VISVESVARAYA TECHNOLOGICAL UNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.

LAB REPORT
on

UNIX SHELL AND PROGRAMMING

Submitted by

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in partial fulfillment for the award of the degree of
BACHELOR OF ENGINEERING
in
COMPUTER SCIENCE AND ENGINEERING

B.M.S. COLLEGE OF ENGINEERING
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Bull Temple Road, Bangalore 560019
(Affiliated To Visvesvaraya Technological University, Belgaum)

Department of Computer Science and Engineering

CERTIFICATE

This is to certify that the Lab work entitled “LAB COURSE **UNIX SHELL AND PROGRAMMING**” carried out by **ANKITH S (1BM20CS017),** who is bonafide student of **B. M. S. College of Engineering.** It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 2022. The Lab report has been approved as it satisfies the academic requirements in respect of a **Unix Shell and Programming - (20CS5PCUSP)** work prescribed for the said degree.

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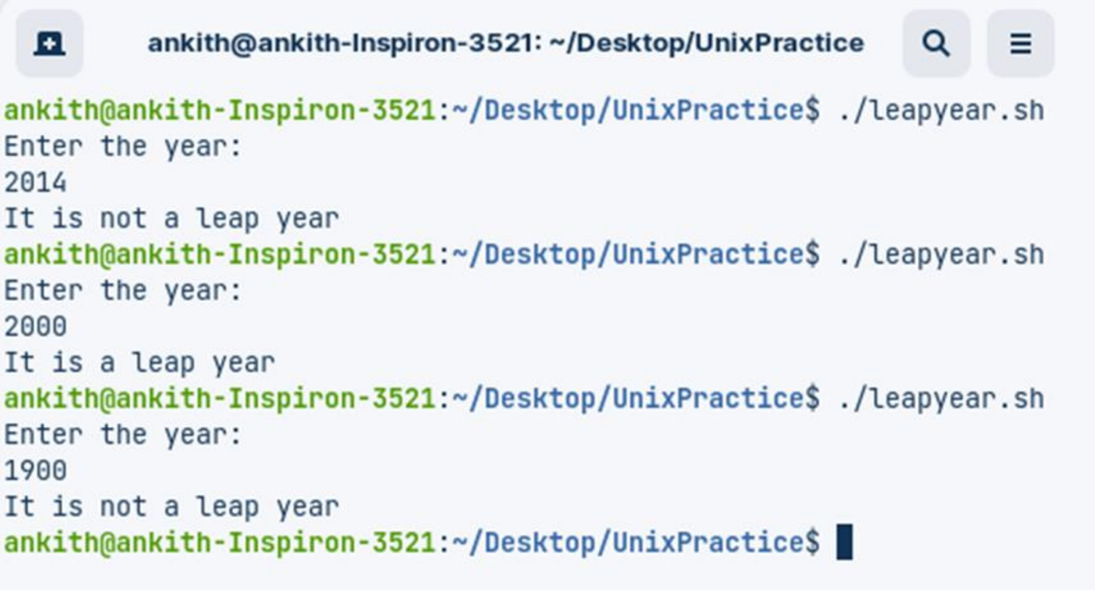
Experiment No 1

Shell script to find if the given year is leap or not

```
#!/bin/bash
echo "Enter an Year: "
read year
if [ $((year % 4)) -eq 0 ]
then
  if [ $((year % 100)) -eq 0 ]
    then
    if [ $((year % 400)) -eq 0 ]
          then
        echo "$year is a leap year"
    else
           echo "$year is not a leap year"
    fi
  else
  echo "$year is a leap year"
  fi
else
 echo "$year is not a leap year"
fi
```

Output



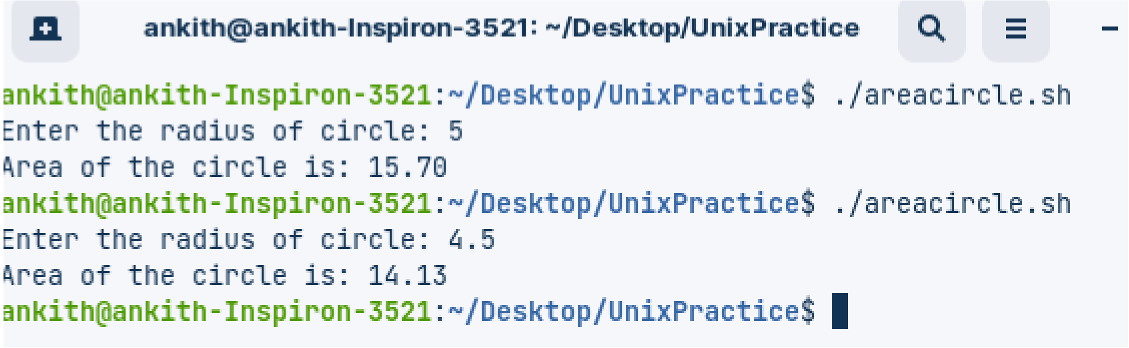
```
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./leapyear.sh
Enter the year:
2014
It is not a leap year
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./leapyear.sh
Enter the year:
2000
It is a leap year
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./leapyear.sh
Enter the year:
1900
It is not a leap year
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ 
```

Experiment No 2

Shell script to find the area of a circle

```
#!/bin/bash

echo "\nEnter the radius of a circle : "

read r

d=$(echo "scale=2;2 * $r"| bc) #Diameter

area=$(echo "scale=2; 22/7 * ($r * $r)" | bc)

circumference=$(echo "scale=2; 22/7 * $d"| bc)

echo "\nArea of circle is : $area"

echo "\nCircumference of circle is : $circumference \n"
```

