OS RECORD

EX NO:	INSTALLATION OF WINDOWS OPERATING SYSTEM CASE STUDY
DATE:	

AIM:

To know how to install the windows operating system.

INTRODUCTION:

Each version of Microsoft Windows is installed on a computer using similar steps. While there are steps in the installation process that differ between versions of Windows, the following general steps and guidelines help you install Windows on your computer. The steps below are for all recent versions of Windows, including Windows 98, Windows ME, Windows 2000, Windows XP, Windows Vista, Windows 7, Windows 8, Windows 10, and Windows 11. These steps even work for earlier versions (e.g., Windows 95) as long as you use the disc version. The floppy diskette version is similar, but it requires additional steps.

CHECK HARDWARE COMPATIBILITY

Before installing or upgrading Windows on your computer, check the hardware in the computer to make sure it's compatible with that version of Windows. Microsoft provides a Windows Compatible Products List for checking if the hardware in your computer is compatible with the chosen version of Windows.

If one or more pieces of hardware is not compatible with the chosen Windows version, we recommend replacing that hardware with compatible hardware or purchasing a new computer. Having compatible hardware in your computer helps ensure the Windows install or upgrade process is successful.

GENUINE WINDOWS CD, DVD, OR USB THUMB DRIVE

First, you need a genuine copy of the Microsoft Windows operating system installation CD, DVD, or USB thumb drive. A genuine Windows product key is included with the installation disc, which is required to activate Windows after installation. If you have an OEM (original equipment manufacturer) computer,the Windows product key is often on the back or side of the computer.

If you have an OEM computer (e.g., Acer, Dell, HP, etc.), the computer will not have a genuine Windows CD, DVD, or USB thumb drive. Instead, you would reinstall Windows and the software using a hidden partition or a set of restore discs.

The steps mentioned on this page would still work, but you'd need a copy of Windows. You can borrow a friend's Windows disc, as long as it's the same version of Windows that came with the computer and have a product key.

HOW TO ENTER AND EXIT THE BIOS OR CMOS SETUP

Every computer provides a way to enter the BIOS or CMOS setup, which lets you configure some basic settings for your computer and its hardware components. Below is a list of common methods for accessing and exiting your computer's BIOS or CMOS setup and recommendations if you're having trouble.

ACCESS BIOS OR CMOS ON NEWER COMPUTERS:

Computers manufactured in the last few years allow you to enter the BIOS or CMOS setup by pressing one of the five keys listed below during the boot process.

- F1
- F2
- F10
- Delete or Del
- Esc

- If pressing F2 opens a diagnostics tool, your setup key is likely F10.
- F10 is also used for the boot menu. If pressing F10 opens a boot menu, your setup key is likely F2.

Setup keys are to be pressed as the computer is booting up. Most users see a message similar to the example below upon startup. Some older computers may also display a flashing block of text to indicate when to press F1 or F2.

Press F2 to enter BIOS setup. Once you have successfully entered the CMOS setup, a screen similar to the example below appears. Your CMOS setup may look different, depending on the manufacturer, but it should still share a lot of the same options and information.

HOW DO I CHANGE AND SAVE CHANGES IN CMOS SETUP

Once in CMOS setup, the method for changing the settings often depends on the BIOS manufacturer. You may use the arrow keys and the Enter key to select categories and change their values. Some manufacturers may have you press the Page up and Page down keys to change the values.

If you're trying to change the clock, speed, or other settings and don't have the option available, the motherboard doesn't support it. If you believe it should be supported, you may need a BIOS update.

HOW DO I SAVE THE CHANGES?

If any changes are made, you need to save those changes, which is usually done by pressing the F10 key on the keyboard. If F10 doesn't work, look at the bottom or top of the screen for the key that's used to save the settings.

ACCESS BIOS OR CMOS ON OLDER COMPUTERS:

Unlike today's computers, older computers (before 1995) had numerous methods of entering the BIOS setup. Below is a listing of key sequences to press as the computer boots to enter the BIOS setup.

- ❖ Ctrl+Alt+Esc
- ❖ Ctrl+Alt+Insert
- ❖ Ctrl+Alt+Enter
- ❖ Ctrl+Alt+S
- ❖ Page Up
- ❖ Page Down

Acer BIOS:

If your Acer computer cannot boot or you want to restore the BIOS to its original settings, press and hold the F10 as you turn on the computer. While holding F10, two beeps should be heard to indicate the settings are restored.

AMI BIOS:

Older AMI BIOS could be restored to bootable settings by pressing and holding ,Insert as the computer is booting.

BIOS or CMOS diskettes:

Early 486, 386, and 286 computers required a floppy disk to enter the BIOS setup. These diskettes may be called ICU, BBU, or SCU disks. Because these diskettes are unique to your computer manufacturer, you must obtain the diskettes from them. See the computer manufacturers list for contact information.

Access BIOS on early IBM computers:

Some early IBM computers require you to press and hold both mouse buttons as the computer boots to enter the BIOS setup.

Additional suggestions for accessing BIOS or CMOS:

Finally, if none of the above suggestions allow access to the setup, try generating a stuck key error, which gives an option to enter the BIOS or CMOS setup. To do this, press and hold any key on the keyboard, and do not let go (you may get several beeps as you are doing this). Keep pressing the key until the computer stops booting, and you have the option to enter setup. If this does not work, make sure your keyboard is working.

HOW TO EXIT THE BIOS OR CMOS:

There are several ways to exit the BIOS or CMOS setup depending on the computer's type. The most common methods include the following.

- Press the Esc key to exit without saving any changes.
- Press the F10 or F12 key to save changes and exit.
- Access the **Exit** or **Save & Exit** tab in setup and select the **Exit** or **Save and Exit** option.

If you have trouble exiting the BIOS or CMOS setup, you can try the following methods to fix the problem.

- Press the F9 key to load default settings and press F10 to save and exit.

  Access the **Exit** or **Save & Exit** tab in setup, select the **Load Optimized Defaults** option, select **Yes**, and press Enter. Any changes made are reverted, and the BIOS or CMOS is set back to default settings.
- Turn off the computer (use only as a last resort and with caution).

INSTALLING OR UPGRADING WINDOWS:

To start the Windows install or upgrade process, you need to configure your computer to boot from a CD or DVD before booting to the hard drive. Changing the boot process forces the computer to look for the Windows installation disc before booting from the hard drive.

1. Open the CMOS setup.

2. Change the computer's boot order. Set the CD, DVD, or disc drive as the first boot device if you are trying to boot from a disc. Or, set the first boot device to your USB drive if you're trying to boot from a USB thumb drive. If the drive is not shown, keep

the disc is inserted and reboot the computer. With the disc in the drive, BIOS should recognize and include it in the list.

3. Save the settings change and exit BIOS.

Note: Once you have updated the boot order, you can begin the Windows installation process.

4. Place the Windows disc in the CD/DVD drive or USB thumb drive into the back of the computer.

5. Turn on or restart the computer. As the computer starts up, it should detect the installation disc or drive and show a message similar to *Press any key to boot from CD*. Press any key on the keyboard to have the computer boot from the Windows disc or drive.

6. After the Windows install begins, there are several prompts that you need to answer. Select either **Yes** or the appropriate option to install Windows.

7. When asked which partition to install Windows onto, select the main partition, usually the C: drive or one labeled "Unallocated partition". If upgrading Windows, select the existing installation of Windows on the hard drive.

8. You may be asked if you want to erase all contents on the hard drive, then install Windows. We recommend you choose this option, as it also formats the hard drive to allow the Windows operating system to be installed.

9. The computer may need to restart several times during the Windows install process. The restarts are normal and if prompted to restart, select the **Yes** option.

10. When the install process is nearly complete, the Windows configuration option screens are shown. On these screens, you may be asked to select the time zone you live in, your preferred language, and the account's name you use to access Windows. Select the appropriate options and enter the appropriate information on each configuration screen.

11. The Windows install process is completed when the computer prompts you to log in or when it loads into Windows.

RESULT:

Thus the study exercise for installing windows operating system is studied successfully.

EX NO:	BASIC UNIX COMMANDS
DATE:	

AIM:

To implement the Basic Unix commands.

COMMANDS:

1.1 GENERAL PURPOSE COMMANDS:

1. THE DATE COMMAND:

The **date** command can also be used with following format.

+ %m	To display only month	$ date + %m
+ %h	To display month name	$ date + %h
+ %d	To display day of month	$ date + %d
+ %y	To display last two digits of the year	$ date + %y
+ %H	To display Hours	$ date + %H
+ %M	To display Minutes	$ date + %M
+ %S	To display Seconds	$ date + %S

[exam@fosslab ~]$ date

Sat Feb 14 11:48:18 IST 2015

2. THE echo COMMAND:

[exam@fosslab ~]$ echo learning unix is intresting

learning unix is intresting

3. THE Who COMMAND:

[exam@fosslab ~]$ who

exam pts/0 2015-02-14 11:48 (192.168.8.5)

exam20 pts/0 2015-02-14 11:48 (192.168.8.6)

4. THE Who am i COMMAND:

[exam@fosslab ~]$ who am i

exam pts/0 2015-02-14 11:48 (192.168.8.5)

5. THE UNIX CALENDER:

Cal:

[exam@fosslab ~]$ cal 2 2015

February 2015

Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

6. THE Finger COMMAND:

[exam@fosslab ~]$ finger exam25

Login: exam Name:

Directory: /home/exam Shell: /bin/bash

On since Sat Feb 14 11:48 (IST) on pts/0 from 192.168.8.5

No mail. No Plan.

7. THE id COMMAND:

[exam@fosslab ~]$ id

uid=662(exam) gid=662(exam) groups=662(exam)

8. THE tty COMMAND:

[exam@fosslab ~]$ tty

/dev/pts/0

9. VIEW THE CONTENT:

[exam@fosslab ~]$ cat test

welcome to operating system. it is an interesting subject.

10. CLEARING THE SCREEN

[exam@fosslab student ~]$ tput clear

1.2 DIRECTORY COMMANDS

1.CREATE A DIRECTORY:

[exam@fosslab ~]$ mkdir student

[exam@fosslab ~]$ cd student

[exam@fosslab student]$

2 CURRENT WORKING DIRECTORY:

[exam@fosslab ~]$ pwd

/home/exam

3. REMOVING A DIRECTORY:

[exam@fosslab student]$ rmdir student [exam@fosslab ~]$

4. LISTING THE FILES AND DIRECTORIES:

ls:

[exam@fosslab student~]$ ls

a.out data program public_html share stud25 student test.c test1

5. CHANGING THE WORKING DIRECTORY:

Cd :Change directory

Pwd: to view the full path of current directory

[exam@fosslab ~]$ pwd

/home/exam/

[exam@fosslab ~]$ mkdir student

[exam@fosslab ~]$ cd student

[exam@fosslab student]$ pwd

/home/exam/student/

6. THE PATH

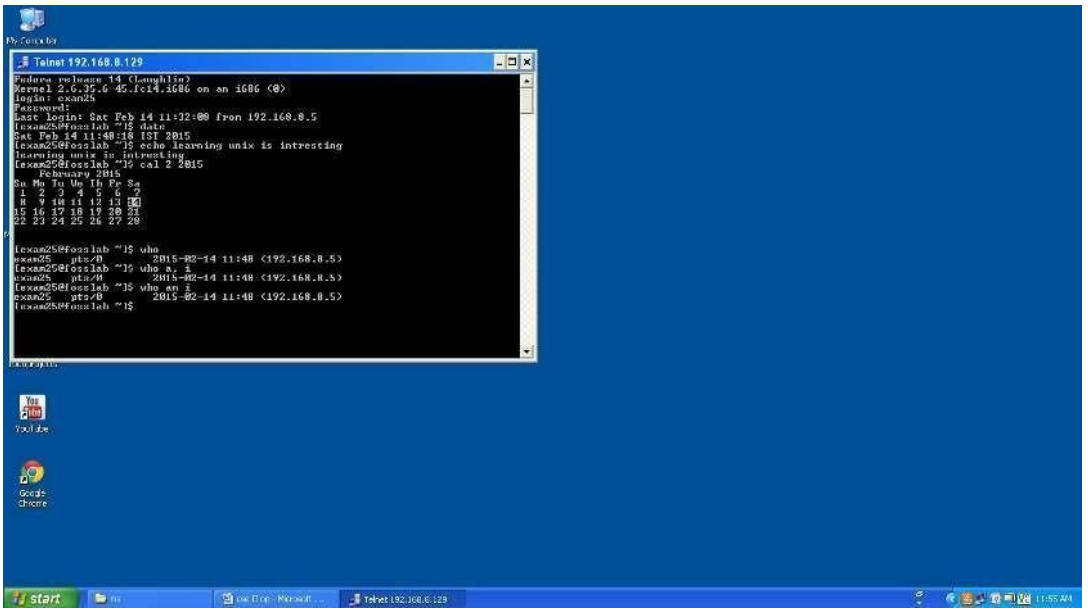
[exam@fosslab student~]$ echo $PATH

/usr/lib/qt3.3/bin:/usr/lib/mpich2/bin:/usr/lib/ccache:/usr/local/bin:/b

in:/usr/bin:/usr/local/sbin:/usr/sbin:/sbin:/usr/lib/alliance/bin:/usr/lib

exec/sdcc:/opt/ns2/bin:/opt/ns2/tcl8.4.14/unix:/opt/ns2/tk8.4.14/unix

:/opt/ns2/ns-2.34/:/opt/ ns2/nam-1.14/:/home/exam25/bin



7.CHANGE THE PASSWORD:

[exam@fosslab ~]$ passwd

(current) UNIX PASSWORD: ******** New Password: ********

Re-enter Password: ********

$

1.3 FILE HANDLING COMMANDS

1. THE CAT COMMAND:

[exam@fosslab ~]$ cat>test

welcome to operating system. it is an interesting subject.

2. COPYING THE FILE:

Cp:

[exam@fosslab student~]$ cat test

welcome to operating system. it is an interesting subject.

[exam@fosslab student ~]$ cat test1

the basic unix commands are cat, pwd, mkdir, rmdir, cd, path,clear,cp,rm, mv,ls,wc.

[exam@fosslab student~]$ cp test test1

[exam@fosslab student ~]$cat test1

welcome to operating system. it is an interesting subject.

3. REMOVING A FILE:

Rm:

[exam@fosslab student ~]$ rm test1

[exam@fosslab student ~]$ cat test1

Cat :test1: No such file or directory

4. MOVING A FILE:

[exam@fosslab student~]$ cat >test1

the basic unix commands are cat,pwd,clear,cp,mv,rm,mv,test..^C

mv:

[exam@fosslab student ~]$ mv test test1

[exam@fosslab student ~]$ cat test 1

the basic unix commands are cat, pwd, mkdir, rmdir, cd, path,clear,cp,rm, mv,ls,wc.

5. DIRECTING OUTPUT TO A FILE:

[exam@fosslab student~]$ ls>test

[exam@fosslab student ~]$ cat test

a.out

data

mylist

program

public_html

share

[exam@fosslab ~]$

6. COUNTING NUMBER OF WORDS IN A FILE:

wc:

[exam@fosslab ~]$ wc test

10 10 70 test

7. THE FILE COMMAND

[exam@fosslab ~]$ file test

test: ASCII Pascal program text

[exam@fosslab ~]$ cat test

a.out

data

mylist

program

public_html

share

8. CHANGING THE FILE PERMISSION:

Chmod:

[exam@fosslab ~]$ chmod u-wx test

[exam@fosslab ~]$ cat > test

-bash: test: Permission denied

1.4 FILTER COMMANDS

1. SORTING THE CONTENTS: (sort)

[exam@fosslab ~]$ sort test1

a.out

data

mylist

program

public_html

share

2. THE uniq COMMAND:

[exam@fosslab ~]$ cat > dept.lst

01 accounts 3977

01 accounts 3977

02 admin 1707

03 marketing 39

06 sales 1008^C

[exam@fosslab ~]$ uniq dept.lst

01 accounts 3977

02 admin 1707

03 marketing 39

04 personel 77

05 production 1739

3. ADDING LINE NUMBERS:

nl

[exam@fosslab ~]$ nl test1

1 a.out

2 data

3 mylist

4 program

5 public_html

SELECTING FIELDS FROM A LINE:

cut

[exam@fosslab ~]$ cat >std

Aswini

Bharathi

Charu

Deepa^C

[exam@fosslab ~]$ cut -c1 std

A

B

C

D

5. THE more COMMAND:

[exam@fosslab ~]$ more test1

a.out

data

mylist

program

public_html

6. PASTING FILES:

[exam@fosslab ~]$ paste std

Aswini

Bharathi

Charu

Deepa

7. COMPARING FILES:

cmp

[exam@fosslab ~]$ cmp test1 std

test1 std differ: byte 1, line 1

8. THE mesg COMMAND:

mesg

[exam@fosslab ~]$ mesg exam25

Usage: mesg [y|n]

[exam@fosslab ~]$ y

Message from exam25@fosslab.linuxpert.in on pts/0 at 12:34 ...

hiiiii ... study well for your exams

hiiiii ... study well for your exams

9. THE write COMMAND:

write

[exam@fosslab ~]$ write exam25

Message from exam25@fosslab.linuxpert.in on pts/0 at 12:30 ...

