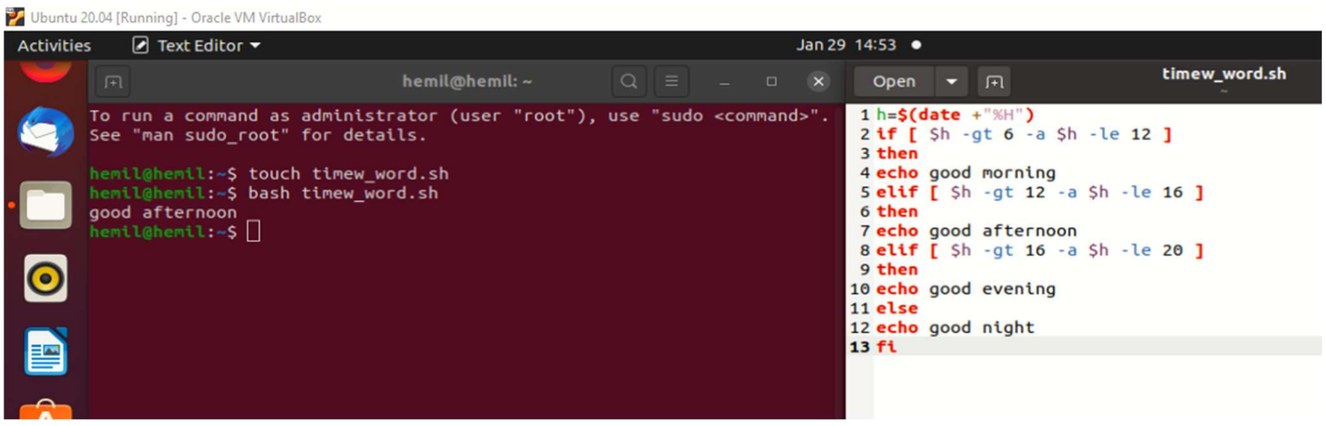
Flow Chart:



Code:

```
h=$(date +"%H")
if [ $h -gt 6 -a $h -le 12 ]
then
echo good morning
elif [ $h -gt 12 -a $h -le 16 ]
then
echo good afternoon
elif [ $h -gt 16 -a $h -le 20 ]
then
echo good evening
else
echo good night
fi
```

Output:



```
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

hemil@hemil:~$ touch timew_word.sh
hemil@hemil:~$ bash timew_word.sh
good afternoon
hemil@hemil:~$
```

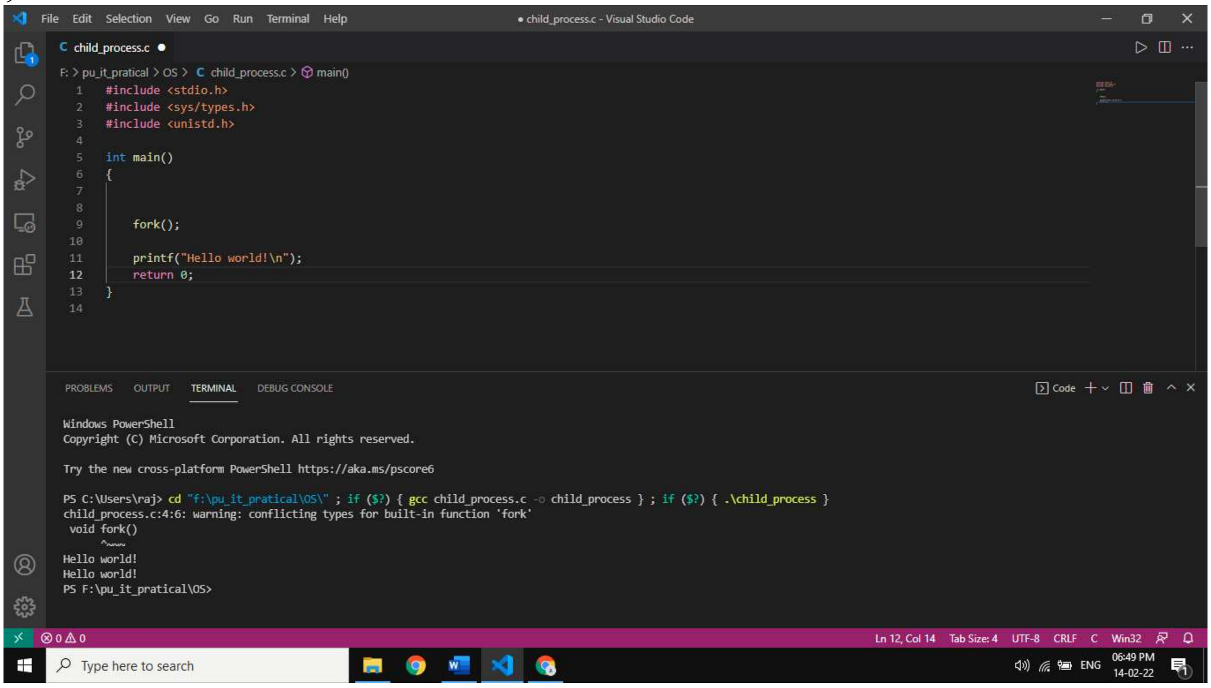
```
h=$(date +"%H")
if [ $h -gt 6 -a $h -le 12 ]
then
echo good morning
elif [ $h -gt 12 -a $h -le 16 ]
then
echo good afternoon
elif [ $h -gt 16 -a $h -le 20 ]
then
echo good evening
else
echo good night
fi
```