Output



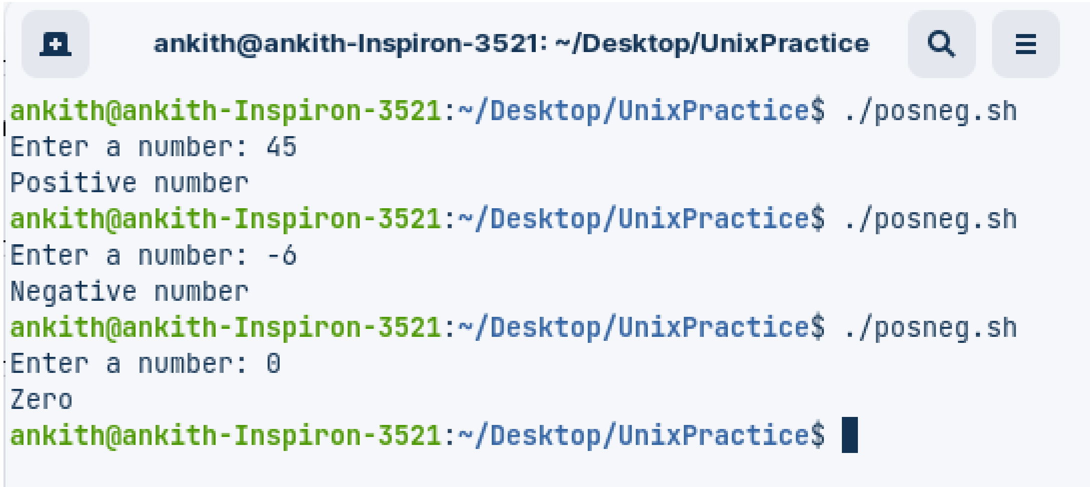
```
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./areacircle.sh
Enter the radius of circle: 5
Area of the circle is: 15.70
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./areacircle.sh
Enter the radius of circle: 4.5
Area of the circle is: 14.13
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$
```

Experiment No 3

Shell script to check whether the number is zero/ positive/ negative

```
#!/bin/bash
echo "Enter the number : "
read num
if [ $num -gt 0 ]
then
   echo "$num is positive"
elif [ $num -lt 0 ]
then
   echo "$num is negative"
else
   echo "$num is zero"
fi
```

Output



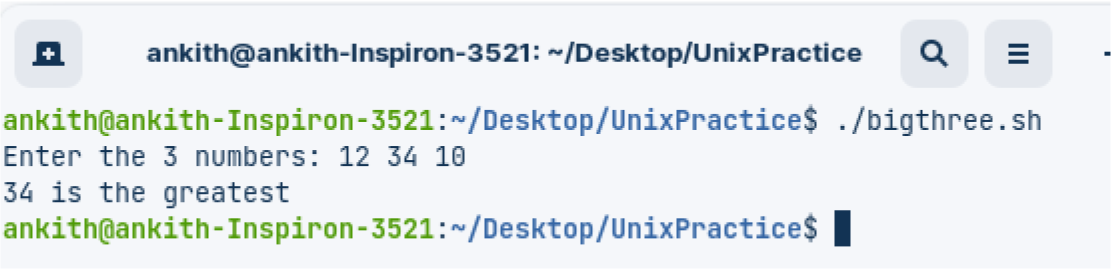
```
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./posneg.sh
Enter a number: 45
Positive number
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./posneg.sh
Enter a number: -6
Negative number
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./posneg.sh
Enter a number: 0
Zero
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ 
```

Experiment No 4

Shell script to find the biggest of three numbers

```
#!/bin/bash
echo "Enter first number : "
read num1
echo "Enter second number : "
read num2
echo "Enter third number : "
read num3
if [ $num1 -gt $num2 ] && [ $num1 -gt $num3 ]
then
   echo "\n$num1 is the greatest"
elif [ $num2 -gt $num1 ] && [ $num2 -gt $num3 ]
then
   echo "\n$num2 is the greatest"
else
   echo "\n$num3 is the greatest"
fi
```

Output



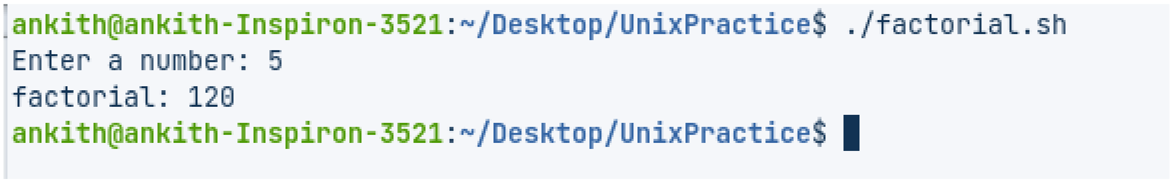
```
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./bigthree.sh
Enter the 3 numbers: 12 34 10
34 is the greatest
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ 
```

Experiment No 5

Shell script to find the factorial of a number

```
#!/bin/bash

echo "ENTER THE NUMBER: "

read n

fact=1

while [ $n -gt 1 ]

do

   fact=$(( fact * n))

   n=$((n-1 ))

done

echo "FACTORIAL IS: "

echo $fact
```

Output



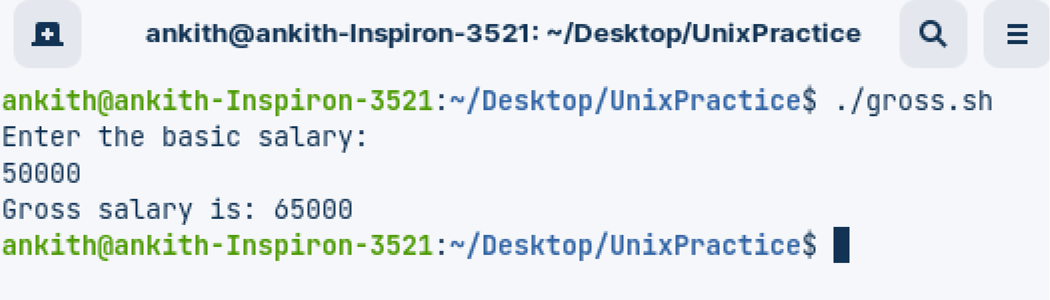
```
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./factorial.sh
Enter a number: 5
factorial: 120
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ 
```

Experiment No 6

Shell script to compute the gross salary of an employee

```
#!/bin/bash


echo "Enter the basic salary: "

read sal

grossSal=$(($sal + ($sal/5) + ($sal/10)))

echo "Gross salary is: $grossSal"
```