Hiiii

Hiiii

10. SENDING MESSAGE TO ALL THE USERS:

wall:

[exam@fosslab ~]$ wall os laboratory lab records

Broadcast message from exam25@fosslab.linuxpert.in (pts/0) (Wed Jan 21 13:21:os laboratory lab records

11. SENDING MAIL TO USERS:

mail:

[exam@fosslab ~]$ mail user2 Subject: about operating systems

THE OPERATING SYSTEMS BOOk is a "practice of some materials to gain knowledge" EOT

12. THE reply COMMAND:

reply

reply exam25

Thanks For Giving A Mail

13. NO LOGGING OUT:

[exam@fosslab ~]$ std.lst test1.lst & [1] 4663

14. THE nohup COMMAND:

[exam@fosslab ~]$ nohup test1.lst &

[1] 4685

15. Execution of a Job With Low Priority:

nice

[exam@fosslab ~]$ nice wc -l std &

[2] 4721

[1] Exit 127 nohup test1.lst

[exam@fosslab ~]$ 4 std

16. THE at COMMAND:

[exam@fosslab ~]$ at 12.54pm

at> today at evening 4pm

at> 21.30 tue next at 9.20

at> 2pm apr3 next 3rd

17. THE sleep COMMAND:

[exam@fosslab ~]$ sleep 1

18. KILLING PROCESSES WITH SIGNALS

kill

[exam@fosslab ~]$ kill 4921

RESULT:

Thus the basic UNIX commands were executed successfully.

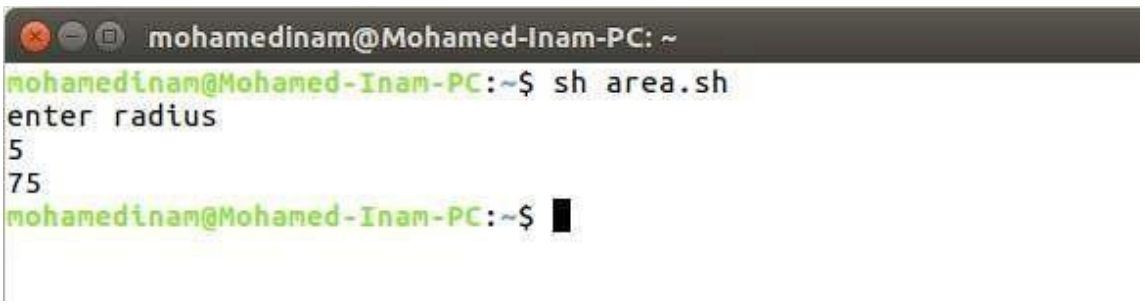
SHELL PROGRAMMING

AREA OF THE CIRCLE

SHELL SCRIPT:

```
echo "enter radius"
read r
val=`expr 3 \* $r \* $r`
echo "$val"
```

OUTPUT:



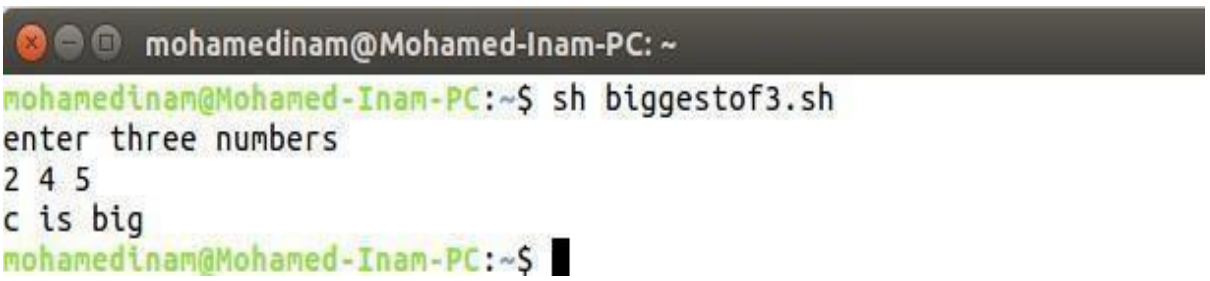
SHELL PROGRAMMING

BIGGEST OF THREE NUMBERS

SHELL SCRIPT:

```
echo "Enter three numbers"
read a b c
if [ $a -gt $b ] && [ $a -gt $c ]; then
  echo "a is big"
elif [ $b -gt $c ]; then
  echo "b is big"
else
  echo "c is big"
fi
```

OUTPUT:



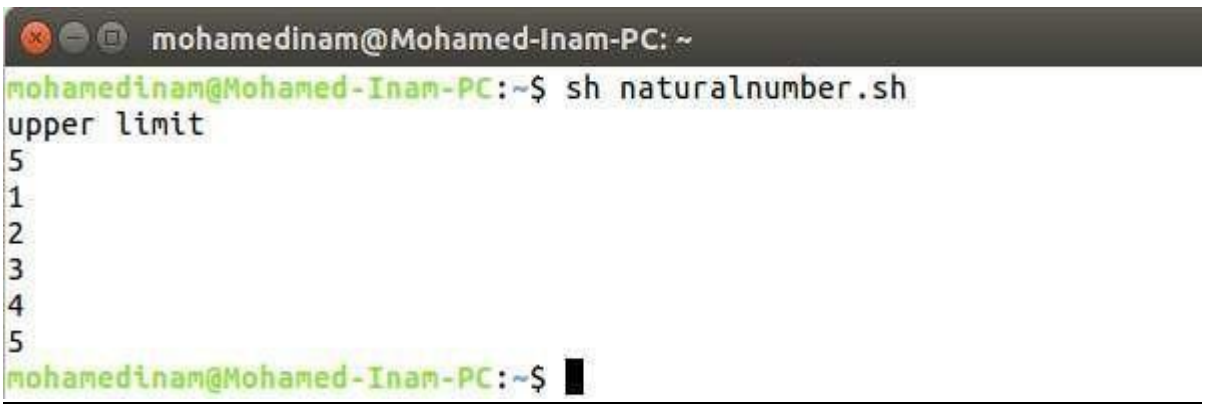
SHELL PROGRAMMING

NATURAL NUMBERS UPTO 'N'

SHELL SCRIPT:

```
echo "Enter upper limit"
read n
i=0
while [ $i -lt $n ]
do
  echo $i
  i=`expr $i + 1`
done
```

OUTPUT:



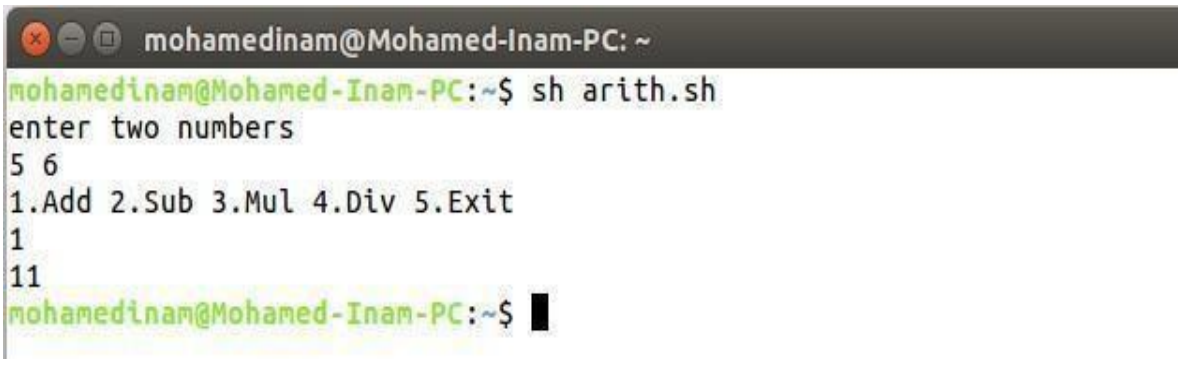
SHELL PROGRAMMING

ARITHMETIC OPERATIONS

SHELL SCRIPT:

```
echo "Enter two numbers"
read a b
echo "1. Add 2. Sub 3. Mul 4. Div 5. Exit"
read op
case $op in
  1) c=`expr $a + $b` ;;
  2) c=`expr $a - $b` ;;
  3) c=`expr $a \* $b` ;;  # The asterisk needs to be escaped
  4) c=`expr $a / $b` ;;    # Ensure division works correctly
  5) exit ;;
  *) echo "Invalid option" ;;  # Added for handling invalid options
esac
echo $c
```

OUTPUT:



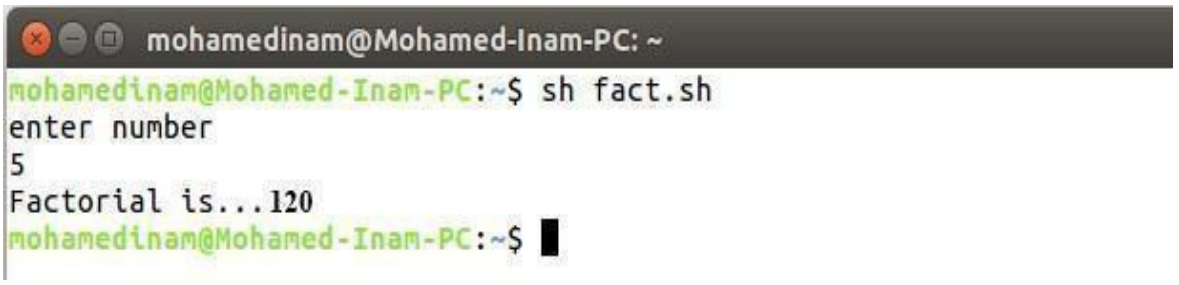
SHELL PROGRAMMING

FACTORIAL OF A NUMBER

SHELL SCRIPT:

```
echo "enter number"
read n
i=1
f=1
while [ $i -le $n ]
do
f=`expr $f \* $i`
i=`expr $i + 1`
done
echo "Factorial is...$f"
```

OUTPUT:



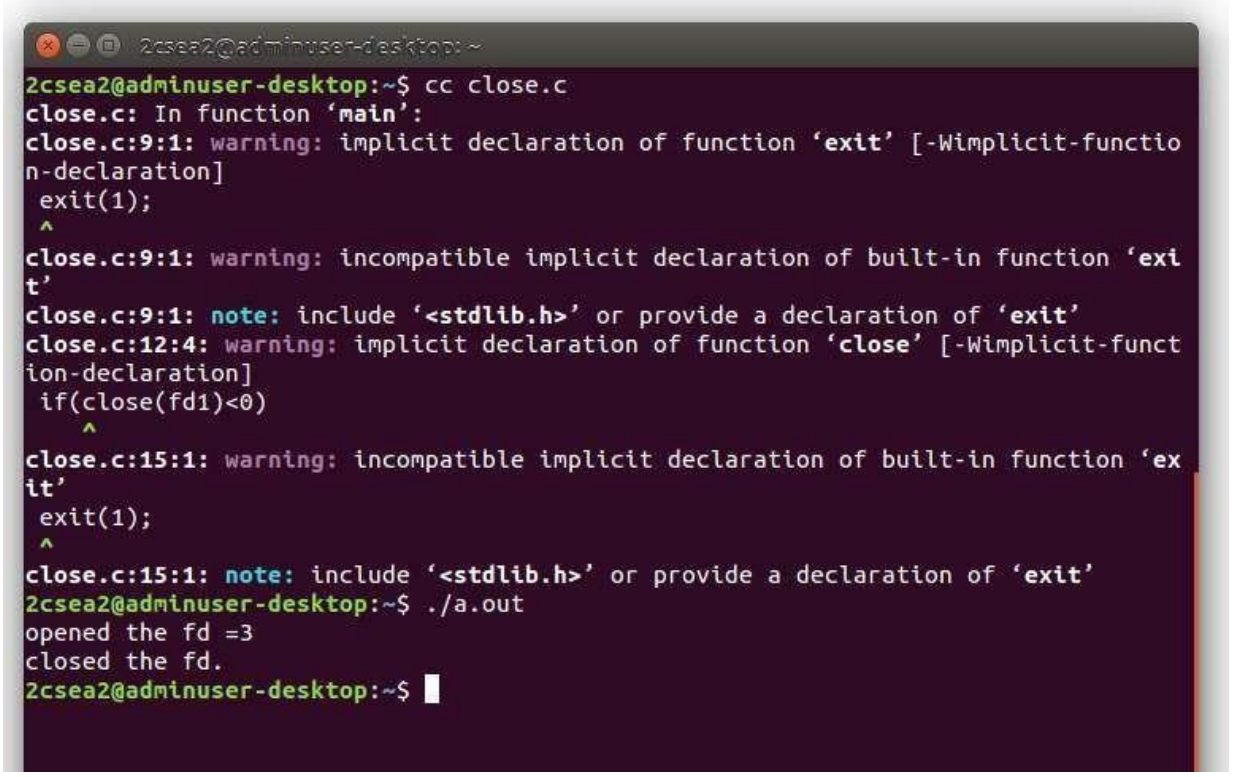
SYSTEM CALLS OF UNIX OPERATING SYSTEM

CLOSE()

PROGRAM:

```
#include<stdio.h>
#include<fcntl.h>
#include<unistd.h>
#include<stdlib.h>

int main()
{
   int fd1 = open("foo.txt", O_RDONLY);
   if (fd1 < 0)
   {
      perror("c1");
      exit(1);
   }
   printf("opened the fd = %d\n", fd1);

   if (close(fd1) < 0)
   {
      perror("c1");
      exit(1);
   }

   printf("closed the fd.\n");
   return 0;
}
```

OUTPUT:


2csea2@adminuser-desktop:~
2csea2@adminuser-desktop:~$ cc close.c
close.c: In function 'main':
close.c:9:1: warning: implicit declaration of function 'exit' [-Wimplicit-functio
n-declaration]
exit(1);
^
close.c:9:1: warning: incompatible implicit declaration of built-in function 'exi
t'
close.c:9:1: note: include '<stdlib.h>' or provide a declaration of 'exit'
close.c:12:4: warning: implicit declaration of function 'close' [-Wimplicit-funct
ion-declaration]
if(close(fd1)<0)
^
close.c:15:1: warning: incompatible implicit declaration of built-in function 'ex
it'
exit(1);
^
close.c:15:1: note: include '<stdlib.h>' or provide a declaration of 'exit'
2csea2@adminuser-desktop:~$ ./a.out
opened the fd =3
closed the fd.
2csea2@adminuser-desktop:~$

SYSTEM CALLS OF UNIX OPERATING SYSTEM

GETPID()

PROGRAM:

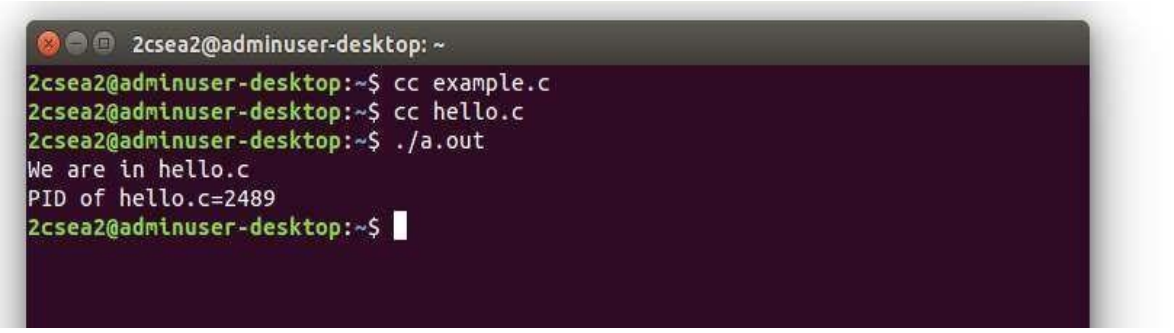
Example.c

```
#include <stdio.h>
#include <unistd.h>
#include <stdlib.h>
int main(int argc, char *argv[]) {
   printf("PID of example.c = %d\n", getpid());
   char *args[] = {"hello", "c", "programming", NULL};
   if (execv("./hello", args) == -1) {
      perror("execv failed");
      exit(EXIT_FAILURE);
   }
   printf("BACK TO EXAMPLE.C\n");
   return 0;
}
```

Hello.c

```
#include<stdio.h>
#include<unistd.h>
#include<stdlib.h>
int main (int argc, char *argv[])
{
 printf("We are in hello.c\n");
printf("PID of hello.c=%d\n",getpid());
return 0;
}
```

OUTPUT:


2csea2@adminuser-desktop: ~
2csea2@adminuser-desktop:~$ cc example.c
2csea2@adminuser-desktop:~$ cc hello.c
2csea2@adminuser-desktop:~$ ./a.out
We are in hello.c
PID of hello.c=2489
2csea2@adminuser-desktop:~$

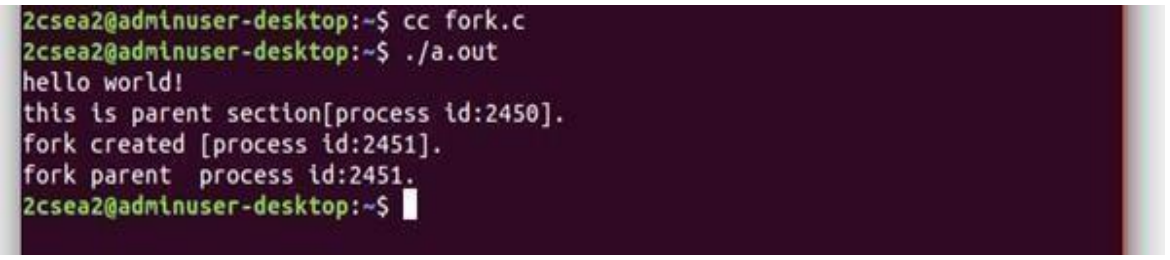
SYSTEM CALLS OF UNIX OPERATING SYSTEM

FORK()