PRACTICAL 6

AIM: Write a C program to create a child process. (Use of gcc compiler).

Code:

```
#include <stdio.h>
#include <sys/types.h>
#include <unistd.h>
int main()
{

        // make two process which run same
        // program after this instruction
        fork();

        printf("Hello world!\n");
        return 0;
}
```



```
#include <stdio.h>
#include <sys/types.h>
#include <unistd.h>

int main()
{


    fork();

    printf("Hello world!\n");
    return 0;
}
```

```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Users\raj> cd "f:\pu_it_pratical\OS\" ; if ($?) { gcc child_process.c -o child_process } ; if ($?) { .\child_process }
child_process.c:4:6: warning: conflicting types for built-in function 'fork'
 void fork()
      ^~~~
Hello world!
Hello world!
PS F:\pu_it_pratical\OS>
```

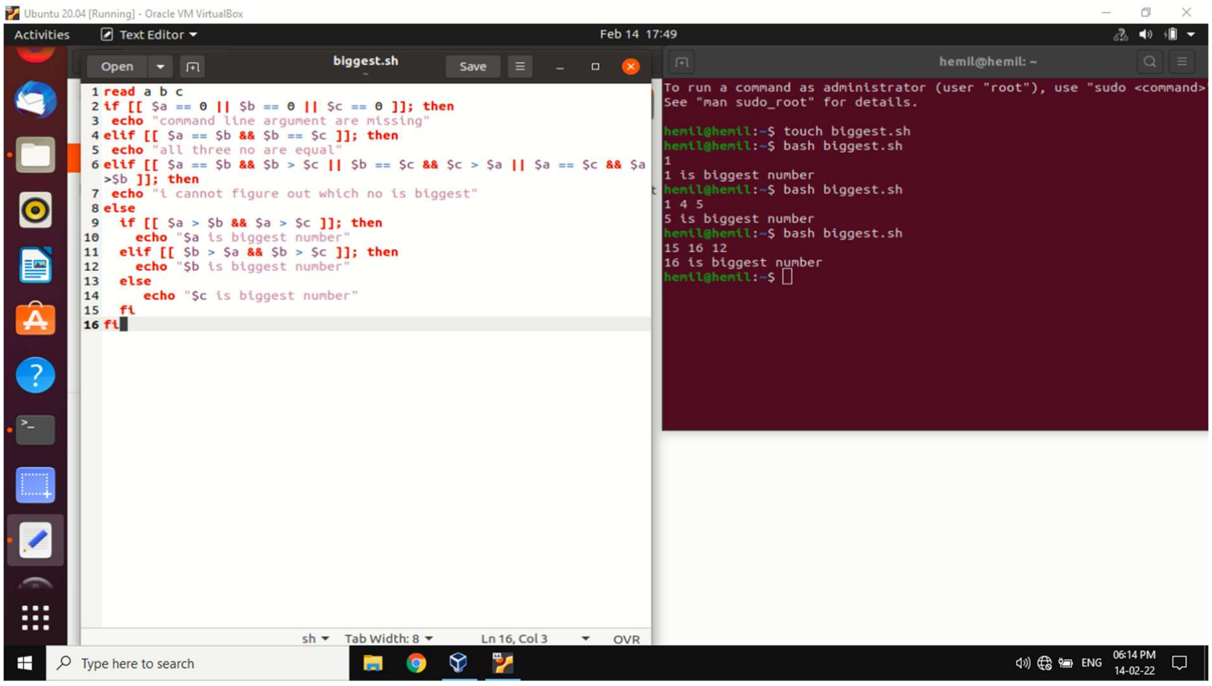
PRACTICAL 7 A

AIM: Finding out biggest number from given three numbers supplied as command line Arguments

Code:

```
read a b c
if [[ $a == 0 || $b == 0 || $c == 0 ]]; then
   echo "command line arguments are missing"
elif [[ $a == $b && $b == $c ]]; then
   echo "All the three numbers are equal"
elif [[  $a == $b && $b > $c  ||  $b == $c && $c > $a ||  $a == $c && $a > $b
]]; then
   echo "I cannot figure out which number is biggest"
else
   if [[ $a > $b && $a > $c ]]; then
      echo "$a is Biggest number"
   elif [[ $b > $a && $b > $c ]]; then
      echo "$b is Biggest number"
   else
      echo "$c is Biggest number"
   fi
fi
```

Output:



```
read a b c
if [[ $a == 0 || $b == 0 || $c == 0 ]]; then
 echo "command line argument are missing"
elif [[ $a == $b && $b == $c ]]; then
 echo "all three no are equal"
elif [[ $a == $b && $b > $c || $b == $c && $c > $a || $a == $c && $a
>$b ]]; then
 echo "i cannot figure out which no is biggest"
else
  if [[ $a > $b && $a > $c ]]; then
    echo "$a is biggest number"
  elif [[ $b > $a && $b > $c ]]; then
    echo "$b is biggest number"
  else
     echo "$c is biggest number"
  fi
fi
```

```
To run a command as administrator (user "root"), use "sudo <command>"
See "man sudo_root" for details.

hemil@hemil:~$ touch biggest.sh
hemil@hemil:~$ bash biggest.sh
1
1 is biggest number
hemil@hemil:~$ bash biggest.sh
1 4 5
5 is biggest number
hemil@hemil:~$ bash biggest.sh
15 16 12
16 is biggest number
hemil@hemil:~$
```

