OPERATING SYSTEMS

LAB MANUAL

SUBJECT CODE: IT221

REGULATION: R19

CLASS: II Year II Semester

DEPARTMENT OF INFORMATION TECHNOLOGY

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES

(UGC AUTONOMOUS)

(Affiliated to Andhra University, Approved by AICTE & Accredited by NBA) Sangivalasa, Bheemunipatnam Mandal, Visakhapatnam Dt. 531162.

Phone : 08933-225083/84/87 Fax:226395

Website:www.anits.edu.in email:principal@anits.edu.in

Faculty signature Student signature

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
DEPARTMENT OF INFORMATION TECHNOLOGY

OS RECORD

SUBMITTED TO:

A.DURGA PRAVEEN KUMAR

ASSISTANT PROFESSOR

DEPT. OF IT

SUBMITTED BY:

B.YOGANANDA REDDY

319126511077

IT-B

INDEX

2.	Write programs using the following system calls of LINUX operating system: Fork, exec, getpid, exit, wait, close, stat, opendir,readdir	1
3.	Write programs using the I/O system calls of LINUX operating system (open, read, write, etc) and error reporting using errno	1
4.	Write C programs to simulate UNIX commands like ls, grep,etc.	1
5.	CPU SCHEDULING ALGORITHMS a)Round Robin b)SJF c)FCFS d)Priority	1
6.	Implement the Producer – Consumer problem using semaphores (using LINUX system calls).	1
7.	Programs using pipes	2
8.	Implement Banker's algorithm for handlingdeadlock	1
9.	Implement free space management strategies such as First fit, Best fit and Worstfit	2
10.	Implement page replacement algorithms such as FIFO,LRU	2
11.	FILE ALLOCATION STRATEGIES a)sequential b)Indexed c)Linked	3

Prerequisite:

Operating System Concepts.

Course Objectives:

1. Analyze the working of an operating system, its programming interface and file system.
2. Develop algorithms for process scheduling, memory management, page replacement algorithms and disk scheduling.

Course Outcomes:

After completion of this course, a student will be able to :	
1.	Implement scheduling algorithms, deadlock management.
2.	Implement free space management and page replacement strategies.
3.	Implement file allocation methods and disk scheduling algorithms.

Mapping of course outcomes with program outcomes:

		PO												PSO	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	3	3	3		3	2	3			3			3	3
	2	3	3	3		3		2	2		3		3	3	3
	3	3	3	3		3		2	2		3		3	3	3

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

1	To enable IT graduates to excel in professional career contributing towards the need of the industry and society.
2	To impart knowledge of theory, practice, and design in the areas of Information Technology like Data Science and Computer Communications and training the students to analyze and interpret the data for IT applications.
3	Exhibit leadership, managerial and ethical qualities in their profession and adapt to global environment by engaging in lifelong learning.

PROGRAM SPECIFIC OUTCOMES (PSOs)

	The ability to analyze, design and develop computer based information systems leveraging the concepts of computing techniques, data analytics, software engineering and networking.
2	The ability to apply the knowledge of computing skills in building the Software Systems that meet the requirements of Industry and Society.

PROGRAM OUTCOMES (POs)

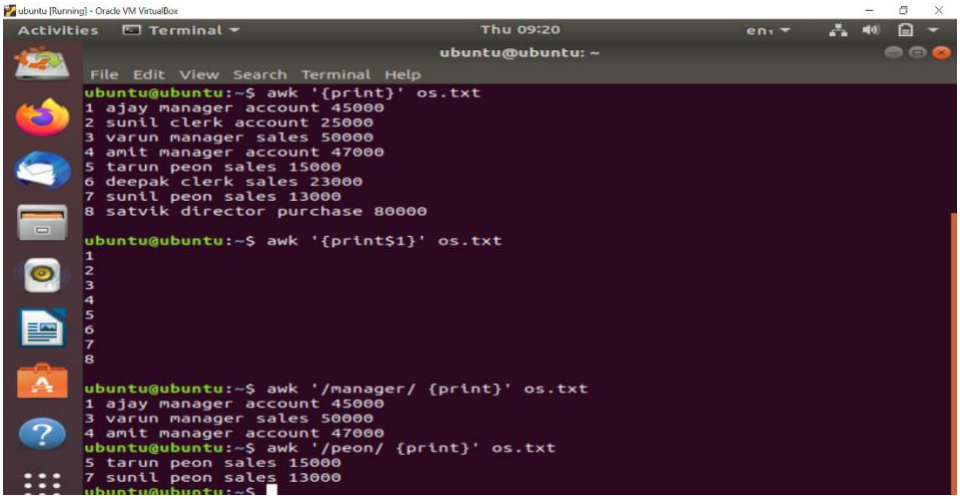
	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