PROGRAM:

```
#include <stdio.h>
#include <unistd.h>

int main() {
   int id;
   printf("hello world!\n");
   id = fork();

   if (id > 0) {
      printf("this is parent section [process id: %d].\n", getpid());
   }
   else if (id == 0) {
      printf("fork created [process id: %d].\n", getpid());
      printf("fork parent process id: %d.\n", getppid());
   }
   else {
      printf("fork creation failed!!\n");
   }

   return 0;
}
```

OUTPUT:


2csea2@adminuser-desktop:~$ cc fork.c
2csea2@adminuser-desktop:~$ ./a.out
hello world!
this is parent section[process id:2450].
fork created [process id:2451].
fork parent process id:2451.
2csea2@adminuser-desktop:~$

SYSTEM CALLS OF UNIX OPERATING SYSTEM

EXIT()

PROGRAM:

```
#include<stdio.h>
#include<stdlib.h>
#include<sys/wait.h>
#include<unistd.h>

int main() {
   pid_t cpid;
   if (fork() == 0) {
      exit(0);  // terminate child
   } else {
      cpid = wait(NULL);  // parent waits for child to terminate
      printf("Parent pid = %d\n", getpid());
      printf("Child pid = %d\n", cpid);
   }
   return 0;
}
```

OUTPUT:

```
Parent pid    = 12345678
Child pid     = 89546848
```

SYSTEM CALLS OF UNIX OPERATING SYSTEM

WAIT()

PROGRAM:

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

int main() {
   if (fork() == 0) {
      printf("HC: hello from child\n");
   } else {
      printf("HP: hello from parent\n");
      wait(NULL);
      printf("CT: child has terminated\n");
   }
   printf("Bye\n");
   return 0;
}
```

OUTPUT:

```
HP: hello from parent
HC: hello from child
HC: Bye
CT: child has terminated
```

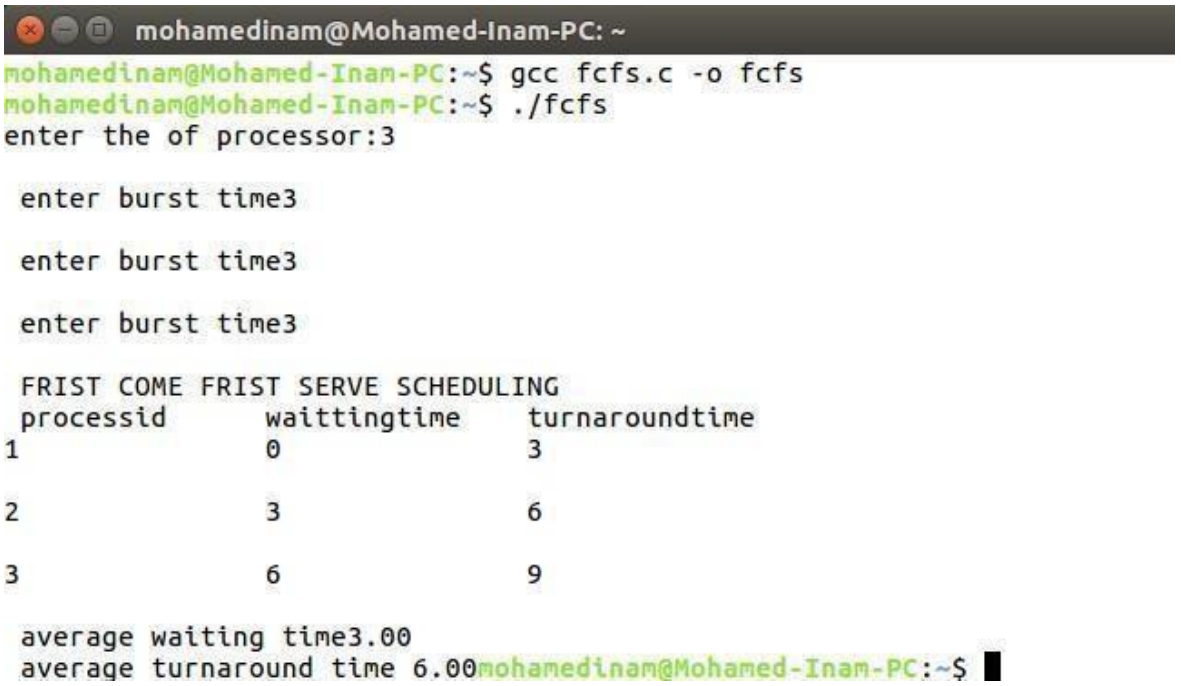
CPU SCHEDULING ALGORITHMS

FIRST COME FIRST SERVE (FCFS)

PROGRAM:

```
#include<stdio.h>

void main() {
   int i, n, sum, wt, tat, twt, ttat;
   int t[10];  // Array to store burst times of the processes
   float awt, atat;

   printf("Enter the number of processes: ");
   scanf("%d", &n);

   // Input burst times for each process
   for (i = 0; i < n; i++) {
      printf("\nEnter burst time for process %d: ", i + 1);
      scanf("%d", &t[i]);
   }

   printf("\nFIRST COME FIRST SERVE SCHEDULING");
   printf("\nProcess ID\tWaiting Time\tTurnaround Time\n");

   sum = 0;
   twt = 0;
   ttat = t[0];  // Turnaround time for the first process is just its burst time

   // Process the first process
   printf("1\t\t0\t\t%d\n", t[0]);

   // Calculate waiting time and turnaround time for other processes
   for (i = 1; i < n; i++) {
      sum += t[i - 1];  // Sum of burst times of all previous processes
      wt = sum;         // Waiting time for current process
      tat = sum + t[i];  // Turnaround time for current process
      twt += wt;        // Accumulate total waiting time
      ttat += tat;      // Accumulate total turnaround time
      printf("%d\t\t%d\t\t%d\n", i + 1, wt, tat);
   }

   // Calculate average waiting time and average turnaround time
   awt = (float)twt / n;
   atat = (float)ttat / n;

   // Print the average times
   printf("\nAverage Waiting Time: %.2f", awt);
   printf("\nAverage Turnaround Time: %.2f", atat);
}
```

OUTPUT:


mohamedinam@Mohamed-Inam-PC: ~
mohamedinam@Mohamed-Inam-PC:~$ gcc fcfs.c -o fcfs
mohamedinam@Mohamed-Inam-PC:~$ ./fcfs
enter the of processor:3
enter burst time3
enter burst time3
enter burst time3
FRIST COME FRIST SERVE SCHEDULING
processid waittingtime turnaroundtime
1 0 3
2 3 6
3 6 9
average waiting time3.00
average turnaround time 6.00mohamedinam@Mohamed-Inam-PC:~$

CPU SCHEDULING ALGORITHMS

SHORTEST JOB FIRST (SJF)

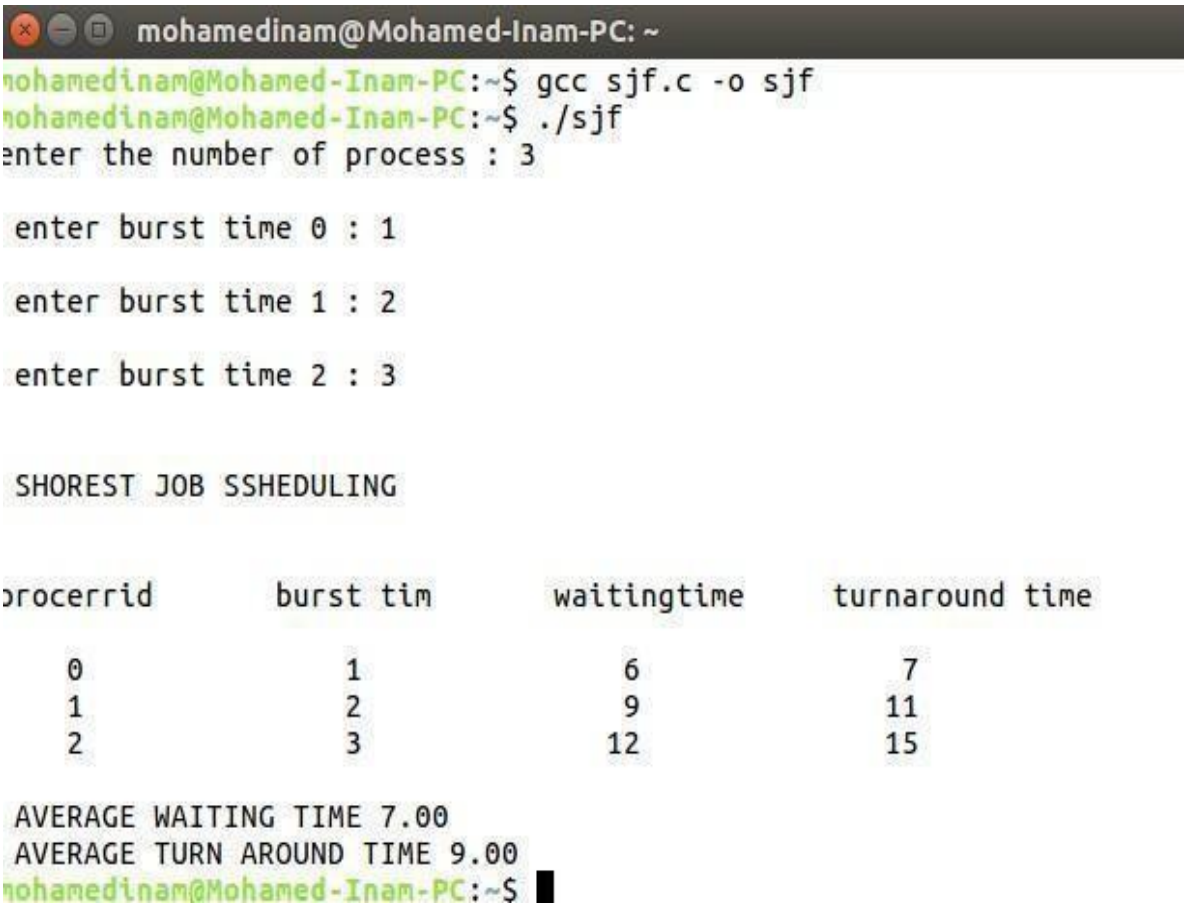
PROGRAM:

```
#include<stdio.h>

void main() {
   int i, j, n, sum, wt[10], tt[10], twt = 0, ttat = 0;
   int t[10], p[10];  // t[] for burst times, p[] for process IDs
   float awt, atat;

   printf("Enter the number of processes: ");
   scanf("%d", &n);

   // Input burst times for processes
   for (i = 0; i < n; i++) {
      printf("\nEnter burst time for process %d: ", i + 1);
      scanf("%d", &t[i]);
      p[i] = i;  // Assign process IDs
   }

   // Sorting the processes based on burst time using selection sort
   for (i = 0; i < n - 1; i++) {
      for (j = i + 1; j < n; j++) {
         if (t[i] > t[j]) {
            // Swap burst times
            int temp = t[i];
            t[i] = t[j];
            t[j] = temp;
            // Swap process IDs to maintain correct order
            temp = p[i];
            p[i] = p[j];
            p[j] = temp;
         }
      }
   }
```

```
// Printing header for the output
printf("\nSHORTEST JOB FIRST SCHEDULING\n");
printf("\nProcess ID\tBurst Time\tWaiting Time\tTurnaround Time\n");

wt[0] = 0;  // First process has no waiting time
sum = 0;

// Calculate waiting times for each process
for (i = 1; i < n; i++) {
   sum += t[i - 1];  // Sum of burst times of previous processes
   wt[i] = sum;      // Waiting time for current process
}

// Calculate turnaround times for each process
for (i = 0; i < n; i++) {
   tt[i] = t[i] + wt[i];  // Turnaround time = burst time + waiting time
}

// Print the results for each process
for (i = 0; i < n; i++) {
   printf("%5d\t\t%5d\t\t%5d\t\t%5d\n", p[i] + 1, t[i], wt[i], tt[i]);
}

// Calculate total waiting time and total turnaround time
for (i = 0; i < n; i++) {
   twt += wt[i];
   ttat += tt[i];
}

// Calculate average waiting time and average turnaround time
awt = (float)twt / n;
atat = (float)ttat / n;

// Print average times
```

```
    printf("\nAverage Waiting Time: %.2f", awt);
    printf("\nAverage Turnaround Time: %.2f", atat);
}
```

OUTPUT:



CPU SCHEDULING ALGORITHMS

PRIORITY – SCHEDULING ALGORITHM

PROGRAM:

```
#include<stdio.h>

void main()
{
   int i, j, n, t, twt = 0, ttat = 0;
   int tat[10], wt[10], bt[10], pid[10], pr[10];
   float awt, atat;

   printf("\n----------PRIORITY SCHEDULING\n");
   printf("Enter the number of processes: ");
   scanf("%d", &n);

   // Input burst times and priorities for each process
   for (i = 0; i < n; i++) {
      pid[i] = i; // Assign Process IDs
      printf("Enter the Burst time of Pid %d: ", i);
      scanf("%d", &bt[i]);
      printf("Enter the Priority of Pid %d: ", i);
      scanf("%d", &pr[i]);
   }

   // Sorting based on Priority using Selection Sort
   for (i = 0; i < n; i++) {
      for (j = i + 1; j < n; j++) {
         if (pr[i] > pr[j]) {
            // Swap priorities
            t = pr[i];
            pr[i] = pr[j];
            pr[j] = t;

            // Swap burst times
            t = bt[i];
            bt[i] = bt[j];
            bt[j] = t;
```

```
            // Swap process IDs
            t = pid[i];
            pid[i] = pid[j];
            pid[j] = t;
        }
    }
}

// Calculate waiting times and turnaround times
wt[0] = 0; // The first process has no waiting time
tat[0] = bt[0]; // Turnaround time for first process is its burst time

for (i = 1; i < n; i++) {
    wt[i] = wt[i - 1] + bt[i - 1]; // Waiting time is sum of burst times of previous processes
    tat[i] = wt[i] + bt[i]; // Turnaround time = waiting time + burst time
}

// Printing the results
printf("\nPid \t Priority \t Burst Time \t Waiting Time \t Turnaround Time\n");
for (i = 0; i < n; i++) {
    printf("\n %d \t\t %d \t\t %d \t\t %d \t\t %d", pid[i], pr[i], bt[i], wt[i], tat[i]);
}

// Calculate total waiting time and total turnaround time
for (i = 0; i < n; i++) {
    twt += wt[i];
    ttat += tat[i];
}

// Calculate average waiting time and average turnaround time
awt = (float)twt / n;
atat = (float)ttat / n;

// Printing average times
printf("\n\n Avg.Waiting Time: %.2f\n Avg.Turn Around Time: %.2f\n", awt, atat);
}
```

OUTPUT:

```
mohamedinam@Mohamed-Inam-PC: ~
mohamedinam@Mohamed-Inam-PC:~$ gcc priority.c -o priority
mohamedinam@Mohamed-Inam-PC:~$ ./priority

----------PRIORITY SCHEDULING----------
Enter the number of process: 4
Enter the Burst time of Pid 0: 2
Enter the Priority of Pid 0: 3
Enter the Burst time of Pid 1: 6
Enter the Priority of Pid 1: 2
Enter the Burst time of Pid 2: 4
Enter the Priority of Pid 2: 1
Enter the Burst time of Pid 3: 5
Enter the Priority of Pid 3: 7

 ------------------------------------
Pid      Priority        Burst time      WaitingTime     TurnAroundTime

 ------------------------------------

 2               1               4               0               4
 1               2               6               4               10
 0               3               2               10              12
 3               7               5               12              17

 Avg.Waiting Time: 6.500000
 Avg.Turn Around Time: 10.750000
mohamedinam@Mohamed-Inam-PC:~$
```

CPU SCHEDULING ALGORITHMS

ROUND ROBIN – SCHEDULING ALGORITHM

PROGRAM:

```
#include <stdio.h>

void main() {
   int ts, pid[10], need[10], wt[10], tat[10], i, j, n, n1;
   int bt[10], flag[10], ttwt = 0, ttat = 0;
   float awt, atat;

   printf("\nROUND ROBIN SCHEDULING\n");
   printf("Enter the number of processes: ");
   scanf("%d", &n);
   n1 = n;

   printf("Enter the Time Slice: ");
   scanf("%d", &ts);

   // Input Burst Times and Process IDs
   for (i = 1; i <= n; i++) {
      printf("\nEnter Process ID for Process %d: ", i);
      scanf("%d", &pid[i]);
      printf("Enter Burst Time for Process %d: ", i);
      scanf("%d", &bt[i]);
      need[i] = bt[i];  // Remaining burst time initialized to the burst time
      flag[i] = 1;      // Process is still in the ready queue
      wt[i] = 0;        // Initialize waiting time to 0
   }