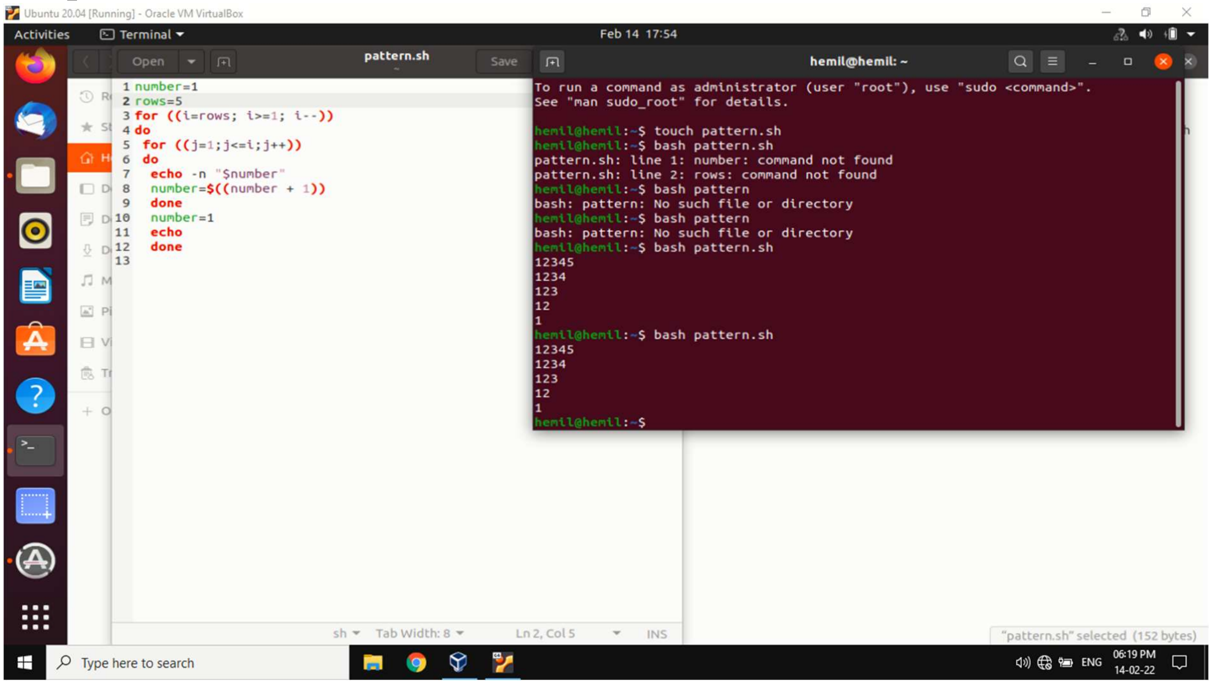
PRACTICAL 7 B

AIM: Printing the patterns using for loop.

Code:

```
number=1
rows=5
for((i=rows; i>=1; i--))
do
  for((j=1; j<=i; j++))
  do
    echo -n "$number "
    number=$((number + 1))
  done
  number=1
  echo
done
```

Output:



```
number=1
rows=5
for ((i=rows; i>=1; i--))
do
 for ((j=1;j<=i;j++))
 do
  echo -n "$number"
  number=$((number + 1))
  done
  number=1
  echo
  done
```

```
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

hemil@hemil:~$ touch pattern.sh
hemil@hemil:~$ bash pattern.sh
pattern.sh: line 1: number: command not found
pattern.sh: line 2: rows: command not found
hemil@hemil:~$ bash pattern
bash: pattern: No such file or directory
hemil@hemil:~$ bash pattern
bash: pattern: No such file or directory
hemil@hemil:~$ bash pattern.sh
12345
1234
123
12
1
hemil@hemil:~$ bash pattern.sh
12345
1234
123
12
1
hemil@hemil:~$
```