Output



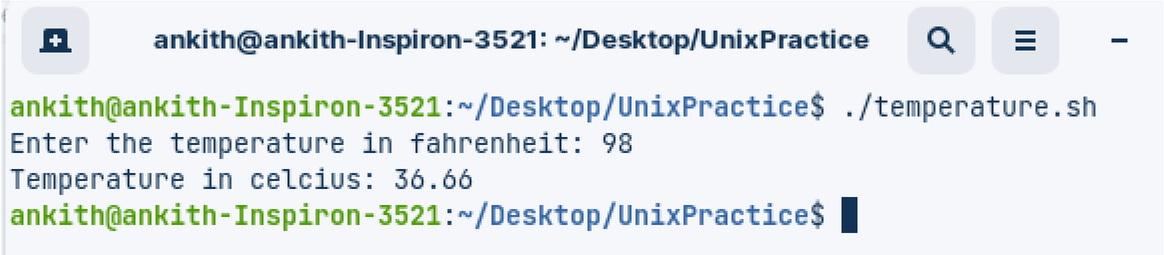
```
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./gross.sh
Enter the basic salary:
50000
Gross salary is: 65000
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ 
```

Experiment No 7

Shell script to convert the temperature Fahrenheit to Celsius

```
#!/bin/bash

echo "Enter temperature in F : "

read f

c=$(echo "scale=2;(5/9)*($f-32)"|bc)

echo "$f °F = $c °C"
```

Output:



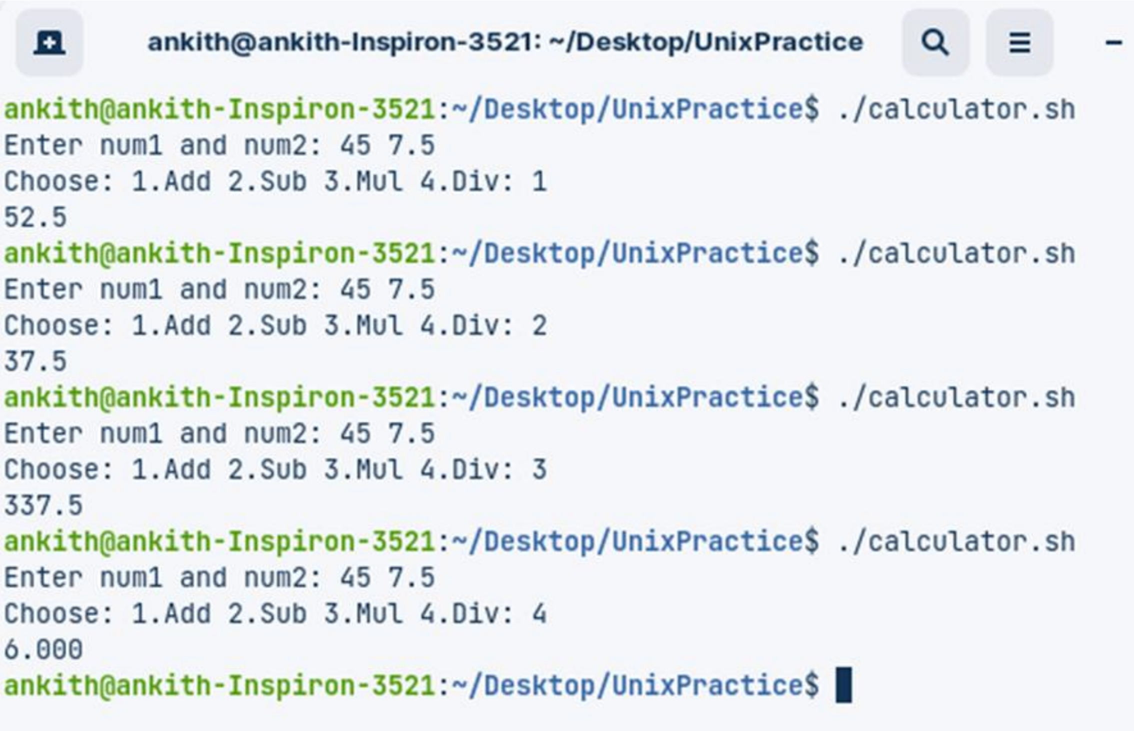
```
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./temperature.sh
Enter the temperature in fahrenheit: 98
Temperature in celcius: 36.66
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ 
```

Experiment No 8

Shell script to perform arithmetic operations on given two numbers

```
#!/bin/bash

read -p "Enter num1 and num2: " n1 n2

read -p "Choose: 1.Add 2.Sub 3.Mul 4.Div: " op

if [ $op -eq 1 ]

then echo "$n1 + $n2" | bc

elif [ $op -eq 2 ]

then echo "$n1 - $n2" | bc

elif [ $op -eq 3 ]

then echo "$n1 * $n2" | bc

elif [ $op -eq 4 ]

then echo "scale=3; $n1 / $n2" | bc

else echo "Invalid input"

fi
```

Output



```
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./calculator.sh
Enter num1 and num2: 45 7.5
Choose: 1.Add 2.Sub 3.Mul 4.Div: 1
52.5
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./calculator.sh
Enter num1 and num2: 45 7.5
Choose: 1.Add 2.Sub 3.Mul 4.Div: 2
37.5
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./calculator.sh
Enter num1 and num2: 45 7.5
Choose: 1.Add 2.Sub 3.Mul 4.Div: 3
337.5
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./calculator.sh
Enter num1 and num2: 45 7.5
Choose: 1.Add 2.Sub 3.Mul 4.Div: 4
6.000
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ 
```

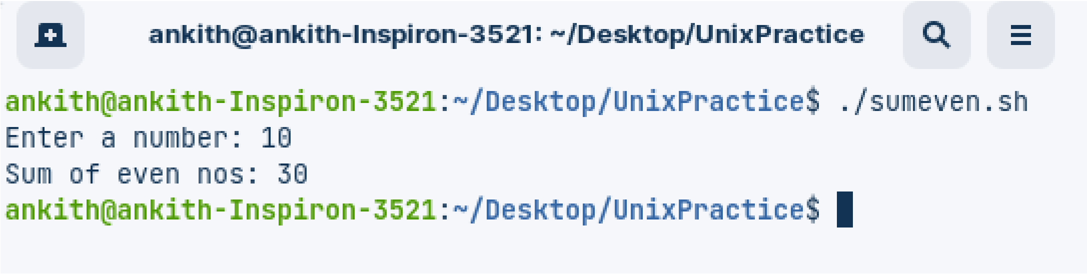
Experiment No 9

Shell script to find the sum of even numbers upto n

Program:

```
#!/bin/bash
sum=0
read -p "Enter maximum limit of Even Numbers : " m
for ((i = 0; i < m; i++)); do
    if [[ $i%2 -eq 0 ]]; then
        sum=$(expr $sum + $i)
    fi
done
echo $sum
```