   // Round Robin Scheduling
   while (1) {
      int done = 1;  // Flag to check if all processes are completed

      for (i = 1; i <= n; i++) {
         if (need[i] > 0) {
            done = 0;  // If any process is pending, set done to 0

            if (need[i] > ts) {
               need[i] -= ts;  // Reduce the remaining time by time slice
               for (j = 1; j <= n; j++) {
                  if (i != j && need[j] > 0) {
                     wt[j] += ts;  // Increment waiting time for other processes
                  }
               }
            } else {
               for (j = 1; j <= n; j++) {
                  if (i != j && need[j] > 0) {
                     wt[j] += need[i];  // Add the remaining burst time to waiting times
```

```
                }
            }
            need[i] = 0;  // Mark this process as completed
        }
      }
    }

    if (done) {
      break;  // All processes are completed, exit the loop
    }
  }

  // Calculate Turnaround Time and Total Waiting Time
  for (i = 1; i <= n1; i++) {
    tat[i] = bt[i] + wt[i];  // Turnaround time = burst time + waiting time
    ttwt += wt[i];           // Total waiting time
    ttat += tat[i];          // Total turnaround time
  }

  awt = (float)ttwt / n1;  // Average Waiting Time
  atat = (float)ttat / n1; // Average Turnaround Time

  // Output the results
  printf("\nROUND ROBIN SCHEDULING ALGORITHM\n");
  printf("\nProcess \t Process ID \t Burst Time \t Waiting Time \t Turnaround Time\n");
  for (i = 1; i <= n1; i++) {
    printf("\n%5d \t %5d \t\t %5d \t\t %5d \t\t %5d\n", i, pid[i], bt[i], wt[i], tat[i]);
  }

  printf("\nThe average Waiting Time = %.2f", awt);
  printf("\nThe average Turnaround Time = %.2f", atat);
}
```

OUTPUT:

```
mohamedinam@Mohamed-Inam-PC: ~
mohamedinam@Mohamed-Inam-PC:~$ gcc rr.c -o rr
mohamedinam@Mohamed-Inam-PC:~$ ./rr

 ROUND ROBIN SCHEDULING
Enter the number of processors :
4

 Enter the Timeslice :
5

 Enter the process ID 1 : 5
 Enter the Burst Time for the process10

 Enter the process ID 2 : 6
 Enter the Burst Time for the process15

 Enter the process ID 3 : 7
 Enter the Burst Time for the process20

 Enter the process ID 4 : 8
 Enter the Burst Time for the process25
```

ROUND ROBIN SCHEDULING ALGORITHM

Process	Process ID	BurstTime	Waiting Time	Turnaround Time
1	5	10	15	25
2	6	15	25	40
3	7	20	25	45
4	8	25	20	45

The average Waiting Time=4.2f

The average Turn around Time=4.2f

IPC-SHARED MEMORY

PROGRAM:

Shared Memory For Writer Process

```
#include <iostream>
#include <sys/ipc.h>
#include <sys/shm.h>
#include <stdio.h>
using namespace std;
int main() {
    key_t key = ftok("shmfile", 65); // Generate a unique key
    int shmid = shmget(key, 1024, 0666 | IPC_CREAT); // Create shared memory segment
    char *str = (char *)shmat(shmid, (void *)0, 0); // Attach shared memory
    printf("Write Data : ");
    fgets(str, 1024, stdin); // Read input into shared memory
    printf("Data written in memory: %s\n", str); // Output the stored data
    shmdt(str); // Detach shared memory
    return 0;
}
```

Shared Memory For Reader Process

```
#include <iostream>
#include <sys/ipc.h>
#include <sys/shm.h>
#include <stdio.h>
using namespace std;
int main() {
    key_t key = ftok("shmfile", 65); // Generate a unique key
    int shmid = shmget(key, 1024, 0666 | IPC_CREAT); // Access shared memory
    char *str = (char *)shmat(shmid, (void *)0, 0); // Attach shared memory
    printf("Data read from memory: %s\n", str); // Read data from shared memory
```

```
    shmdt(str); // Detach shared memory
    shmctl(shmid, IPC_RMID, NULL); // Remove shared memory segment
    return 0;
}
```

OUTPUT:

Writer:

gcc write.c –o write

./write

Data written in memory

Hii

Reader:

Gcc read.c –o read

./read

Data read from memory

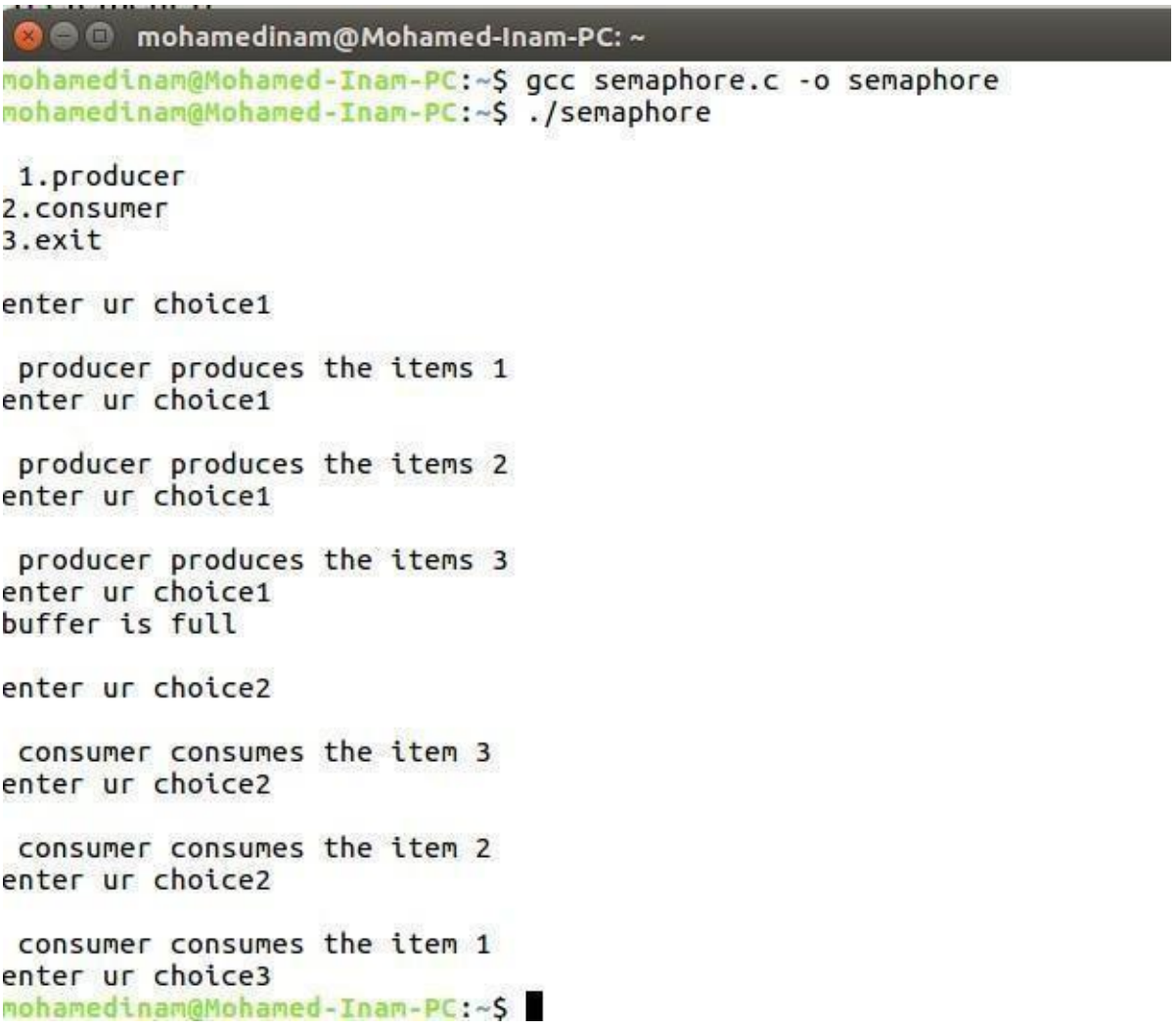
Hii

SEMAPHORES

PROGRAM:

```
#include <stdio.h>
#include <stdlib.h>

int mutex = 1, full = 0, empty = 3, x = 0;

int wait(int s) { return --s; }
int signal(int s) { return ++s; }

void producer() {
   mutex = wait(mutex);
   full = signal(full);
   empty = wait(empty);
   printf("\nProducer produces item %d", ++x);
   mutex = signal(mutex);
}

void consumer() {
   mutex = wait(mutex);
   full = wait(full);
   empty = signal(empty);
   printf("\nConsumer consumes item %d", x--);
   mutex = signal(mutex);
}

int main() {
   int n;
   printf("\n1. Producer\n2. Consumer\n3. Exit\n");
   while (1) {
      printf("\nEnter your choice: ");
      scanf("%d", &n);
      switch (n) {
         case 1:
            if (mutex == 1 && empty != 0) producer();
            else printf("Buffer is full\n");
            break;
         case 2:
            if (mutex == 1 && full != 0) consumer();
            else printf("Buffer is empty\n");
            break;
         case 3: exit(0);
      }
   }
}
```

OUTPUT:


mohamedinam@Mohamed-Inam-PC: ~
mohamedinam@Mohamed-Inam-PC:~$ gcc semaphore.c -o semaphore
mohamedinam@Mohamed-Inam-PC:~$ ./semaphore
1.producer
2.consumer
3.exit
enter ur choice1
producer produces the items 1
enter ur choice1
producer produces the items 2
enter ur choice1
producer produces the items 3
enter ur choice1
buffer is full
enter ur choice2
consumer consumes the item 3
enter ur choice2
consumer consumes the item 2
enter ur choice2
consumer consumes the item 1
enter ur choice3
mohamedinam@Mohamed-Inam-PC:~$

EX NO :	DEADLOCK AVOIDANCE – BANKER'S ALGORITHM
DATE :	

AIM:

To implement deadlock avoidance by using Banker's Algorithm.

Banker's Algorithm:

When a new process enters a system, it must declare the maximum number of instances of each resource type it needed. This number may exceed the total number of resources in the system. When the user request a set of resources, the system must determine whether the allocation of each resources will leave the system in safe state. If it will the resources are allocation; otherwise the process must wait until some other process release the resources.

Data structures

- n-Number of process, m-number of resource types.
- Available: Available[j]=k, k – instance of resource type Rj is available.
- Max: If max[i, j]=k, Pi may request at most k instances resource Rj.
- Allocation: If Allocation [i, j]=k, Pi allocated to k instances of resource Rj
- Need: If Need[I, j]=k, Pi may need k more instances of resource type Rj, Need [I, j]=Max[I, j]-Allocation[I, j];

Safety Algorithm

1. Work and Finish be the vector of length m and n respectively, Work=Available and Finish[i] =False.
2. Find an i such that both
   - Finish[i] =False
   - Need<=Work

   If no such I exists go to 4.
3. work=work+Allocation, Finish[i] =True;
4. if Finish[1]=True for all I, then the system is in safe state.

Resource request algorithm

Let Request i be request vector for the process Pi, If request i=[j]=k, then process Pi wants k instances of resource type Rj.

1. if Request<=Need I go to 2. Otherwise raise an error condition.

2. if Request<=Available go to 3. Otherwise Pi must since the resources are available.

3. Have the system pretend to have allocated the requested resources to process Pi by modifying the state as follows;

Available	=	Available-Request I;
Allocation I	=	Allocation+Request I;
Need I	=	Need i-Request I;

If the resulting resource allocation state is safe, the transaction is completed and process Pi is allocated its resources. However if the state is unsafe, the Pi must wait for Request i and the old resource-allocation state is restored.

ALGORITHM:

1. Start the program.
2. Get the values of resources and processes.
3. Get the avail value.
4. After allocation find the need value.
5. Check whether its possible to allocate.
6. If it is possible then the system is in safe state.
7. Else system is not in safety state.
8. If the new request comes then check that the system is in safety.
9. Or not we allow the request.
10. Stop the program.

BANKER'S ALGORITHM

PROGRAM:

```
#include <stdio.h>
#include <stdlib.h>

struct da {
   int max[10], a1[10], need[10], before[10], after[10];
} p[10];

int main() {
   int i, j, l, r, n, tot[10], av[10], cn = 0, cz = 0, temp = 0, c = 0;

   printf("\nEnter the number of processes: ");
   scanf("%d", &n);
   printf("Enter the number of resources: ");
   scanf("%d", &r);

   for (i = 0; i < n; i++) {
      printf("Process %d:\n", i + 1);
      for (j = 0; j < r; j++) {
         printf("Max value for resource %d: ", j + 1);
         scanf("%d", &p[i].max[j]);
      }
      for (j = 0; j < r; j++) {
         printf("Allocated from resource %d: ", j + 1);
         scanf("%d", &p[i].a1[j]);
         p[i].need[j] = p[i].max[j] - p[i].a1[j];
      }
   }

   for (i = 0; i < r; i++) {
      printf("Enter total value of resource %d: ", i + 1);
      scanf("%d", &tot[i]);
   }

   for (i = 0; i < r; i++) {
      temp = 0;
      for (j = 0; j < n; j++) temp += p[j].a1[i];
      av[i] = tot[i] - temp;
   }

   printf("\n\tProcess\tMax\tAlloc\tNeed\tTotal\tAvail");
   for (i = 0; i < n; i++) {
      printf("\nP%d\t", i + 1);
      for (j = 0; j < r; j++) printf("%d ", p[i].max[j]);
      printf("\t");
      for (j = 0; j < r; j++) printf("%d ", p[i].a1[j]);
      printf("\t");
      for (j = 0; j < r; j++) printf("%d ", p[i].need[j]);
      printf("\t");
```

```
        if (i == 0)
            for (j = 0; j < r; j++) printf("%d ", tot[j]);
        printf("\t");
        if (i == 0)
            for (j = 0; j < r; j++) printf("%d ", av[j]);
    }

    printf("\n\n\tAvail Before\tAvail After");
    for (l = 0; l < n; l++) {
        for (i = 0; i < n; i++) {
            cn = cz = 0;
            for (j = 0; j < r; j++) {
                if (p[i].need[j] > av[j]) cn++;
                if (p[i].max[j] == 0) cz++;
            }
            if (cn == 0 && cz != r) {
                for (j = 0; j < r; j++) {
                    p[i].before[j] = av[j] - p[i].need[j];
                    p[i].after[j] = p[i].before[j] + p[i].max[j];
                    av[j] = p[i].after[j];
                    p[i].max[j] = 0;
                }
                printf("\nP%d\t", i + 1);
                for (j = 0; j < r; j++) printf("%d ", p[i].before[j]);
                printf("\t");
                for (j = 0; j < r; j++) printf("%d ", p[i].after[j]);
                c++;
                break;
            }
        }
    }

    if (c == n)
        printf("\nThe above sequence is a safe sequence.\n");
    else
        printf("\nDeadlock occurred.\n");

    return 0;
}
```

OUTPUT: **RUN 1: NO deadlock**

```
mo hamedinam@Mohamed-Inam-PC: ~
oha edlna @Noha ed-Ina -P :-$ gee bankers.e -o ban ers
oha edlna @Noha ed-Ina -P :-$ ./banke s

EN ER THE NO. OF PROCESSES  4

EN ER THE NO. OF RESOURCES  3
PROCESS 1
MAXIMUM VALUE FOR RESOURCE 1    3
MAXIMUM VALUE FOR RESOURCE 2    2
MAXIMUM VALUE FOR RESOURCE 3    2
ALLOCATED FROM RESOURCE 1    1
ALLOCATED FROM RESOURCE 2    0
ALLOCATED FROM RESOURCE 3    0
PROCESS 2
MAXIMUM VALUE FOR RESOURCE 1    6
MAXIMUM VALUE FOR RESOURCE 2    1
MAXIMUM VALUE FOR RESOURCE 3    3
ALLOCATED FROM RESOURCE 1    5
ALLOCATED FROM RESOURCE 2    1
ALLOCATED FROM RESOURCE 3    1
PROCESS 3
MAXIMUM VALUE FOR RESOURCE 1    3
MAXIMUM VALUE FOR RESOURCE 2    1
MAXIMUM VALUE FOR RESOURCE 3    4
ALLOCATED FROM RESOURCE 1    2
ALLOCATED FROM RESOURCE 2    1
ALLOCATED FROM RESOURCE 3    1
PROCESS 4
MAXIMUM VALUE FOR RESOURCE 1    4
MAXIMUM VALUE FOR RESOURCE 2    2
MAXIMUM VALUE FOR RESOURCE 3    2
ALLOCATED FROM RESOURCE 1    0
ALLOCATED FROM RESOURCE 2    0
ALLOCATED FROM RESOURCE 3    2
ENTER TOTAL VALUE OF RESOURCE 1    9
ENTER TOTAL VALUE OF RESOURCE 2    3
ENTER TOTAL VALUE OF RESOURCE 3    6

        RESOURCES ALLOCATED  NEEDED  TOTAL AVAIL
P1      322      100      222      936    112
P2      613      511      102
P3      314      211      103
P4      422      002      420

        AVAIL BEFORE  AVAIL AFTER
p 2     010      623
p 1     401      723
p 3     620      934
p 4     514      936
THE ABOVE SEQUENCE IS A SAFE SEQUENCE
 ha edlna @N          :-$
```

RUN2: Deadlock occurs

```
"-      mohamedinam@Mohamed-Inam-PC: ~
 oha edlna @N  ha ed          :-$ ge  bankers.e -o bankers
 oha edlna @No     d-Ina -P      .,bankers