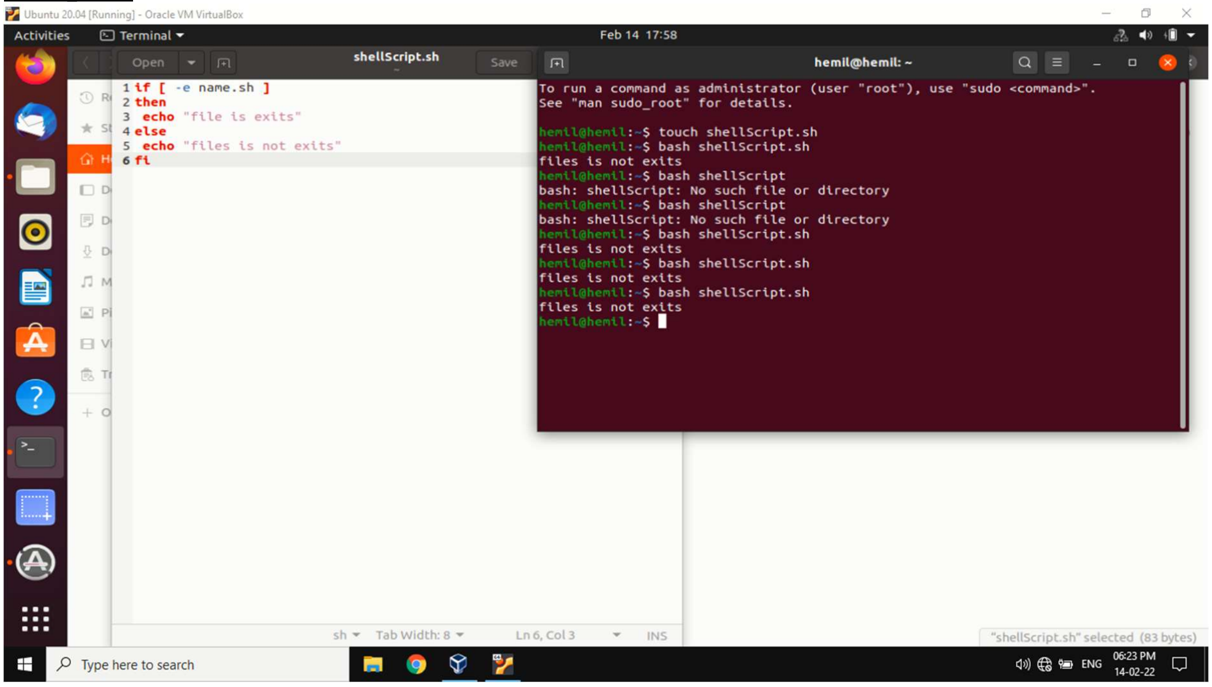
PRACTICAL 8

AIM: Shell script to determine whether given file exist or not.

Code:

```
if [ -e name.sh ]
then
   echo "file is exists "
else
   echo "file is not exists"
fi
```

Output:



shellScript.sh

```
if [ -e name.sh ]
then
 echo "file is exits"
else
 echo "files is not exits"
fi
```

hemil@hemil: ~

```
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

hemil@hemil:~$ touch shellScript.sh
hemil@hemil:~$ bash shellScript.sh