Output



```
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./sumeven.sh
Enter a number: 10
Sum of even nos: 30
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ 
```

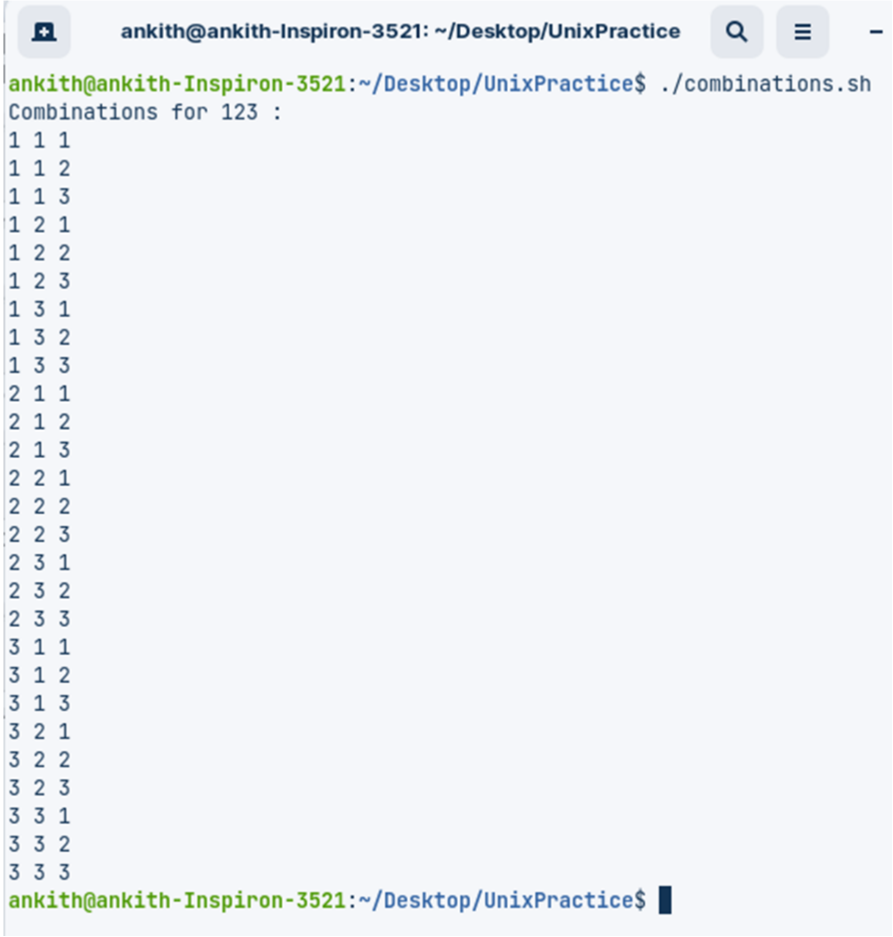
Experiment No 10

Shell script to print the combinations of numbers 123

Program:

```
#!/bin/bash

echo "Combinations for 123 :"

for ((i = 1; i <= 3; i++)); do

    for ((j = 1; j <= 3; j++)); do

        for ((k = 1; k <= 3; k++)); do

            echo $i $j $k

        done

    done

done
```

Output



```
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./combinations.sh
Combinations for 123 :
1 1 1
1 1 2
1 1 3
1 2 1
1 2 2
1 2 3
1 3 1
1 3 2
1 3 3
2 1 1
2 1 2
2 1 3
2 2 1
2 2 2
2 2 3
2 3 1
2 3 2
2 3 3
3 1 1
3 1 2
3 1 3
3 2 1
3 2 2
3 2 3
3 3 1
3 3 2
3 3 3
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$
```

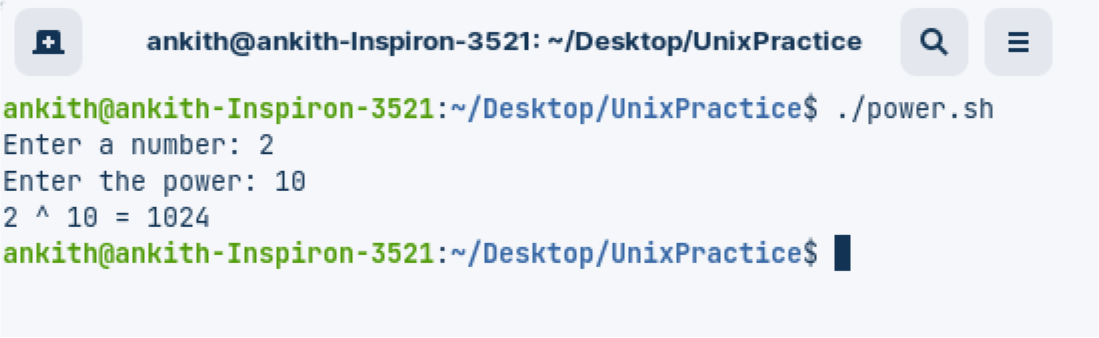
Experiment No 11

Shell script to find the power of a number

Program:

```
#!/bin/bash

echo "Enter base"

read a

echo "Enter power"

read b

res=1

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

    res=`expr $res \* $a`

done

echo $res
```

Output



```
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./power.sh
Enter a number: 2
Enter the power: 10
2 ^ 10 = 1024
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ 
```

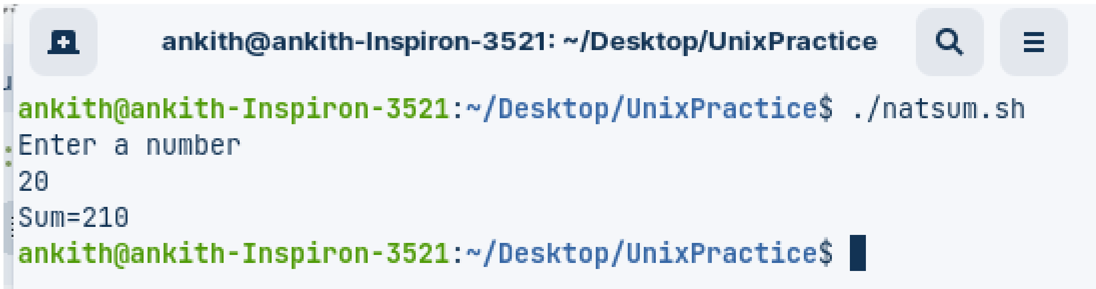
Experiment No 12

Shell script to find the sum of n natural numbers

Program:

```
#!/bin/bash
echo "Enter a number"
read n
i=1
sum=0
while [ $i -le $n ]
  do
   echo "$i"
   sum=$(( $sum + $i ))
        i=$(( $i + 1 ))
  done
echo "Sum=$sum"
```