 ENTER TIHE NO      PROCESSE S  4

 ENTER TIHE NO      RESOURCE S  3

MAXIMUM VALUE FOR RESOURCE 1    3
MAXIMUM VALUE FOR RESOURCE 2    2
MAXIMUM VALUE FOR RESOURCE 3    2
ALLOCATE!)FROM  RESOURCE  1    1
ALLOCATE!)FROM  RESOURCE 2    0
ALLOCATE!)FROM  RESOURCE 3    1
PROCESS 2
MAXIMUM VALUE FOR RESOURCE 1    6
MAXIMUM VALUE FOR RESOURCE 2    1
MAXIMUM VALUE FOR RESOURCE 3    3
ALLOCATEIJFROM  RESOURCE  1    5
ALLOCATE!)FROM  RESOURCE 2    1
ALLOCATE!)FROM  RESOURCE 3    1
PROCESS 3
MAXIMUM VALUE FOR RESOURCE 1    3
MAXIMUM VALUE FOR RESOURCE 2    1
MAXIMUM VALUE FOR RESOURCE 3    4
ALLOCATE!)FROM  RESOURCE  1    2
ALLOCATE!)FROM  RESOURCE 2    1
ALLOCATE!)FROM

-MAXIMUM VALUE
                                    9
                                    3
                                    6
        RESOURCES ALLOCATE!) NEEDEIJ TOTAL  AVAIL
P1      322       Hl1       221      936    110
P2      613       511       102
P3      314       212       102
P4      422       082       420

        AVAIL BEFORE  AVAIL AFTER
IJEAOLOCK OCCUREIJ
 ha edlna @N           :-$
```

DEADLOCK DETECTION – BANKER'S ALGORITHM

PROGRAM:

```
#include<stdio.h>

int main() {
   int np, nr, i, j;
   int alloc[10][10], request[10][10], avail[10], r[10], w[10], mark[20] = {0};

   printf("\nEnter the number of processes: ");
   scanf("%d", &np);
   printf("\nEnter the number of resources: ");
   scanf("%d", &nr);

   for (i = 0; i < nr; i++) {
      printf("\nTotal amount of Resource R%d: ", i + 1);
      scanf("%d", &r[i]);
   }

   printf("\nEnter the request matrix:\n");
   for (i = 0; i < np; i++)
      for (j = 0; j < nr; j++)
         scanf("%d", &request[i][j]);

   printf("\nEnter the allocation matrix:\n");
   for (i = 0; i < np; i++)
      for (j = 0; j < nr; j++)
         scanf("%d", &alloc[i][j]);

   for (j = 0; j < nr; j++) {
      avail[j] = r[j];
      for (i = 0; i < np; i++)
         avail[j] -= alloc[i][j];
   }

   for (i = 0; i < np; i++) {
      int count = 0;
      for (j = 0; j < nr; j++) {
         if (alloc[i][j] == 0)
            count++;
         else
            break;
      }
      if (count == nr)
         mark[i] = 1;
   }

   for (j = 0; j < nr; j++)
      w[j] = avail[j];
```

```
int deadlock = 1;
    for (i = 0; i < np; i++) {
        if (mark[i] == 0) {
            int canbeprocessed = 1;
            for (j = 0; j < nr; j++) {
                if (request[i][j] > w[j]) {
                    canbeprocessed = 0;
                    break;
                }
            }
            if (canbeprocessed) {
                mark[i] = 1;
                for (j = 0; j < nr; j++)
                    w[j] += alloc[i][j];
                deadlock = 0;
            }
        }
    }

    if (deadlock)
        printf("\nDeadlock detected!\n");
    else
        printf("\nNo Deadlock possible.\n");

    return 0;
}
```

OUTPUT:

Enter the no of process: 4

Enter the no of resources: 5

Total Amount of the Resource R1: 2

Total Amount of the Resource R2: 1

Total Amount of the Resource R3: 1

Total Amount of the Resource R4: 2

Total Amount of the Resource R5: 1

Enter the request matrix: 0 1 0 0 1

0 0 1 0 1

0 0 0 0 1

1 0 1 0 1

Enter the allocation matrix: 1 0 1 1 0

1 1 0 0 0

0 0 0 1 0

0 0 0 0 0

Deadlock detected

IMPLEMENTATION OF THREADING AND SYNCHRONIZATION APPLICATIONS

PROGRAM:

```
#include<stdio.h>
#include <string.h>
#include<pthread.h>
// Global variable:
int i = 2;
void* foo(void* p){
// Print value received as argument:
printf("Value recevied as argument in starting routine:");
printf("%i\n", * (int*)p);
// Return reference to global variable:
pthread_exit(&i);
}
int main(void){
// Declare variable for thread's ID:
pthread_t id;
int j = 1;
pthread_create(&id, NULL, foo, &j);
int* ptr;
// Wait for foo() and retrieve value in ptr;
pthread_join(id, (void**)&ptr);
printf("Value recevied by parent from child: ");
printf("%i\n", *ptr);
return 0 ;
}
```

OUTPUT:

Value received as argument in starting routine: 1

Value received by parent from child: 2

PAGING TECHNIQUE OF MEMORY MANAGEMENT

PROGRAM:

```
#include <stdio.h>

struct pstruct {
   int fno;
   int pbit;
} ptable[10];

int pmsize, lmsize, psize, frame, page, ftable[20], frameno;

void info() {
   printf("\n\nMEMORY MANAGEMENT USING PAGING\n\n");
   printf("Enter the Size of Physical memory: ");
   scanf("%d", &pmsize);

   printf("Enter the size of Logical memory: ");
   scanf("%d", &lmsize);

   printf("Enter the partition size: ");
   scanf("%d", &psize);

   frame = pmsize / psize;
   page = lmsize / psize;

   printf("\nThe physical memory is divided into %d no.of frames\n", frame);
   printf("The Logical memory is divided into %d no.of pages\n", page);
}

void assign() {
   int i;

   for (i = 0; i < page; i++) {
      ptable[i].fno = -1;
      ptable[i].pbit = -1;
   }

   for (i = 0; i < frame; i++) {
      ftable[i] = 32555;
   }

   for (i = 0; i < page; i++) {
      printf("\nEnter the Frame number where page %d must be placed: ", i);
      scanf("%d", &frameno);

      ftable[frameno] = i;

      if (ptable[i].pbit == -1) {
```

```
            ptable[i].fno = frameno;
            ptable[i].pbit = 1;
        }
    }

    printf("\nPAGE TABLE\n");
    printf("PageAddress\tFrameNo.\tPresenceBit\n");
    for (i = 0; i < page; i++) {
        printf("%d\t\t%d\t\t%d\n", i, ptable[i].fno, ptable[i].pbit);
    }

    printf("\nFRAME TABLE\n");
    printf("FrameAddress\tPageNo\n");
    for (i = 0; i < frame; i++) {
        printf("%d\t\t%d\n", i, ftable[i]);
    }
}

void cphyaddr() {
    int laddr, paddr, disp, phyaddr, baddr;

    printf("\n\nProcess to create the Physical Address\n");
    printf("Enter the Base Address: ");
    scanf("%d", &baddr);

    printf("Enter the Logical Address: ");
    scanf("%d", &laddr);

    paddr = laddr / psize;
    disp = laddr % psize;

    if (ptable[paddr].pbit == 1) {
        phyaddr = baddr + (ptable[paddr].fno * psize) + disp;
        printf("The Physical Address where the instruction is present: %d\n", phyaddr);
    } else {
        printf("Page is not present in memory.\n");
    }
}

int main() {
    info();
    assign();
    cphyaddr();
    return 0;
}
```

OUTPUT:

```
mohamedinam@Mohamed-Inam-PC: ~
mohamedinam@Mohamed-Inam-PC:~$ clear

mohamedinam@Mohamed-Inam-PC:~$ gcc paging.c -o paging
mohamedinam@Mohamed-Inam-PC:~$ ./paging

MEMORY MANAGEMENT USING PAGING
Enter the Size of Physical memory: 16
Enter the size of Logical memory: 8
Enter the partition size: 2

The physical memory is divided into 8 no.of frames
The Logical memory is divided into 4 no.of pages
Enter the Frame number where page 0 must be placed: 5
Enter the Frame number where page 1 must be placed: 6
Enter the Frame number where page 2 must be placed: 7
Enter the Frame number where page 3 must be placed: 2

PAGE TABLE
PageAddress  FrameNo. PresenceBit
0               5               1
1               6               1
2               7               1
3               2               1

        FRAME TABLE
FrameAddress   PageNo

0               32555
1               32555
2               3
3               32555
4               32555
5               0
6               1
7               2
        Process to create the Physical Address
Enter the Base Address: 1000

Enter theLogical Address: 3

The Physical Address where the instruction present: 1013mohamedinam@Mohamed-Inam-PC:~
$
```

MEMORY ALLOCATION METHODS FOR FIXED PARTITION

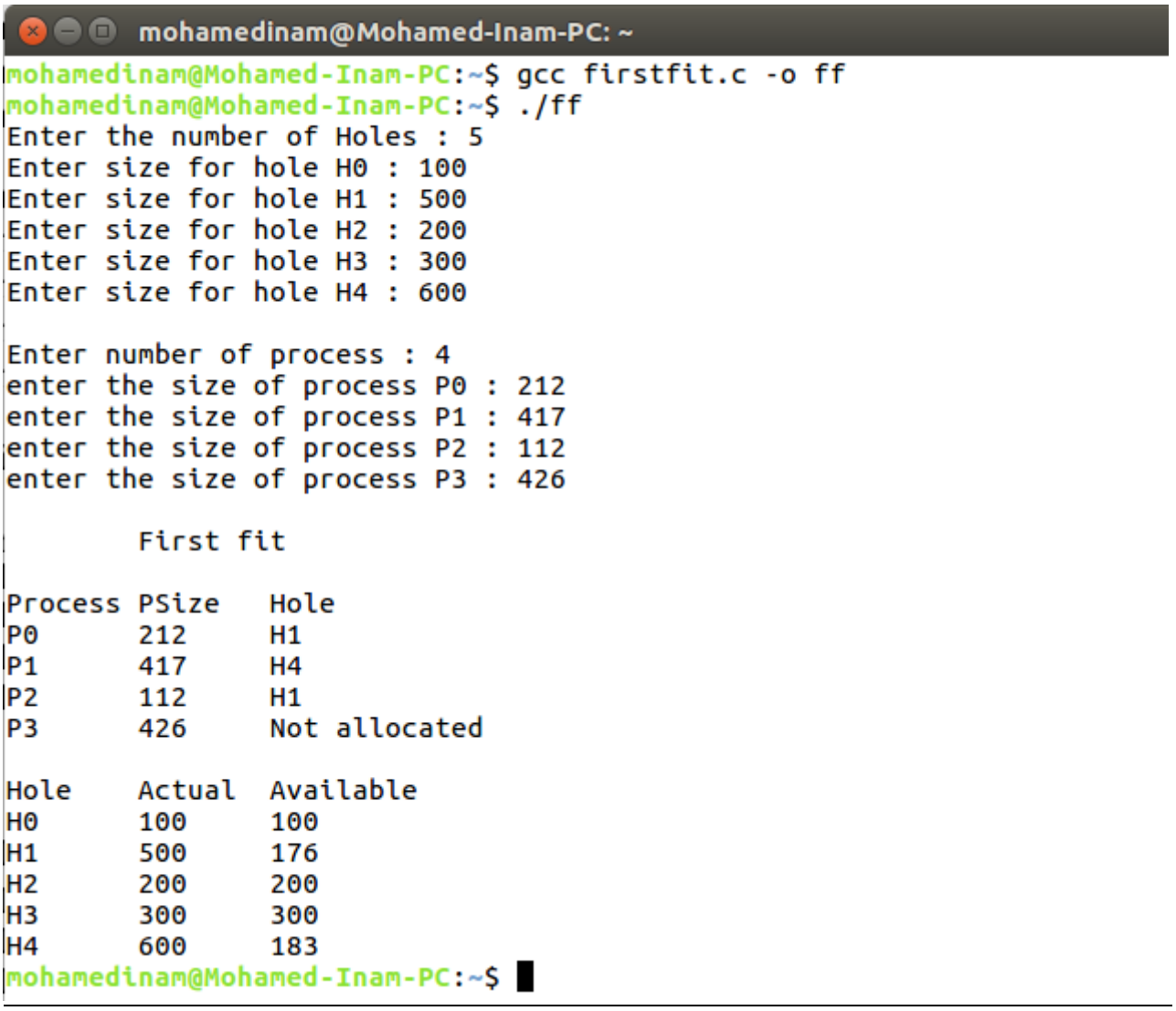
FIRST FIT ALLOCATION

PROGRAM :

```
#include <stdio.h>

struct process {
   int size;
   int flag;
   int holeid;
};

struct hole {
   int size;
   int actual;
};

int main() {
   int i, np, nh, j;

   printf("Enter the number of Holes: ");
   scanf("%d", &nh);

   for(i = 0; i < nh; i++) {
      printf("Enter size for hole H%d: ", i);
      scanf("%d", &h[i].size);
      h[i].actual = h[i].size;
   }

   printf("\nEnter number of processes: ");
   scanf("%d", &np);

   for(i = 0; i < np; i++) {
      printf("Enter the size of process P%d: ", i);
      scanf("%d", &p[i].size);
      p[i].flag = 0;
   }

   for(i = 0; i < np; i++) {
      for(j = 0; j < nh; j++) {
         if(p[i].flag != 1) {
            if(p[i].size <= h[j].size) {
               p[i].flag = 1;
               p[i].holeid = j;
               h[j].size -= p[i].size;
            }
         }
      }
   }

   printf("\n\tFirst Fit\n");
   printf("\nProcess\tPSize\tHole");
```

```
    for(i = 0; i < np; i++) {
        if(p[i].flag != 1)
            printf("\nP%d\t%d\tNot allocated", i, p[i].size);
        else
            printf("\nP%d\t%d\tH%d", i, p[i].size, p[i].holeid);
    }

    printf("\n\nHole\tActual\tAvailable");

    for(i = 0; i < nh; i++) {
        printf("\nH%d\t%d\t%d", i, h[i].actual, h[i].size);
    }

    printf("\n");
    return 0;
}
```

OUTPUT:


mohamedinam@Mohamed-Inam-PC: ~
mohamedinam@Mohamed-Inam-PC:~$ gcc firstfit.c -o ff
mohamedinam@Mohamed-Inam-PC:~$ ./ff
Enter the number of Holes : 5
Enter size for hole H0 : 100
Enter size for hole H1 : 500
Enter size for hole H2 : 200
Enter size for hole H3 : 300
Enter size for hole H4 : 600
Enter number of process : 4
enter the size of process P0 : 212
enter the size of process P1 : 417
enter the size of process P2 : 112
enter the size of process P3 : 426
First fit
Process PSize Hole
P0 212 H1
P1 417 H4
P2 112 H1
P3 426 Not allocated
Hole Actual Available
H0 100 100
H1 500 176
H2 200 200
H3 300 300
H4 600 183
mohamedinam@Mohamed-Inam-PC:~$

MEMORY ALLOCATION METHODS FOR FIXED PARTITION

WORST FIT ALLOCATION

PROGRAM :