files is not exits
hemil@hemil:~$ bash shellScript
bash: shellScript: No such file or directory
hemil@hemil:~$ bash shellScript
bash: shellScript: No such file or directory
hemil@hemil:~$ bash shellScript.sh
files is not exits
hemil@hemil:~$ bash shellScript.sh
files is not exits
hemil@hemil:~$ bash shellScript.sh
files is not exits
hemil@hemil:~$
```

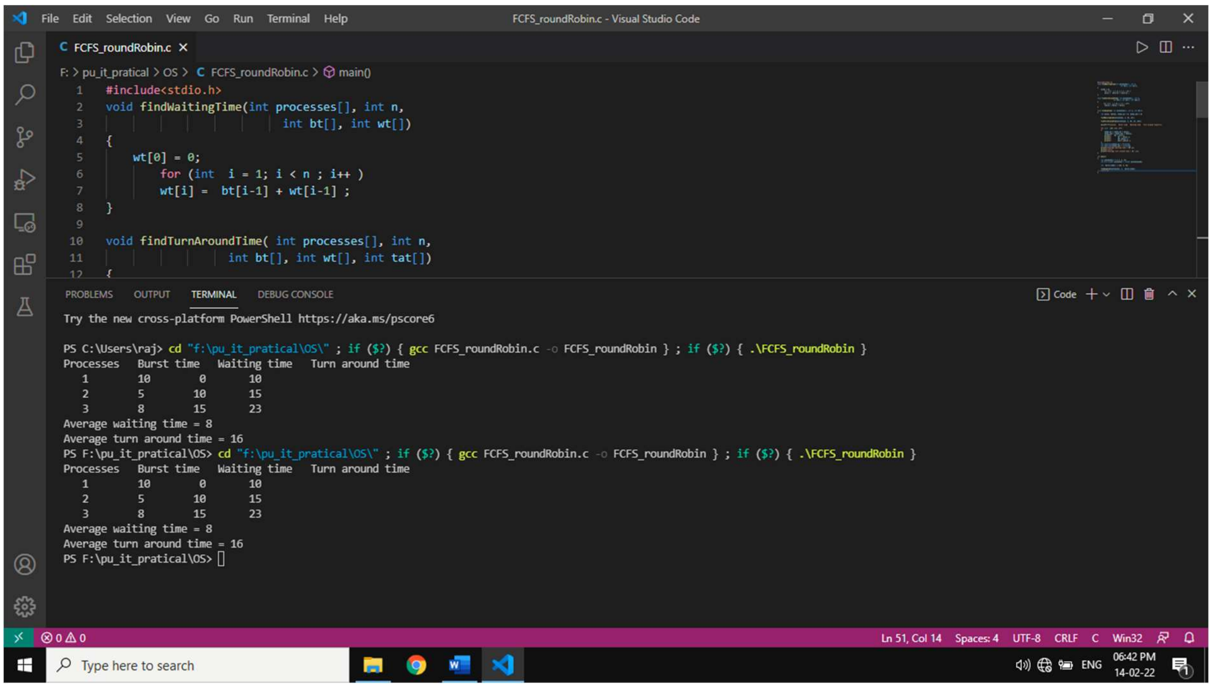
PRACTICAL 9

AIM: Implementation of FCFS & Round Robin Algorithm.