Output



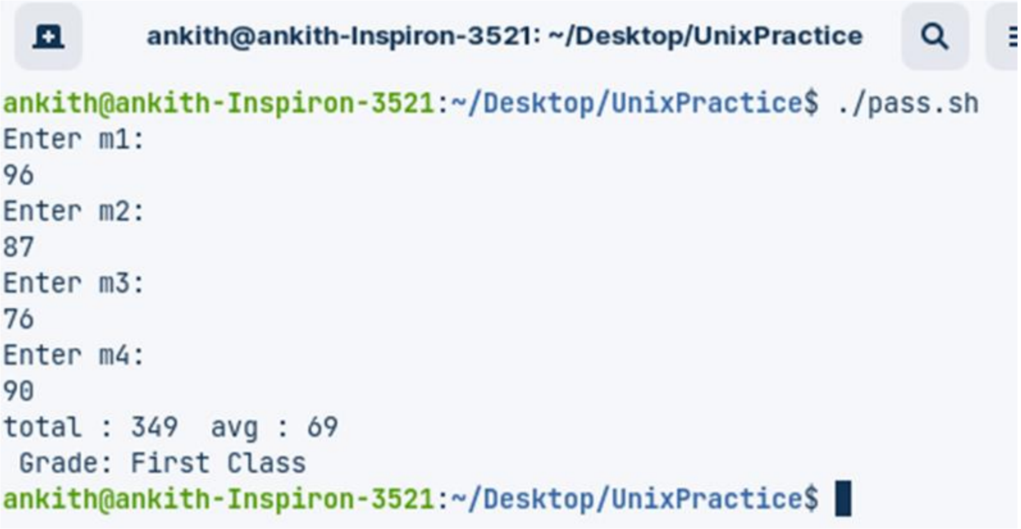
```
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./natsum.sh
Enter a number
20
Sum=210
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$
```

Experiment No 13

Shell script to display the pass class of a student

```
#!/bin/bash
echo "Enter m1:\c and Enter m2:\c "
read m1
echo "Enter m3:\c"
read m3
echo "Enter m4:\c"
read m4
echo "Enter m5:\c"
read m5
tot=`expr $m1 + $m2 + $m3 + $m4 + $m5`;
avg=`expr $tot / 5`;
echo "total : $tot \n avg : $avg"
if [ $avg -gt 85 ];then
echo " Grade: Distinction "
elif [ $avg -gt 65 ];then
echo " Grade: First Class "
elif [ $avg -gt 50 ];then
echo " Grade: Second Class  "
elif [ $avg -gt 35 ];then
echo " Grade: Pass "
else echo " Grade: Fail"
fi
```

Output:



```
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./pass.sh
Enter m1:
96
Enter m2:
87
Enter m3:
76
Enter m4:
90
total : 349  avg : 69
 Grade: First Class
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ 
```

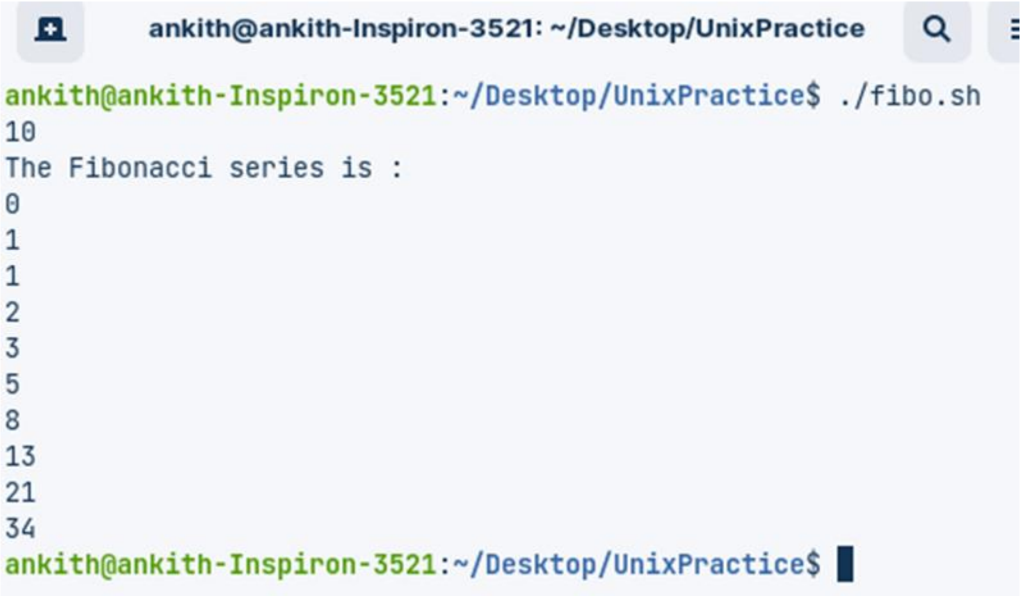
Experiment No 14

Shell script to find the Fibonacci series up to n

Program:

```
#!/bin/bash
read N
a=0
b=1
echo "The Fibonacci series is : "
for (( i=0; i<N; i++ ))
do
    echo "$a"
    fib=$((a + b))
    a=$b
    b=$fib
done
```

Output



```
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./fibo.sh
10
The Fibonacci series is :
0
1
1
2
3
5
8
13
21
34
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ 
```