```
#include<stdio.h>
#define max 25

void main() {
   int frag[max], b[max], f[max], i, j, nb, nf, temp;
   static int bf[max], ff[max];

   printf("\n\tMemory Management Scheme - First Fit");
   printf("\nEnter the number of blocks: ");
   scanf("%d", &nb);
   printf("Enter the number of files: ");
   scanf("%d", &nf);

   printf("\nEnter the size of the blocks:-\n");
   for(i = 1; i <= nb; i++) {
      printf("Block %d: ", i);
      scanf("%d", &b[i]);
   }

   printf("Enter the size of the files :-\n");
   for(i = 1; i <= nf; i++) {
      printf("File %d: ", i);
      scanf("%d", &f[i]);
   }

   for(i = 1; i <= nf; i++) {
      for(j = 1; j <= nb; j++) {
         if(bf[j] != 1) {
            temp = b[j] - f[i];
            if(temp >= 0) {
               ff[i] = j;
               break;
            }
         }
      }
      frag[i] = temp;
      bf[ff[i]] = 1;
   }

   printf("\nFile_no:\tFile_size:\tBlock_no:\tBlock_size:\tFragment");
   for(i = 1; i <= nf; i++) {
      printf("\n%d\t\t%d\t\t%d\t\t%d\t\t%d", i, f[i], ff[i], b[ff[i]], frag[i]);
   }
}
```

INPUT

Enter the number of blocks 3

Enter the number of files 2

Enter the size of the blocks:-

Block 1 : 5

Block 2 : 2

Block 3 : 7

Enter the size of the files:-

File 1: 1

File 2: 4

OUTPUT

File No	File Size	Block No	Block Size	Fragment
1	1	1	5	4
2	4	3	7	3

MEMORY ALLOCATION METHODS FOR FIXED PARTITION

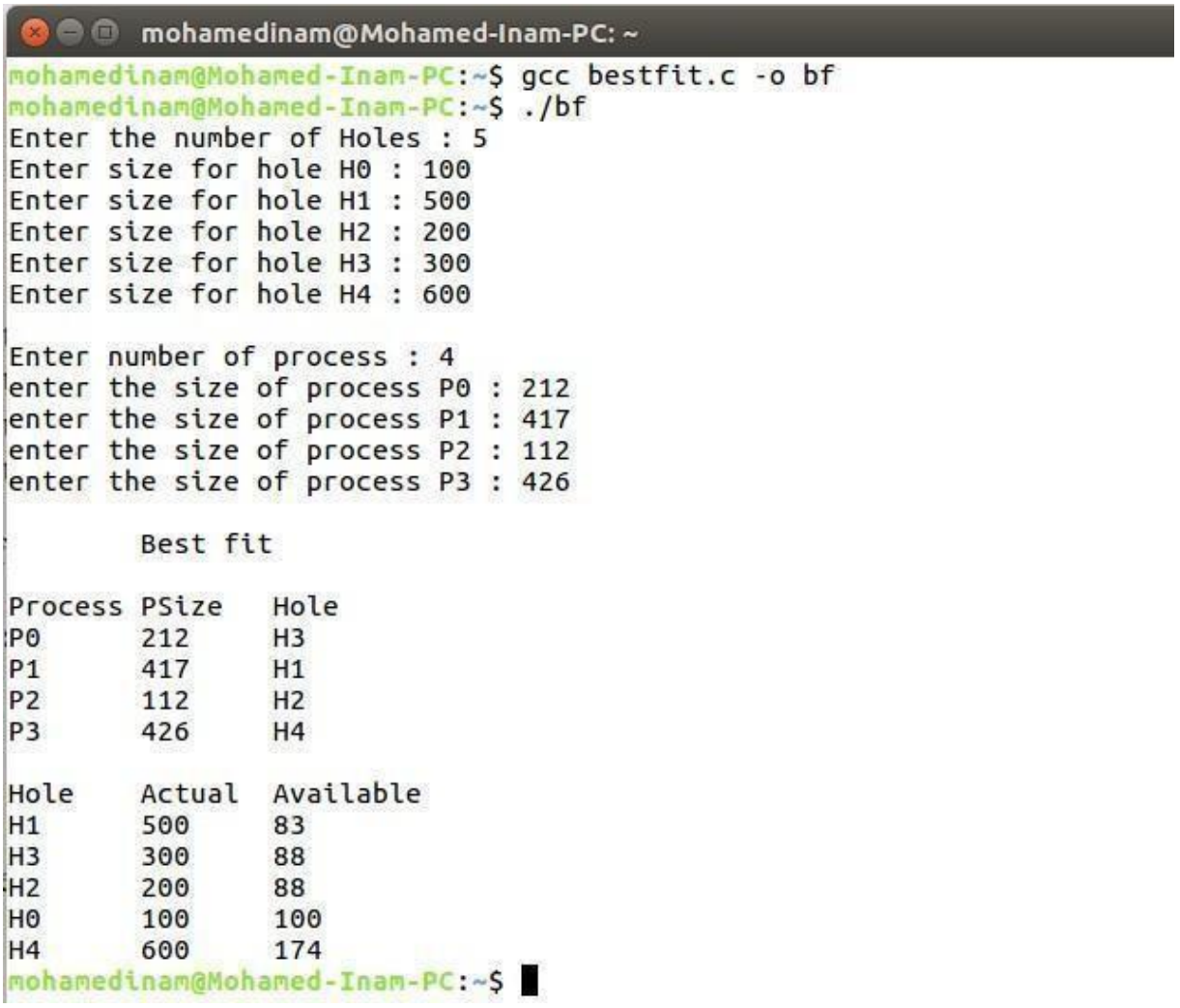
BEST FIT ALLOCATION

PROGRAM :

```
#include <stdio.h>

struct process {
    int size;
    int flag;
    int holeid;
} p[10];

struct hole {
    int hid;
    int size;
    int actual;
} h[10];

void bsort(struct hole bh[], int n);

int main() {
    int i, np, nh, j;

    printf("Enter the number of Holes: ");
    scanf("%d", &nh);

    for(i = 0; i < nh; i++) {
        printf("Enter size for hole H%d: ", i);
        scanf("%d", &h[i].size);
        h[i].actual = h[i].size;
        h[i].hid = i;
    }

    printf("\nEnter number of processes: ");
    scanf("%d", &np);

    for(i = 0; i < np; i++) {
        printf("Enter the size of process P%d: ", i);
        scanf("%d", &p[i].size);
        p[i].flag = 0;
    }

    for(i = 0; i < np; i++) {
        bsort(h, nh);

        for(j = 0; j < nh; j++) {
            if(p[i].flag != 1) {
                if(p[i].size <= h[j].size) {
                    p[i].flag = 1;
                    p[i].holeid = h[j].hid;
```

```
                h[j].size -= p[i].size;
            }
        }
    }
}

printf("\n\tBest Fit\n");
printf("\nProcess\tPSize\tHole");

for(i = 0; i < np; i++) {
    if(p[i].flag != 1)
        printf("\nP%d\t%d\tNot allocated", i, p[i].size);
    else
        printf("\nP%d\t%d\tH%d", i, p[i].size, p[i].holeid);
}

printf("\n\nHole\tActual\tAvailable");
for(i = 0; i < nh; i++) {
    printf("\nH%d\t%d\t%d", h[i].hid, h[i].actual, h[i].size);
}

printf("\n");
return 0;
}

void bsort(struct hole bh[], int n) {
    struct hole temp;
    int i, j;

    for(i = 0; i < n - 1; i++) {
        for(j = i + 1; j < n; j++) {
            if(bh[i].size > bh[j].size) {
                temp = bh[i];
                bh[i] = bh[j];
                bh[j] = temp;
            }
        }
    }
}
```

OUTPUT :

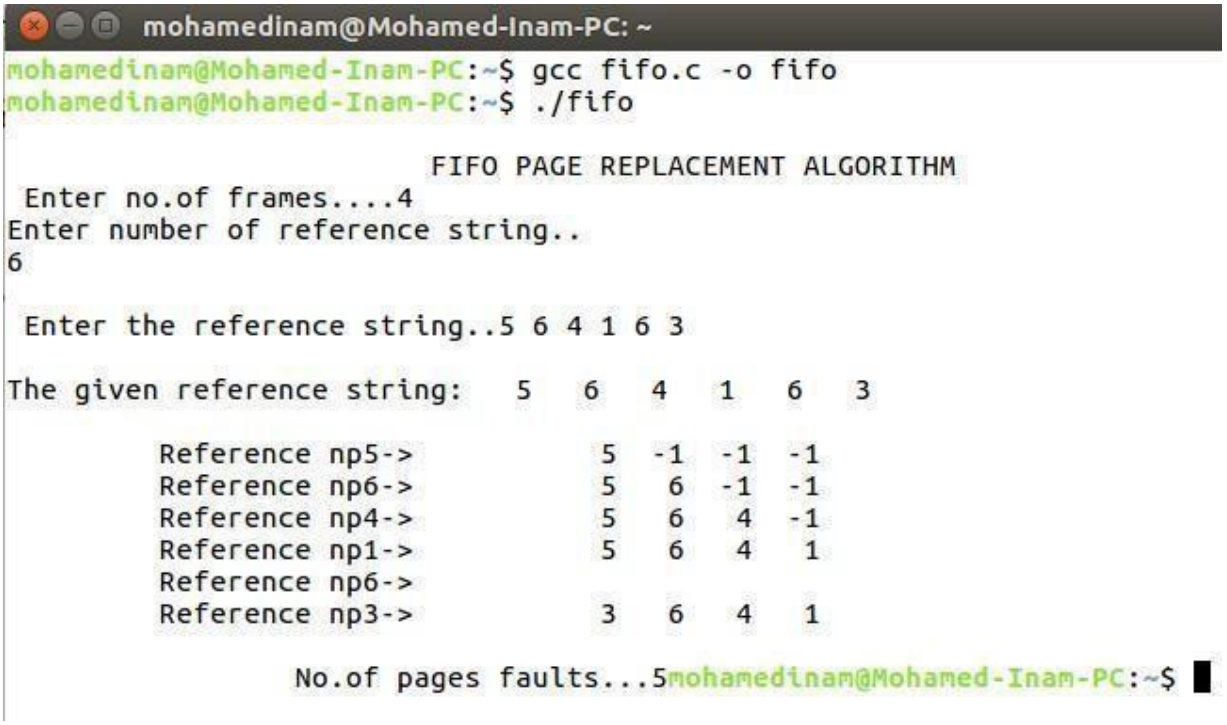

mohamedinam@Mohamed-Inam-PC: ~
mohamedinam@Mohamed-Inam-PC:~$ gcc bestfit.c -o bf
mohamedinam@Mohamed-Inam-PC:~$ ./bf
Enter the number of Holes : 5
Enter size for hole H0 : 100
Enter size for hole H1 : 500
Enter size for hole H2 : 200
Enter size for hole H3 : 300
Enter size for hole H4 : 600
Enter number of process : 4
enter the size of process P0 : 212
enter the size of process P1 : 417
enter the size of process P2 : 112
enter the size of process P3 : 426
Best fit
Process PSize Hole
P0 212 H3
P1 417 H1
P2 112 H2
P3 426 H4
Hole Actual Available
H1 500 83
H3 300 88
H2 200 88
H0 100 100
H4 600 174
mohamedinam@Mohamed-Inam-PC:~$

PROGRAM :

```
#include<stdio.h>

int i, j, nof, nor, flag = 0, ref[50], frm[50], pf = 0, victim = -1;

int main() {
   printf("\n \t\t\t FIFO PAGE REPLACEMENT ALGORITHM");

   // Input number of frames
   printf("\n Enter no. of frames: ");
   scanf("%d", &nof);

   // Input number of reference string
   printf("Enter number of reference string: ");
   scanf("%d", &nor);

   // Input reference string
   printf("\n Enter the reference string: ");
   for (i = 0; i < nor; i++) {
      scanf("%d", &ref[i]);
   }

   printf("\nThe given reference string: ");
   for (i = 0; i < nor; i++) {
      printf("%4d", ref[i]);
   }

   // Initialize frames with -1 (indicating empty frames)
   for (i = 0; i < nof; i++) {
      frm[i] = -1;
   }

   printf("\n");

   // Implement FIFO page replacement algorithm
   for (i = 0; i < nor; i++) {
      flag = 0;
      printf("\n\t Reference page %d ->\t", ref[i]);

      // Check if the current reference page is already in the frames
      for (j = 0; j < nof; j++) {
         if (frm[j] == ref[i]) {
            flag = 1;
            break;
         }
      }
```

```
        // If page is not found in the frames, replace the oldest page
        if (flag == 0) {
            pf++;  // Increment page fault counter
            victim++;  // Move the victim pointer
            victim = victim % nof;  // Ensure circular allocation
            frm[victim] = ref[i];  // Replace the page
            for (j = 0; j < nof; j++) {
                printf("%4d", frm[j]);
            }
        }
    }

    printf("\n\n\t\t Number of page faults: %d", pf);
    return 0;
}
```

OUTPUT :


mohamedinam@Mohamed-Inam-PC: ~
mohamedinam@Mohamed-Inam-PC:~$ gcc fifo.c -o fifo
mohamedinam@Mohamed-Inam-PC:~$ ./fifo
FIFO PAGE REPLACEMENT ALGORITHM
Enter no.of frames....4
Enter number of reference string..
6
Enter the reference string..5 6 4 1 6 3
The given reference string: 5 6 4 1 6 3
Reference np5-> 5 -1 -1 -1
Reference np6-> 5 6 -1 -1
Reference np4-> 5 6 4 -1
Reference np1-> 5 6 4 1
Reference np6->
Reference np3-> 3 6 4 1
No.of pages faults...5mohamedinam@Mohamed-Inam-PC:~$

LRU PAGE REPLACEMENT ALGORITHM

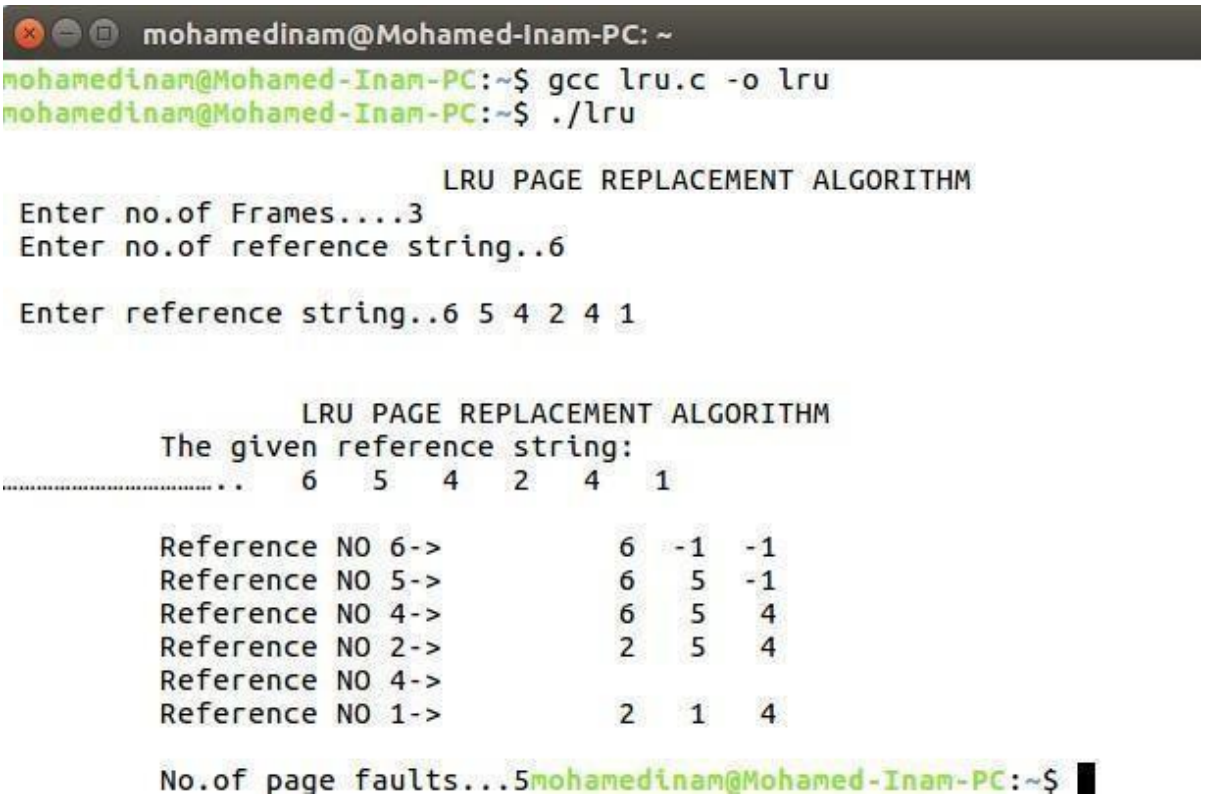
PROGRAM :

```
#include<stdio.h>

int i, j, nof, nor, flag = 0, ref[50], frm[50], pf = 0, victim = -1;
int recent[50], lrucal[50], count = 0;

int lruvictim();

int main() {
   printf("\n\t\t\t LRU PAGE REPLACEMENT ALGORITHM");

   // Input number of frames
   printf("\n Enter no. of frames: ");
   scanf("%d", &nof);

   // Input number of reference string
   printf("Enter number of reference string: ");
   scanf("%d", &nor);

   // Input reference string
   printf("\n Enter reference string: ");
   for (i = 0; i < nor; i++) {
      scanf("%d", &ref[i]);
   }

   printf("\n\n\t\t LRU PAGE REPLACEMENT ALGORITHM ");
   printf("\n\t The given reference string: ");
   for (i = 0; i < nor; i++) {
      printf("%4d", ref[i]);
   }

   // Initialize frames and LRU calculation arrays
   for (i = 1; i <= nof; i++) {
      frm[i] = -1;
      lrucal[i] = 0;
   }

   for (i = 0; i < 50; i++) {
      recent[i] = 0;
   }

   printf("\n");

   // Process the reference string for page replacement
   for (i = 0; i < nor; i++) {
      flag = 0;
      printf("\n\t Reference NO %d ->\t", ref[i]);
```

```
        // Check if the page is already in any of the frames
        for (j = 0; j < nof; j++) {
            if (frm[j] == ref[i]) {
                flag = 1;
                break;
            }
        }

        // If page is not found in the frames, replace the least recently used page
        if (flag == 0) {
            count++;  // Increment the page count
            if (count <= nof) {
                victim++;  // Victim is just the next available frame
            } else {
                victim = lruvictim();  // Get the least recently used page frame
            }
            pf++;  // Increment the page fault counter
            frm[victim] = ref[i];  // Replace the page in the victim frame
            for (j = 0; j < nof; j++) {
                printf("%4d", frm[j]);  // Print current frames
            }
        }

        // Update the recent usage information for the current page
        recent[ref[i]] = i;
    }

    printf("\n\n\t Number of page faults: %d", pf);
    return 0;
}

// Function to determine the least recently used page
int lruvictim() {
    int i, j, temp1, temp2;

    // Record the last usage time of each page in frames
    for (i = 0; i < nof; i++) {
        temp1 = frm[i];
        lrucal[i] = recent[temp1];
    }

    temp2 = lrucal[0];  // Start with the first frame's LRU time
    for (j = 1; j < nof; j++) {
        if (temp2 > lrucal[j]) {
            temp2 = lrucal[j];  // Find the least recently used page
        }
    }

    // Find and return the index of the least recently used page frame
    for (i = 0; i < nof; i++) {
        if (ref[temp2] == frm[i]) {
```