Code:

```
#include<stdio.h>
void findWaitingTime(int processes[], int n,int bt[], int wt[])
{
         wt[0] = 0;
        for (int  i = 1; i < n ; i++ )
        wt[i] =  bt[i-1] + wt[i-1] ;
}

void findTurnAroundTime( int processes[], int n,int bt[], int wt[], int tat[])
{
       for (int  i = 0; i < n ; i++)
        tat[i] = bt[i] + wt[i];
}

void findavgTime( int processes[], int n, int bt[])
{
    int wt[n], tat[n], total_wt = 0, total_tat = 0;

    findWaitingTime(processes, n, bt, wt);

    findTurnAroundTime(processes, n, bt, wt, tat);

    printf("Processes   Burst time   Waiting time   Turn around time\n");

    for (int  i=0; i<n; i++)
    {
       total_wt = total_wt + wt[i];
       total_tat = total_tat + tat[i];
       printf("   %d ",(i+1));
       printf("       %d ", bt[i] );
       printf("       %d",wt[i] );
       printf("       %d\n",tat[i] );
    }
    int s=(float)total_wt / (float)n;
    int t=(float)total_tat / (float)n;
    printf("Average waiting time = %d",s);
    printf("\n");
    printf("Average turn around time = %d ",t);
}
int main()
{
    int processes[] = { 1, 2, 3};
    int n = sizeof processes / sizeof processes[0];

    int  burst_time[] = {10, 5, 8};

    findavgTime(processes, n,  burst_time);
    return 0;
}
```

Output:



```
#include<stdio.h>
void findWaitingTime(int processes[], int n,
                        int bt[], int wt[])
{
    wt[0] = 0;
        for (int  i = 1; i < n ; i++ )
        wt[i] =  bt[i-1] + wt[i-1] ;
}

void findTurnAroundTime( int processes[], int n,
                    int bt[], int wt[], int tat[])
{
```

```
Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Users\raj> cd "f:\pu_it_pratical\OS\" ; if ($?) { gcc FCFS_roundRobin.c -o FCFS_roundRobin } ; if ($?) { .\FCFS_roundRobin }
Processes   Burst time   Waiting time   Turn around time
   1        10        0       10
   2        5        10       15
   3        8        15       23
Average waiting time = 8
Average turn around time = 16
PS F:\pu_it_pratical\OS> cd "f:\pu_it_pratical\OS\" ; if ($?) { gcc FCFS_roundRobin.c -o FCFS_roundRobin } ; if ($?) { .\FCFS_roundRobin }
Processes   Burst time   Waiting time   Turn around time
   1        10        0       10
   2        5        10       15
   3        8        15       23
Average waiting time = 8
Average turn around time = 16
PS F:\pu_it_pratical\OS> 
```

FCFS_roundRobin.c - Visual Studio Code
F: > pu_it_pratical > OS > FCFS_roundRobin.c > main()
Ln 51, Col 14   Spaces: 4   UTF-8   CRLF   C   Win32
06:42 PM 14-02-22