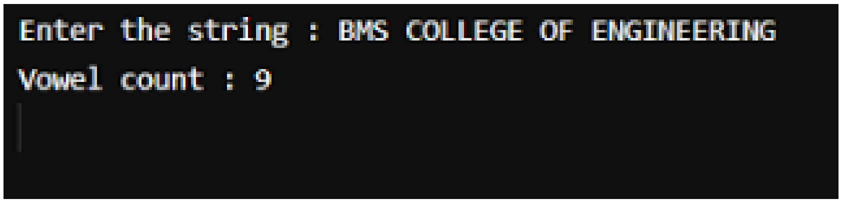
Experiment No 15

Shell script to count the number of vowels of a string

Program:

```
#!/bin/bash

echo "enter filename"

read filename

vowels=`cat $filename | tr -cd 'aeiouAEIOU' | wc -c`

echo "Number of vowels in $filename: $vowels"
```

Output



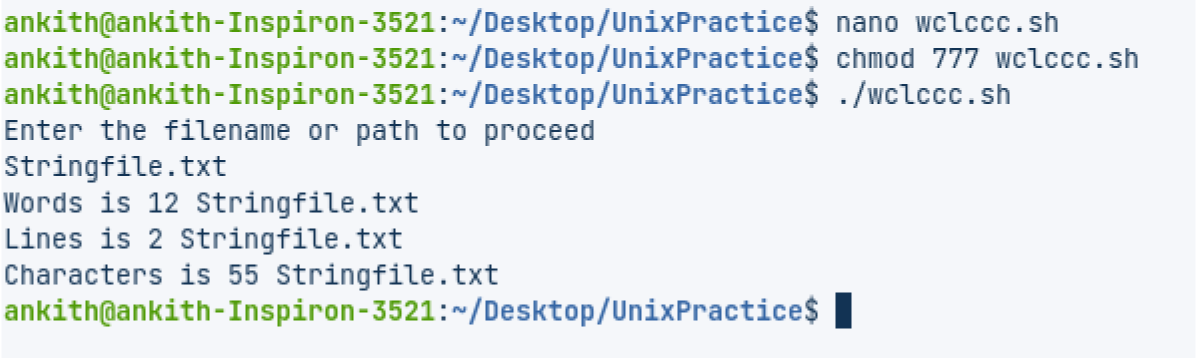
```
Enter the string : BMS COLLEGE OF ENGINEERING
Vowel count : 9
```

Experiment No 16

Shell script to check number of lines, words, characters in a file

```
#!/bin/bash
echo "Enter the filename or path to proceed"
read filename
words=`wc -w $filename`
lines=`wc -l $filename`
chars=`wc -c $filename`
echo "Words is $words"
echo "Lines is $lines"
echo "Characters is $chars"
```

Output

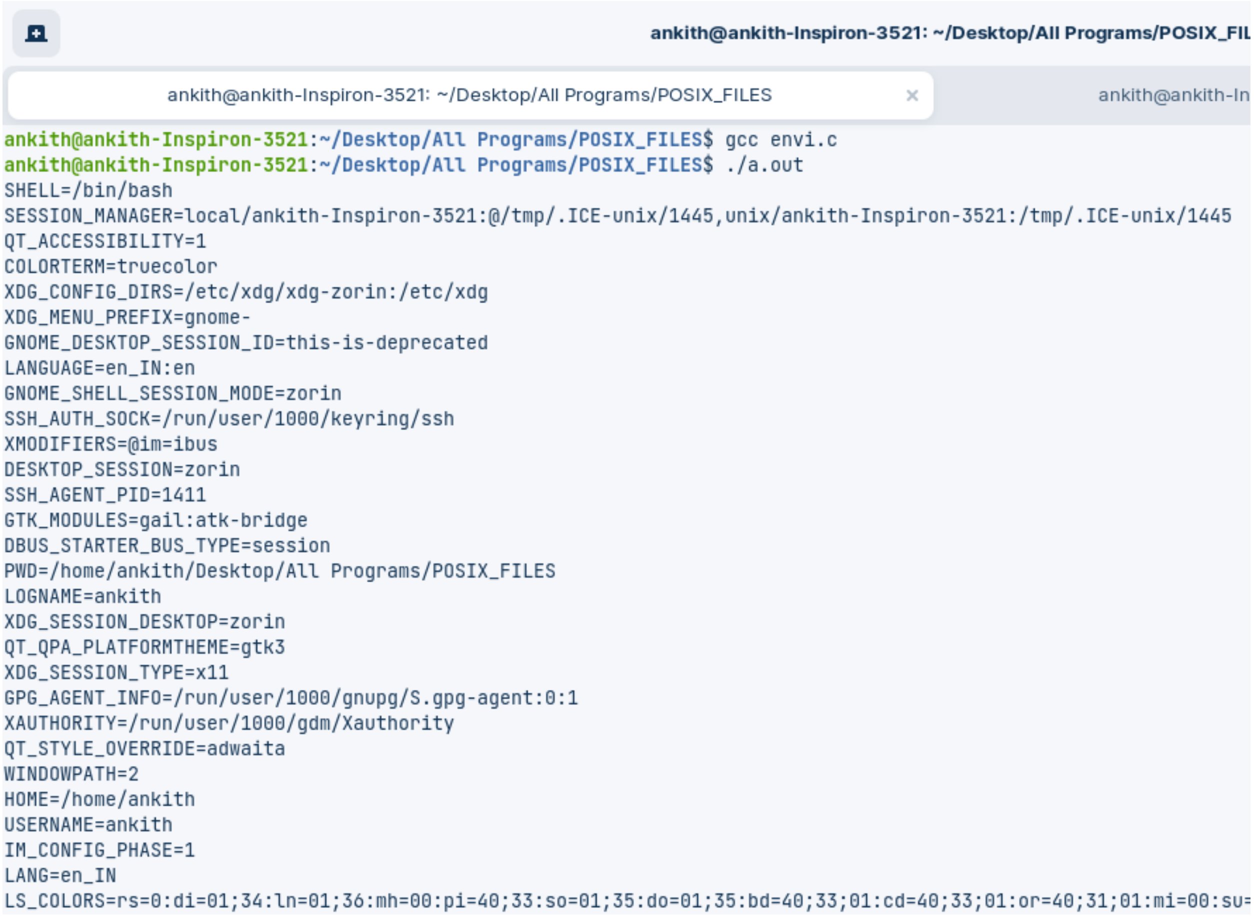


```
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ nano wclccc.sh
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ chmod 777 wclccc.sh
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ ./wclccc.sh
Enter the filename or path to proceed
Stringfile.txt
Words is 12 Stringfile.txt
Lines is 2 Stringfile.txt
Characters is 55 Stringfile.txt
ankith@ankith-Inspiron-3521:~/Desktop/UnixPractice$ 
```