```
            return i;
        }
    }
    return 0;  // Default return if no match found (though this shouldn't happen)
}
```

OUTPUT :


mohamedinam@Mohamed-Inam-PC: ~
mohamedinam@Mohamed-Inam-PC:~$ gcc lru.c -o lru
mohamedinam@Mohamed-Inam-PC:~$ ./lru
LRU PAGE REPLACEMENT ALGORITHM
Enter no.of Frames....3
Enter no.of reference string..6
Enter reference string..6 5 4 2 4 1
LRU PAGE REPLACEMENT ALGORITHM
The given reference string:
6 5 4 2 4 1
Reference NO 6-> 6 -1 -1
Reference NO 5-> 6 5 -1
Reference NO 4-> 6 5 4
Reference NO 2-> 2 5 4
Reference NO 4->
Reference NO 1-> 2 1 4
No.of page faults...5mohamedinam@Mohamed-Inam-PC:~$

OPTIMAL (LFU) PAGE REPLACEMENT ALGORITHM

PROGRAM:

```
#include<stdio.h>

int i, j, nof, nor, flag = 0, ref[50], frm[50], pf = 0, victim = -1;
int recent[50], optcal[50], count = 0;

int optvictim(int index);

int main() {
   printf("\nOPTIMAL PAGE REPLACEMENT ALGORITHM");

   // Input the number of frames
   printf("\nEnter the number of frames: ");
   scanf("%d", &nof);

   // Input the number of reference string
   printf("Enter the number of reference string: ");
   scanf("%d", &nor);

   // Input the reference string
   printf("Enter the reference string: ");
   for (i = 0; i < nor; i++) {
      scanf("%d", &ref[i]);
   }

   // Initialize frames and other arrays
   for (i = 0; i < nof; i++) {
      frm[i] = -1;
      optcal[i] = 0;
   }

   for (i = 0; i < 50; i++) {
      recent[i] = 0;
   }

   printf("\nThe given reference string: ");
   for (i = 0; i < nor; i++) {
      printf("%4d", ref[i]);
   }

   printf("\n");

   // Process the reference string for page replacement
   for (i = 0; i < nor; i++) {
      flag = 0;
```

```
        printf("\n\tReference no %d ->\t", ref[i]);

        // Check if the page is already in any of the frames
        for (j = 0; j < nof; j++) {
            if (frm[j] == ref[i]) {
                flag = 1;
                break;
            }
        }

        // If the page is not found in the frames, replace it
        if (flag == 0) {
            count++;  // Increment page count
            if (count <= nof) {
                victim++;  // If there's space, just put it in the next available frame
            } else {
                victim = optvictim(i);  // Use the optimal victim selection
            }
            pf++;  // Increment page fault count
            frm[victim] = ref[i];  // Replace the page in the victim frame

            // Display the current frame state
            for (j = 0; j < nof; j++) {
                printf("%4d", frm[j]);
            }
        }
    }

    printf("\nNumber of page faults: %d", pf);
    return 0;
}

// Function to select the optimal victim page
int optvictim(int index) {
    int i, j, temp, notfound;

    // For each frame, check when the page will be used next
    for (i = 0; i < nof; i++) {
        notfound = 1;
        for (j = index; j < nor; j++) {
            if (frm[i] == ref[j]) {
                notfound = 0;
                optcal[i] = j;
                break;
            }
        }

        // If a page is not found in the future, it is the victim
        if (notfound == 1) {
            return i;
        }
```

```
    }

    // Find the frame with the furthest usage (optimal victim)
    temp = optcal[0];
    for (i = 1; i < nof; i++) {
        if (temp < optcal[i]) {
            temp = optcal[i];
        }
    }

    // Return the frame index with the furthest usage
    for (i = 0; i < nof; i++) {
        if (optcal[i] == temp) {
            return i;
        }
    }
    return 0;  // Default return if no match found
}
```

OUTPUT :

```
mohamedinam@Mohamed-Inam-PC: ~
mohamedinam@Mohamed-Inam-PC:~$ gcc optimal.c -o opt
mohamedinam@Mohamed-Inam-PC:~$ ./opt

 OPTIMAL PAGE REPLACEMENT ALGORITHN
.................................
Enter the no.of frames3
Enter the no.of reference string6
Enter the reference string6
5
4
2
1
4

 OPTIMAL PAGE REPLACEMENT ALGORITHM
.................................
The given string
.................
   6   5   4   2   1   4

        ref no 6 ->        6  -1  -1
        ref no 5 ->        6   5  -1
        ref no 4 ->        6   5   4
        ref no 2 ->        2   5   4
        ref no 1 ->        1   5   4
        ref no 4 ->
 Number of page faults: 5mohamedinam@Mohamed-Inam-PC:~$
```

VARIOUS FILE ORGANIZATION TECHNIQUES

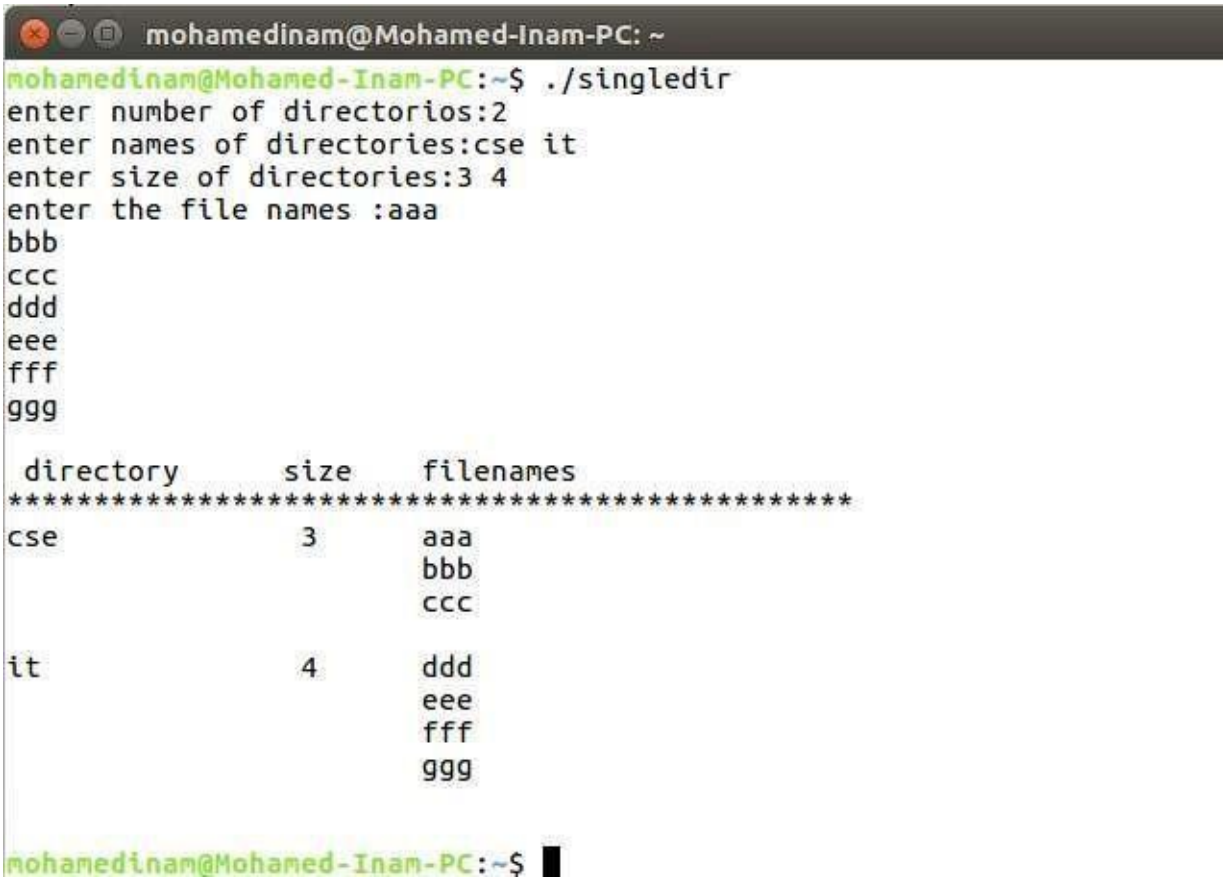
IMPLEMENTATION OF SINGLE LEVEL DIRECTORY

PROGRAM :

```
#include<stdio.h>

int main() {
   int master, s[20];
   char f[20][20][20]; // Stores filenames (max 20 directories, each directory can have 20 files, and each filename can have 20 characters)
   char d[20][20]; // Directory names (max 20 directories, each directory name up to 20 characters)
   int i, j;

   // Input number of directories
   printf("Enter number of directories: ");
   scanf("%d", &master);

   // Input names of directories
   printf("Enter names of directories: ");
   for(i = 0; i < master; i++) {
      scanf("%s", d[i]);
   }

   // Input size of directories (number of files in each directory)
   printf("Enter size of directories: ");
   for(i = 0; i < master; i++) {
      scanf("%d", &s[i]);
   }

   // Input filenames for each directory
   printf("Enter the file names:\n");
   for(i = 0; i < master; i++) {
      for(j = 0; j < s[i]; j++) {
         scanf("%s", f[i][j]);
      }
   }

   // Output the directory information
   printf("\nDirectory\tSize\tFilenames\n");
   printf("*************************************************\n");
   for(i = 0; i < master; i++) {
      printf("%-12s\t%-4d\t", d[i], s[i]);
      for(j = 0; j < s[i]; j++) {
         printf("%s ", f[i][j]);
      }
      printf("\n");
   }
```

```
    return 0;
}
```

OUTPUT :



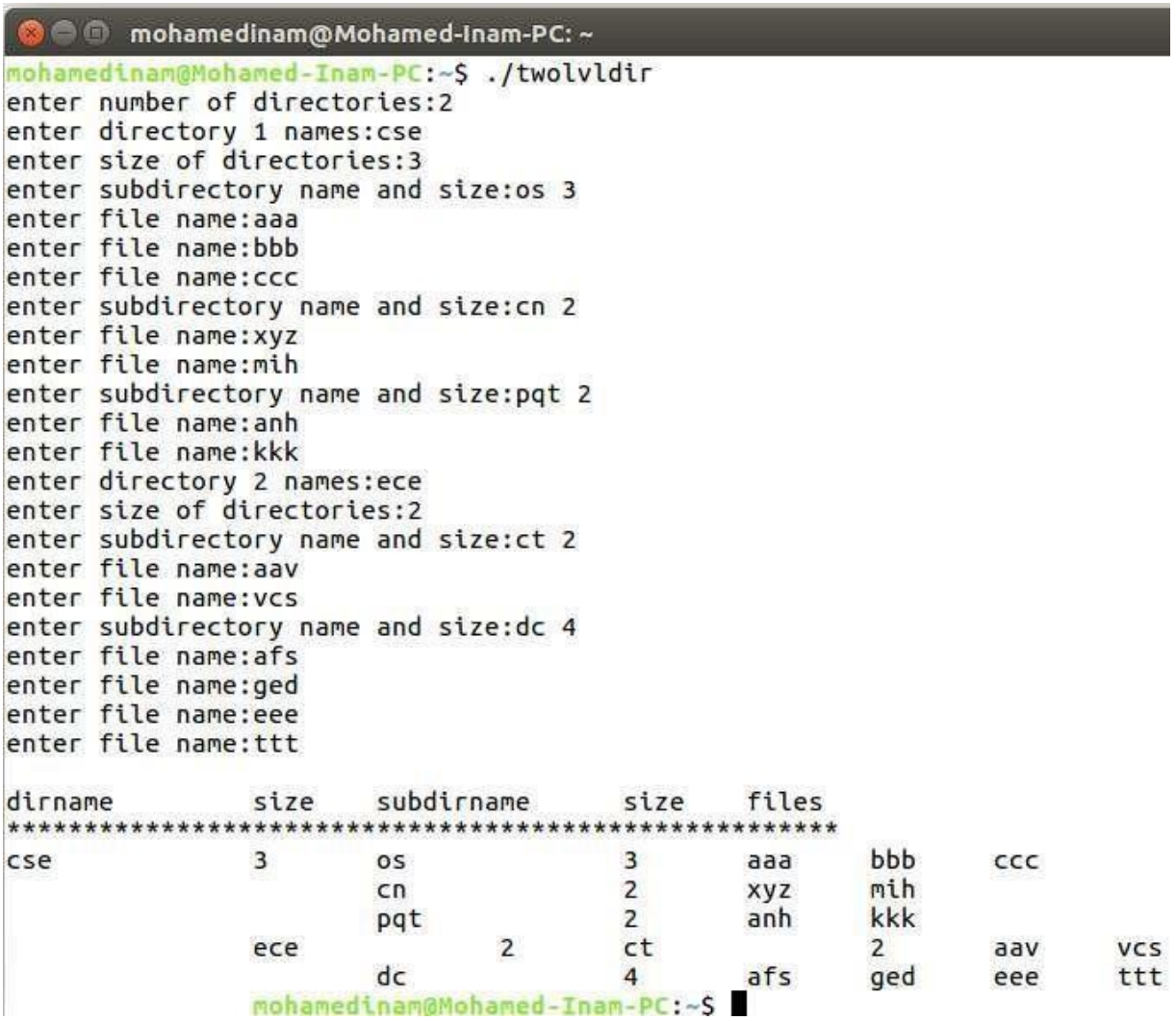
IMPLEMENTATION OF TWO-LEVEL DIRECTORY

PROGRAM :

```
#include<stdio.h>

struct st {
   char dname[10];       // Directory name
   char sdname[10][10];  // Subdirectory names
   char fname[10][10][10]; // File names inside subdirectories
   int ds;               // Number of subdirectories
   int sds[10];          // Size of subdirectories (number of files in each subdirectory)
} dir[10];

void main() {
   int i, j, k, n;

   // Input the number of directories
   printf("Enter number of directories: ");
   scanf("%d", &n);

   // Loop over each directory
   for (i = 0; i < n; i++) {
      // Input directory name
      printf("Enter directory %d name: ", i + 1);
      scanf("%s", dir[i].dname);

      // Input the number of subdirectories
      printf("Enter size of directory %s (number of subdirectories): ", dir[i].dname);
      scanf("%d", &dir[i].ds);

      // Loop over each subdirectory in the directory
      for (j = 0; j < dir[i].ds; j++) {
         // Input subdirectory name and size (number of files)
         printf("Enter subdirectory name for %s: ", dir[i].dname);
         scanf("%s", dir[i].sdname[j]);
         printf("Enter size (number of files) for subdirectory %s: ", dir[i].sdname[j]);
         scanf("%d", &dir[i].sds[j]);

         // Input file names for each subdirectory
         for (k = 0; k < dir[i].sds[j]; k++) {
            printf("Enter file name for subdirectory %s: ", dir[i].sdname[j]);
            scanf("%s", dir[i].fname[j][k]);
         }
      }
   }

   // Output the directory structure
   printf("\nDirectory Name\tSize\tSubdirectory Name\tSize\tFiles\n");
   printf("*****************************************************\n");
```

```
    // Loop over each directory and its subdirectories
    for (i = 0; i < n; i++) {
        printf("%s\t\t%d", dir[i].dname, dir[i].ds);

        // Loop over each subdirectory
        for (j = 0; j < dir[i].ds; j++) {
            printf("\t%s\t\t%d\t", dir[i].sdname[j], dir[i].sds[j]);

            // Loop over each file in the subdirectory
            for (k = 0; k < dir[i].sds[j]; k++) {
                printf("%s\t", dir[i].fname[j][k]);
            }
            printf("\n\t\t");
        }
        printf("\n");
    }
}
```

OUTPUT :


mohamedinam@Mohamed-Inam-PC: ~
mohamedinam@Mohamed-Inam-PC:~$ ./twolvldir
enter number of directories:2
enter directory 1 names:cse
enter size of directories:3
enter subdirectory name and size:os 3
enter file name:aaa
enter file name:bbb
enter file name:ccc
enter subdirectory name and size:cn 2
enter file name:xyz
enter file name:mih
enter subdirectory name and size:pqt 2
enter file name:anh
enter file name:kkk
enter directory 2 names:ece
enter size of directories:2
enter subdirectory name and size:ct 2
enter file name:aav
enter file name:vcs
enter subdirectory name and size:dc 4
enter file name:afs
enter file name:ged
enter file name:eee
enter file name:ttt
dirname size subdirname size files
cse 3 os 3 aaa bbb ccc
cn 2 xyz mih
pqt 2 anh kkk
ece 2 ct 2 aav vcs
dc 4 afs ged eee ttt
mohamedinam@Mohamed-Inam-PC:~$

FILE ALLOCATION STRATEGIES

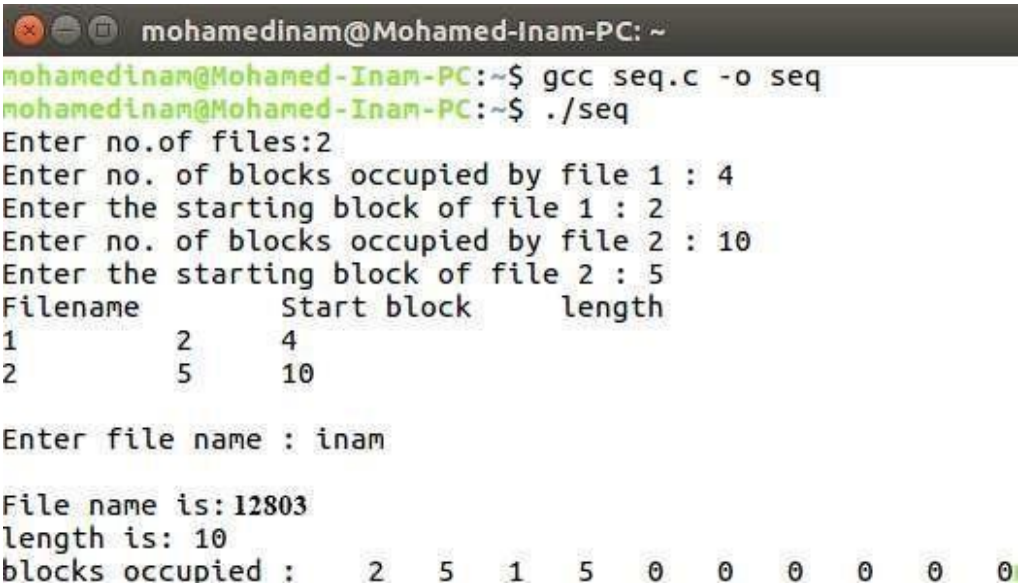
SEQUENTIAL FILE ALLOCATION

PROGRAM :