PRACTICAL 10

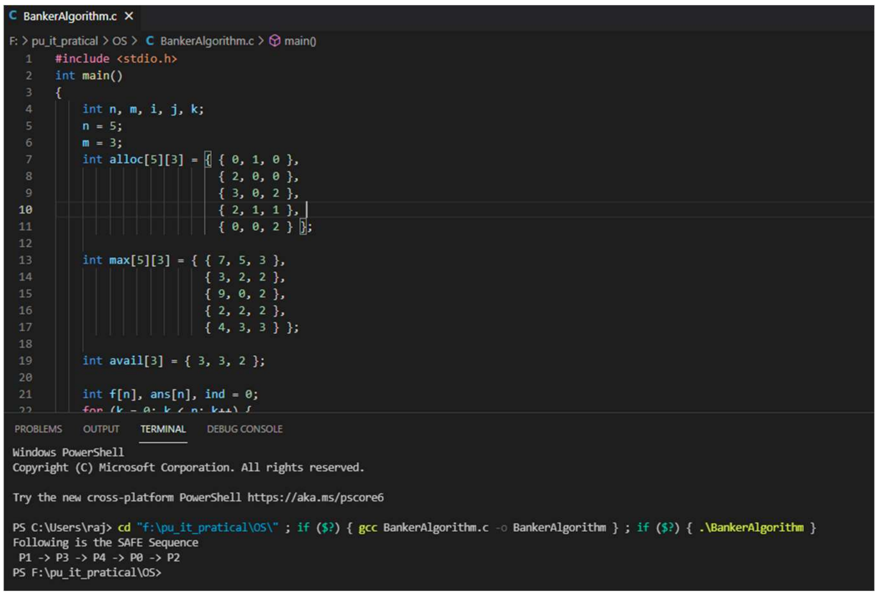
AIM: Implementation of Banker Algorithm

Code:

```
#include <stdio.h>
int main()
{
   int n, m, i, j, k;
   n = 5;
   m = 3;
   int alloc[5][3] = { { 0, 1, 0 },
                      { 2, 0, 0 },
                      { 3, 0, 2 },
                      { 2, 1, 1 },
                      { 0, 0, 2 } };

   int max[5][3] = { { 7, 5, 3 },
                    { 3, 2, 2 },
                    { 9, 0, 2 },
                    { 2, 2, 2 },
                    { 4, 3, 3 } };

   int avail[3] = { 3, 3, 2 };

   int f[n], ans[n], ind = 0;
   for (k = 0; k < n; k++) {
      f[k] = 0;
   }
   int need[n][m];
   for (i = 0; i < n; i++) {
      for (j = 0; j < m; j++)
         need[i][j] = max[i][j] - alloc[i][j];
   }
   int y = 0;
   for (k = 0; k < 5; k++) {
      for (i = 0; i < n; i++) {
         if (f[i] == 0) {

            int flag = 0;
            for (j = 0; j < m; j++) {
               if (need[i][j] > avail[j]){
                  flag = 1;
                   break;
               }
```

```
                }
                 if (flag == 0) {
                    ans[ind++] = i;
                    for (y = 0; y < m; y++)
                        avail[y] += alloc[i][y];
                    f[i] = 1;
                }
            }
        }
    }
        int flag = 1;
        for(int i=0;i<n;i++)
    {
      if(f[i]==0)
      {
        flag=0;
         printf("The following system is not safe");
        break;
      }
    }
        if(flag==1)
    {
      printf("Following is the SAFE Sequence\n");
      for (i = 0; i < n - 1; i++)
        printf(" P%d ->", ans[i]);
      printf(" P%d", ans[n - 1]);
    }
    return (0);
}
```

OUTPUT:



```
#include <stdio.h>
int main()
{
    int n, m, i, j, k;
    n = 5;
    m = 3;
    int alloc[5][3] = { { 0, 1, 0 },
                        { 2, 0, 0 },
                        { 3, 0, 2 },
                        { 2, 1, 1 },
                        { 0, 0, 2 } };

    int max[5][3] = { { 7, 5, 3 },
                      { 3, 2, 2 },
                      { 9, 0, 2 },
                      { 2, 2, 2 },
                      { 4, 3, 3 } };

    int avail[3] = { 3, 3, 2 };

    int f[n], ans[n], ind = 0;
```

```
Windows PowerShell
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Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Users\raj> cd "f:\pu_it_pratical\OS\" ; if ($?) { gcc BankerAlgorithm.c -o BankerAlgorithm } ; if ($?) { .\BankerAlgorithm }
Following is the SAFE Sequence
 P1 -> P3 -> P4 -> P0 -> P2
PS F:\pu_it_pratical\OS>
```