Experiment No 17

Write a C/C++ program to that outputs the contents of its environment list

```
#include&lt;stdio.h&gt;

#include&lt;unistd.h&gt;

int main(int argc,char *argv[])

{

char **ptr;

extern char **environ;

for(ptr=environ; *ptr; ptr++)

printf(&quot;%s\n&quot;,*ptr);

return 0;

}
```


ankith@ankith-Inspiron-3521: ~/Desktop/All Programs/POSIX_FIL
ankith@ankith-Inspiron-3521: ~/Desktop/All Programs/POSIX_FILES
ankith@ankith-In

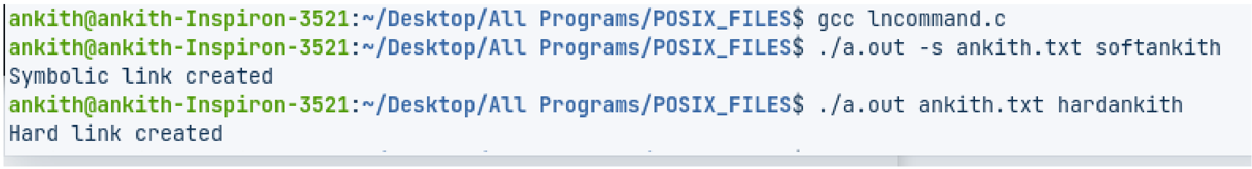
```
ankith@ankith-Inspiron-3521:~/Desktop/All Programs/POSIX_FILES$ gcc envi.c
ankith@ankith-Inspiron-3521:~/Desktop/All Programs/POSIX_FILES$ ./a.out
SHELL=/bin/bash
SESSION_MANAGER=local/ankith-Inspiron-3521:@/tmp/.ICE-unix/1445,unix/ankith-Inspiron-3521:/tmp/.ICE-unix/1445
QT_ACCESSIBILITY=1
COLORTERM=truecolor
XDG_CONFIG_DIRS=/etc/xdg/xdg-zorin:/etc/xdg
XDG_MENU_PREFIX=gnome-
GNOME_DESKTOP_SESSION_ID=this-is-deprecated
LANGUAGE=en_IN:en
GNOME_SHELL_SESSION_MODE=zorin
SSH_AUTH_SOCK=/run/user/1000/keyring/ssh
XMODIFIERS=@im=ibus
DESKTOP_SESSION=zorin
SSH_AGENT_PID=1411
GTK_MODULES=gail:atk-bridge
DBUS_STARTER_BUS_TYPE=session
PWD=/home/ankith/Desktop/All Programs/POSIX_FILES
LOGNAME=ankith
XDG_SESSION_DESKTOP=zorin
QT_QPA_PLATFORMTHEME=gtk3
XDG_SESSION_TYPE=x11
GPG_AGENT_INFO=/run/user/1000/gnupg/S.gpg-agent:0:1
XAUTHORITY=/run/user/1000/gdm/Xauthority
QT_STYLE_OVERRIDE=adwaita
WINDOWPATH=2
HOME=/home/ankith
USERNAME=ankith
IM_CONFIG_PHASE=1
LANG=en_IN
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;01:mi=00:su=
```

Experiment No 18

Write a C/C++ program to emulate the Unix ln command

```
#include<unistd.h>
#include<stdio.h>
#include<string.h>
int main(int argc , char * argv[]){
    if(argc<3 || argc>4){
        printf("Error in usage\n");
        return -1;
    }
    if(argc==4 && strcmp(argv[1],"-s")!=0){
        printf("for symbolic link use -s option");
        return -1;
    }
    if(argc==4 && access(argv[2] , F_OK)==-1){
        printf("Source file does not exist");
        return -1;
    }
    if(argc==3 && access(argv[1] , F_OK)==-1){
        printf("Source file does not exist");
        return -1;
    }
    if(argc==4){
        symlink(argv[2] , argv[3]);
        printf("Symbolic link is created");
        return 0;
    }
    if(argc==3){
        link(argv[1] , argv[2]);
        printf("Hard link is created");
        return 0;
    }
}
```

Output:



```
ankith@ankith-Inspiron-3521:~/Desktop/All Programs/POSIX_FILES$ gcc lncommand.c
ankith@ankith-Inspiron-3521:~/Desktop/All Programs/POSIX_FILES$ ./a.out -s ankith.txt softankith
Symbolic link created
ankith@ankith-Inspiron-3521:~/Desktop/All Programs/POSIX_FILES$ ./a.out ankith.txt hardankith
Hard link created
```