```
#include<stdio.h>

void main() {
   int n, i, j, b[20], sb[20], t[20], x, c[20][20];

   // Take input for number of files
   printf("Enter number of files: ");
   scanf("%d", &n);

   // Input for each file
   for (i = 0; i < n; i++) {
      printf("Enter the number of blocks occupied by file %d: ", i + 1);
      scanf("%d", &b[i]);
      printf("Enter the starting block of file %d: ", i + 1);
      scanf("%d", &sb[i]);

      t[i] = sb[i]; // The starting block of the file is saved

      // Calculate the blocks occupied
      for (j = 0; j < b[i]; j++) {
         c[i][j] = sb[i]++;  // Store the block numbers for the file
      }
   }

   // Output the file details (Filename, Start Block, and Length)
   printf("\nFilename\tStart Block\tLength\n");
   for (i = 0; i < n; i++) {
      printf("%d\t\t%d\t\t%d\n", i + 1, t[i], b[i]);  // Printing file details
   }

   // Ask user to input file number to get details
   printf("\nEnter file number to get details: ");
   scanf("%d", &x);

   // Validate the input file number
   if (x < 1 || x > n) {
      printf("Invalid file number!\n");
      return;
   }

   // Output the details of the specified file

 printf("\nFile name: %d\n", x);
   printf("Length: %d\n", b[x - 1]);  // Length of the file
   printf("Blocks occupied: ");
   for (i = 0; i < b[x - 1]; i++) {
```

```
        printf("%d ", c[x - 1][i]);  // Output blocks occupied by the file
    }
    printf("\n");
}
```

OUTPUT:



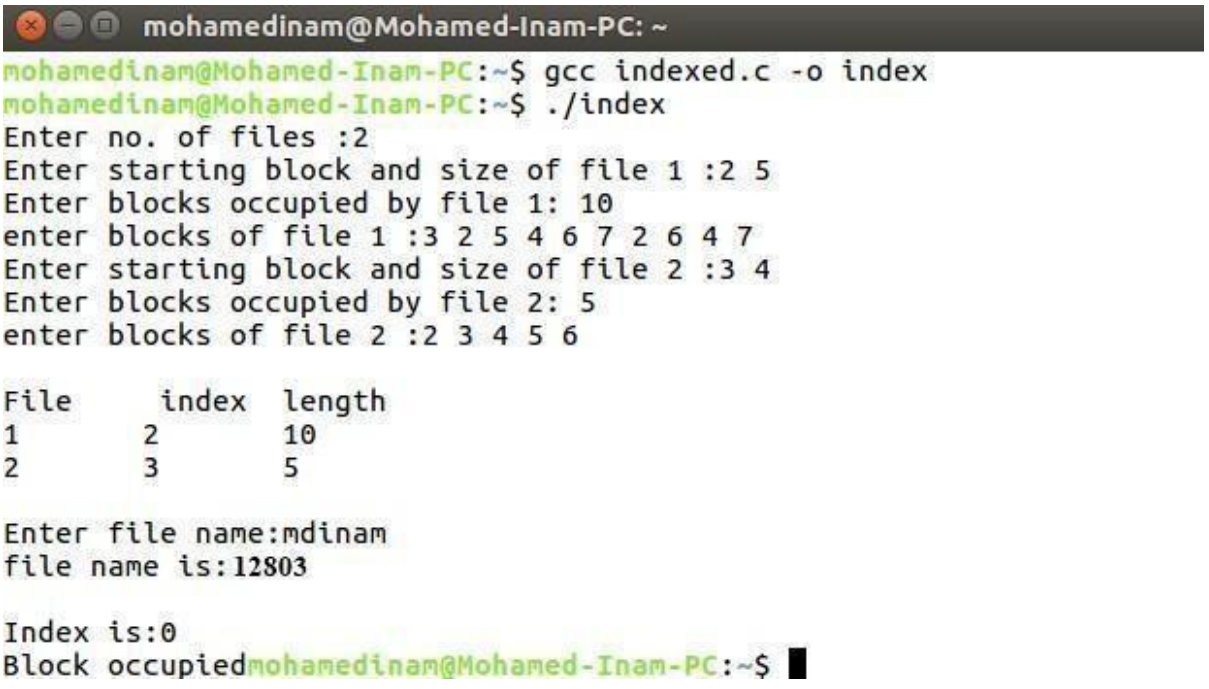
FILE ALLOCATION STRATEGIES – INDEXED FILE ALLOCATION

PROGRAM :

```
#include<stdio.h>

void main() {
   int n, m[20], i, j, sb[20], s[20], b[20][20], x;

   // Input number of files
   printf("Enter no. of files: ");
   scanf("%d", &n);

   // Input for each file
   for (i = 0; i < n; i++) {
      printf("Enter starting block and size of file %d: ", i + 1);
      scanf("%d %d", &sb[i], &s[i]);

      printf("Enter blocks occupied by file %d: ", i + 1);
      scanf("%d", &m[i]);

      printf("Enter blocks of file %d: ", i + 1);
      for (j = 0; j < m[i]; j++) {
         scanf("%d", &b[i][j]);
      }
   }

   // Output the details of files
   printf("\nFile\tIndex\tLength\n");
   for (i = 0; i < n; i++) {
      printf("%d\t%d\t%d\n", i + 1, sb[i], m[i]);
   }

   // Ask for a file number
   printf("\nEnter file number to get details: ");
   scanf("%d", &x);

   // Validate the file number
   if (x < 1 || x > n) {
      printf("Invalid file number!\n");
      return;
   }

   // Output the details for the specified file
   printf("\nFile name is: %d\n", x);
   i = x - 1;  // Adjust for 0-based indexing
   printf("Index is: %d\n", sb[i]);
   printf("Blocks occupied are: ");
   for (j = 0; j < m[i]; j++) {
```

```
  printf("%3d", b[i][j]);
    }
    printf("\n");
}
```

OUTPUT:



DISK SCHEDULING ALGORITHM

FIRST COME FIRST SERVE ALGORITHM

PROGRAM :

```
#include <stdio.h>
#include <stdlib.h>

int main() {
   int RQ[100], i, n, TotalHeadMoment = 0, initial;

   // Input number of requests
   printf("Enter the number of Requests: ");
   scanf("%d", &n);

   // Validate that the number of requests is greater than 0
   if (n <= 0) {
      printf("Invalid number of requests. The number of requests should be greater than
0.\n");
      return 1;
   }

   // Input the request sequence
   printf("Enter the Requests sequence: \n");
   for (i = 0; i < n; i++) {
      scanf("%d", &RQ[i]);
   }

   // Input the initial head position
   printf("Enter the initial head position: ");
   scanf("%d", &initial);

   // Calculate the total head movement
   for (i = 0; i < n; i++) {
      TotalHeadMoment += abs(RQ[i] - initial);  // Absolute difference between current
head and request
      initial = RQ[i];  // Move the head to the current request position
   }

   // Output the total head movement
   printf("Total head movement is %d\n", TotalHeadMoment);

   return 0;
}
```

OUTPUT:

Enter the number of Request 8

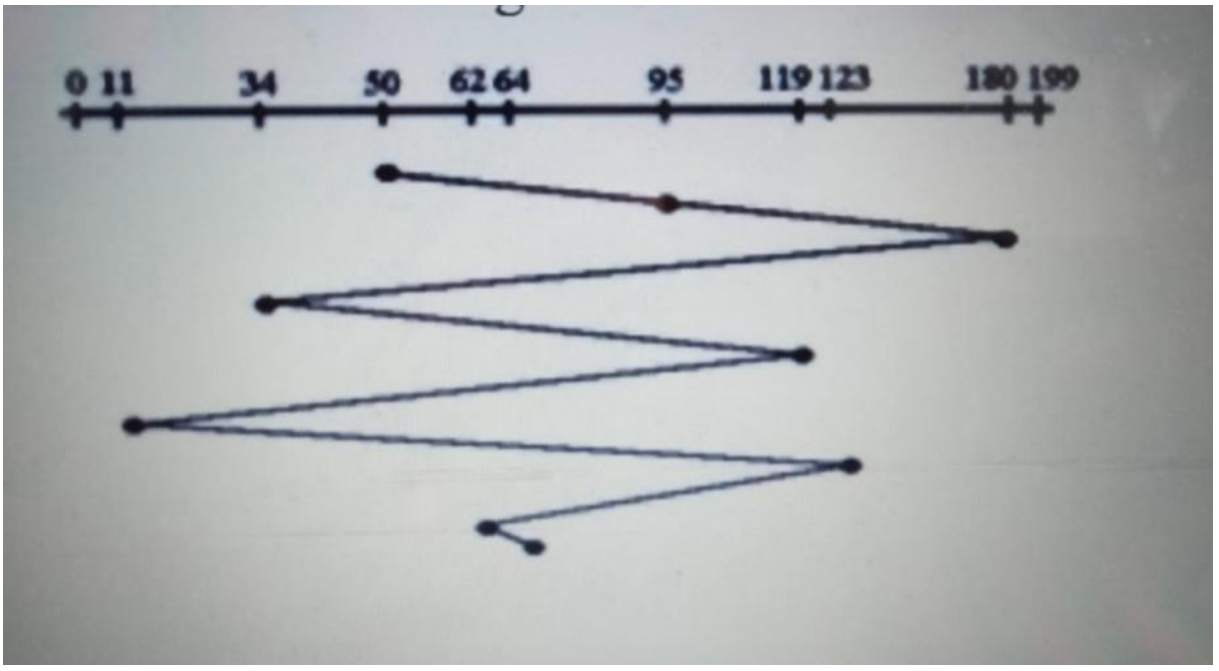
Enter the Requests Sequence

95 180 34 119 11 123 62 64

Enter initial head position 50

Total head movement is 644

Example: Given the following queue -- 95, 180, 34, 119, 11, 123, 62, 64 with the Read-write head initially at the track 50 and the tail track being at 199.



DISK SCHEDULING ALGORITHM

SHORTEST SEEK TIME FIRST (SSTF) ALGORITHM

PROGRAM :

```
#include <stdio.h>
#include <stdlib.h>

int main() {
    int RQ[100], i, n, TotalHeadMoment = 0, initial, count = 0;

    // Input number of requests
    printf("Enter the number of Requests: ");
    scanf("%d", &n);

    // Validate if the number of requests is greater than 0
    if (n <= 0) {
        printf("Invalid number of requests. The number of requests should be greater than
0.\n");
        return 1;
    }

    // Input the request sequence
    printf("Enter the Requests sequence:\n");
    for (i = 0; i < n; i++) {
        scanf("%d", &RQ[i]);
    }

    // Input the initial head position
    printf("Enter the initial head position: ");
    scanf("%d", &initial);

    // Process the requests using the SSTF algorithm
    while (count != n) {
        int min = 1000, d, index;

        // Find the request with the minimum distance
        for (i = 0; i < n; i++) {
            d = abs(RQ[i] - initial);  // Calculate the absolute distance
            if (min > d && RQ[i] != -1) {  // Ensure not processing already processed request
                min = d;
                index = i;
            }
        }

        // Update total head movement and move the head to the selected request
        TotalHeadMoment += min;
        initial = RQ[index];
```

```
        // Mark this request as processed by setting it to -1
        RQ[index] = -1;  // We mark the request as processed

        count++;
    }

    // Output the total head movement
    printf("Total head movement is %d\n", TotalHeadMoment);

    return 0;
}
```

OUTPUT:

Enter the number of Request 8

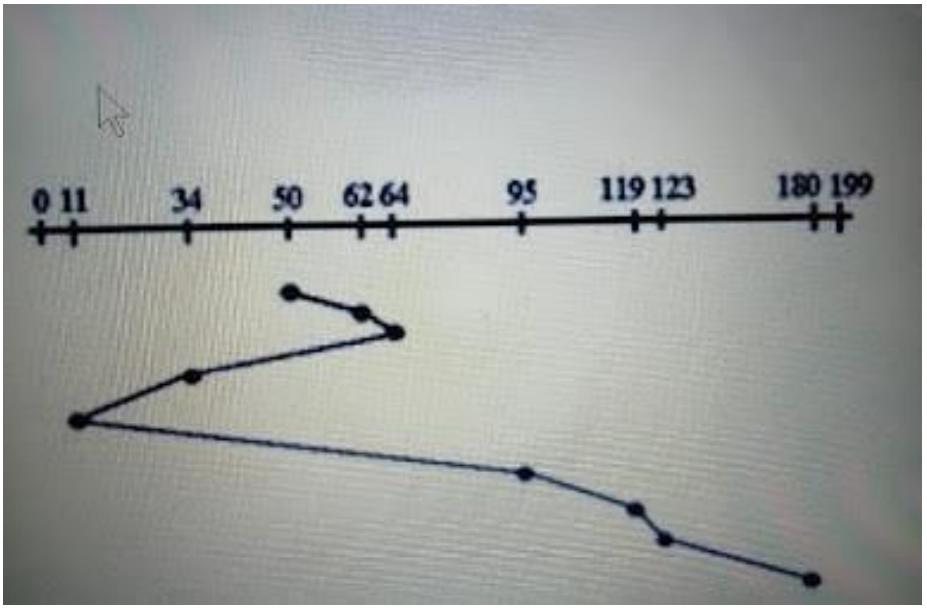
Enter Request Sequence

95 180 34 119 11 123 62 64

Enter initial head Position 50

Total head movement is 236

Example:-: Given the following queue -- 95, 180, 34, 119, 11, 123, 62, 64 with the Read-write head initially at the track 50 and the tail track being at 199.



EX NO:	LINUX INSTALLATION USING VMWARE
DATE:	

AIM:

To install the Linux OS using VMware

Note: If your Linux distribution is not RPM-based, has a custom kernel, or is unsupported, use the steps below to compile VMware Tools. To install VMware Tools in a Linux guest operating system using Compiler:

1. Ensure that your Linux virtual machine is powered on.

2. If you are running a GUI interface, open a command shell. **Note**: Log in as a root user, or use the sudo command to complete each of these steps.
3. Right Click **VM** in the virtual machine menu, then click **Guest > Install/Upgrade VMware Tools**.
4. Click **OK**. **Note**: In some cases, verify that the CDROM device is **Connected** from within the **Edit Settings** option of the virtual machine.
5. To create a mount point, run: mkdir /mnt/cdrom

6. To mount the CDROM, run: mount /dev/cdrom /mnt/cdrom

7. To copy the Compiler gzip tar file to a temporary local directory, run: cp /mnt/cdrom/VMwareTools-*version*.tar.gz /tmp/ Where *version* is the VMware Tools package version.
8. To determine the version of VMware tools, run: ls /mnt/cdrom You see output similar to: # VMwareTools-5.0.0-12124.tar.gz
9. To change to the tmp directory and extract the contents of the tar file into a new directory called vmware-tools-distrib, run:

10. To change directory to vmware-tools-distrib and run the vmware-install.pl PERL script to install VMware Tools, run: cd vmware-tools-distrib ./vmware-install.

Notes:

- ✓ Complete the screen prompts to install the VMware Tools. Options in square brackets are default choices and can be selected by pressing **Enter**.
- ✓ To compile VMware Tools successfully, you need gcc Compiler and Linux Kernel sources provided by your Linux distribution. Consult your Linux distribution documentation for details on methods to install these packages.
- ✓ It is normal for the console screen to go blank for a short time during the installation when the display size changes.
- ✓ Some warnings or errors are normal, like when a files does not exist.
- ✓ Depending on the Linux distribution, your network service might restart after installation. VMware recommends that you invoke this command from the console and not remotely.

11. If you are running a GUI interface, restart your X Window session for any mouse or graphics changes to take effect.
12. To start VMware Tools running in the background during an X Window session, using terminal session run the command /usr/bin/vmware-toolbox.
13. Depending on your environment, you may need to unmount the CD-ROM. To unmount the CD-ROM, run: umount /mnt/cdrom
14. Depending on your environment, you may need to manually end the VMware Tools installation. To end the VMware Tools install, click **VM** in the virtual machine menu, then click **Guest > End VMware Tools Install**.
15. To remove VMware Tools installation packages, run: cd rm /tmp/VMwareTools-*version*.tar.gz rm -rf /tmp/vmware-tools-distrib