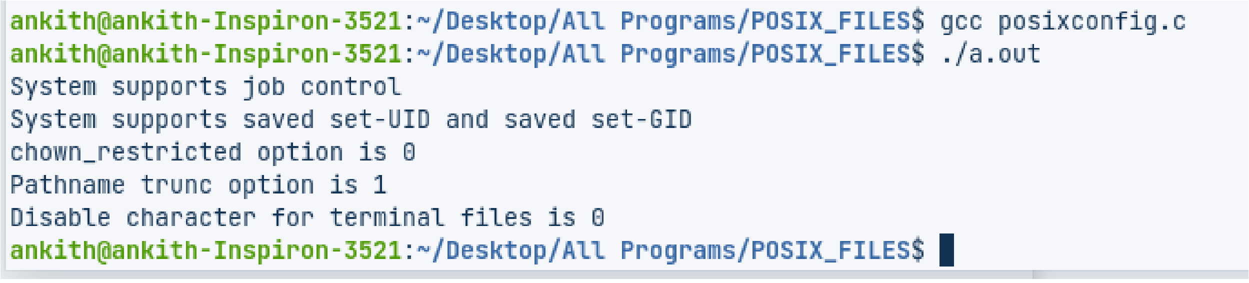
Experiment No 19

Write a C/C++ POSIX compliant program that prints the POSIX defined Configuration options supported on any given system using feature test macros.

```
#define _POSIX_SOURCE
#define _POSIX_C_SOURCE 199309L
#include&lt;iostream&gt;
#include&lt;unistd.h&gt;
int main()
{
using namespace std;
#ifdef _POSIX_JOB_CONTROL
cout&lt;&lt;&quot;System Supports Job Control feature&quot;&lt;&lt;endl;
#else
cout&lt;&lt;&quot;System doesnot support job control\n&quot;;
#endif
#ifdef _POSIX_SAVED_IDS
cout&lt;&lt;&quot;System Supports saved set-UID and saved set-GID&quot;&lt;&lt;endl;
#else
cout&lt;&lt;&quot;System doesnot support saved set-UID\n&quot;;
#endif
#ifdef _POSIX_CHOWN_RESTRICTED
cout&lt;&lt;&quot;System Supports Change Ownership feature:&quot;&lt;&lt;endl;
#else
cout&lt;&lt;&quot;System doesnot support change Ownership feature\n&quot;;
#endif
#ifdef _POSIX_NO_TRUNC
cout&lt;&lt;&quot;System Supports Path truncation option:&quot;&lt;&lt;endl;
```

```
#else
cout&lt;&lt;&quot;System doesnot support Path truncation \n&quot;;
#endif
#ifdef _POSIX_VDISABLE
cout&lt;&lt;&quot;System Supports Disable Character for files:&quot;&lt;&lt;endl;
#else
cout&lt;&lt;&quot;System doesnot support Disable Characters \n&quot;;
#endif
return 0;
```

Output:



```
ankith@ankith-Inspiron-3521:~/Desktop/All Programs/POSIX_FILES$ gcc posixconfig.c
ankith@ankith-Inspiron-3521:~/Desktop/All Programs/POSIX_FILES$ ./a.out
System supports job control
System supports saved set-UID and saved set-GID
chown_restricted option is 0
Pathname trunc option is 1
Disable character for terminal files is 0
ankith@ankith-Inspiron-3521:~/Desktop/All Programs/POSIX_FILES$
```

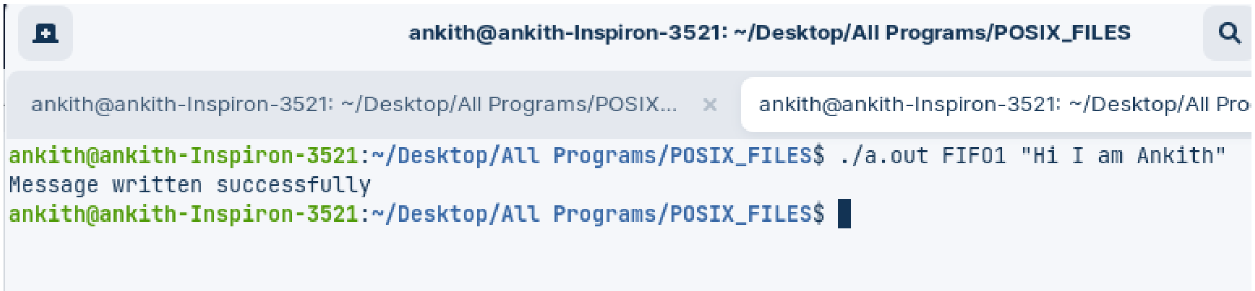
Experiment No 20

Write a C/C++ program which demonstrates Interprocess Communication between a reader process and a writer process. Use mkfifo, open, read, write and close apis in your program.

```
#include <sys/stat.h>
        #include <string.h>
        #include <fcntl.h>
        #include <stdio.h>
        #include <unistd.h>
        int main(int argc, char *argv[])
        {
        char buf[100];
        int fd,n;
        mkfifo (argv[1], S_IFIFO |0777);
        if (argc == 3){
        fd =  open (argv[1], O_WRONLY);
        write (fd, argv[2], strlen(argv[2]));
        close(fd);}
        if (argc ==2){
        fd = open (argv[1], O_RDONLY);
        n= read (fd, buf, sizeof(buf));
        buf[n]='\0';
        printf ("%s", buf);
        close(fd);
        }
```

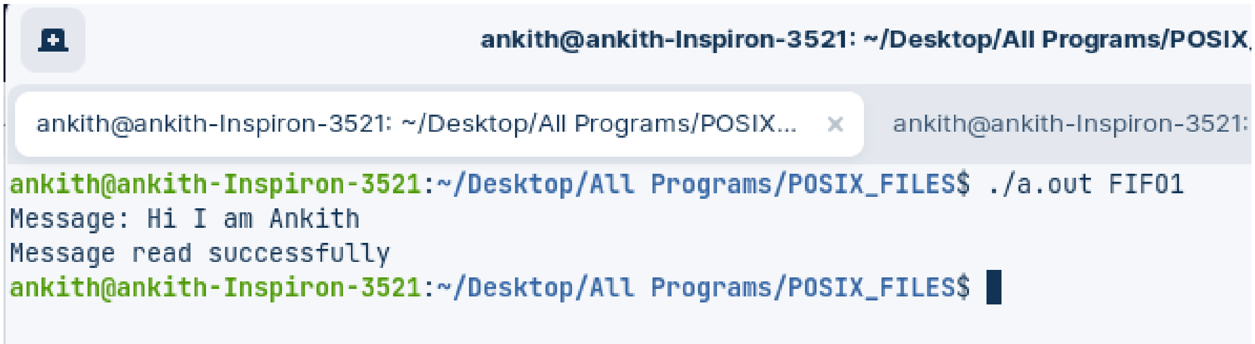
OUTPUT:

Writer process:


ankith@ankith-Inspiron-3521: ~/Desktop/All Programs/POSIX_FILES
ankith@ankith-Inspiron-3521: ~/Desktop/All Programs/POSIX...
ankith@ankith-Inspiron-3521: ~/Desktop/All Pro

```
ankith@ankith-Inspiron-3521:~/Desktop/All Programs/POSIX_FILES$ ./a.out FIFO1 "Hi I am Ankith"
Message written successfully
ankith@ankith-Inspiron-3521:~/Desktop/All Programs/POSIX_FILES$
```

Reader process:


ankith@ankith-Inspiron-3521: ~/Desktop/All Programs/POSIX
ankith@ankith-Inspiron-3521: ~/Desktop/All Programs/POSIX...
ankith@ankith-Inspiron-3521:

```
ankith@ankith-Inspiron-3521:~/Desktop/All Programs/POSIX_FILES$ ./a.out FIFO1
Message: Hi I am Ankith
Message read successfully
ankith@ankith-Inspiron-3521:~/Desktop/All Programs/POSIX_FILES$
```