1. Implement example programs on Shell Programming & AWK scripts.

i) AWK scripts:

awk '{print}' f1.txt
awk '{print $1}' f1.txt
awk '/manager/ {print}' f1.txt



ii)SHELL SCRIPTS:

a)greater

```
echo "Enter a number"
read a
echo "Enter a number"
read b
if [ $a -gt $b ]
then
        echo "$a is greater"
elif [ $b -gt $a ]
then
        echo $b is greater
else
        echo both are equal
fi
```

Output:

```
ubuntu@ubuntu:~$ gedit  greaterscript.sh
ubuntu@ubuntu:~$ bash  greaterscript.sh
enter a number
4
enter another number
5
5 is greater
```

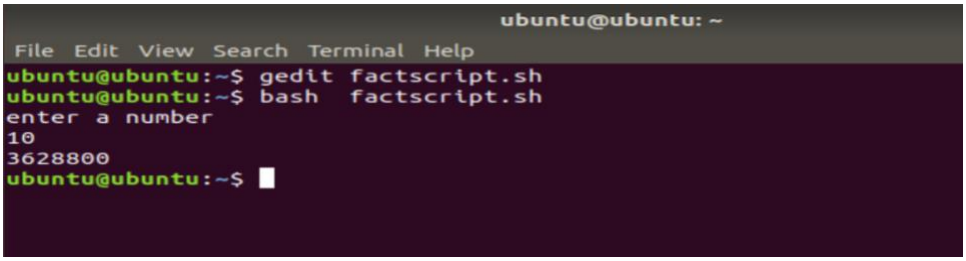
c)finding prime number

```
echo "Enter the number"
read a
i=2
z=0
while [ $i -lt $a ]
do
s=`expr $a % $i`
if [ $s -eq $z ]
then
echo "Not Prime"
exit
else
i=`expr $i + 1`
fi
done
echo "Prime number"
```

d)Factorial

```
echo "Enter a number"
read num
fact=1
while [ $num -gt 1 ]
do
  fact=$((fact * num))  #fact = fact * num
  num=$((num - 1))      #num = num - 1
done
echo $fact
```

Output:



e)Fibonacci series

```
N=10
a=0
b=1
echo "The Fibonacci series is : "
for (( i=0; i<N; i++ ))
do
   echo -n " $a "
   fn=$((a + b))
   a=$b
   b=$fn
done
```

Output:

```
ubuntu@ubuntu:~$ gedit fibonacci.sh
ubuntu@ubuntu:~$ bash  fibonacci.sh
fibonacci series is:
 0  1  1  2  3  5  8  13  21  34 ubuntu@ubuntu:~$
```

2. Write programs using the following system calls of LINUX operating system: Fork, exec, getpid, exit, wait, close, stat, opendir,readdir.

a) **fork**

```
#include<stdio.h>
#include<unistd.h>
main()
{
printf(“B.Yogananda 319126511077:”);
int n,i,sum=1;
pid_t p;
printf("Enter n value:");
scanf("%d",&n);
p=fork();
if(p==0)
{
for(i=n;i!=1;i--)
sum*=i;
printf("%d!=%d\n",n,sum);
}
else
{
sleep(5);
printf("sum of %d terms:%d\n",n,(n*(n+1))/2);
```

}
}

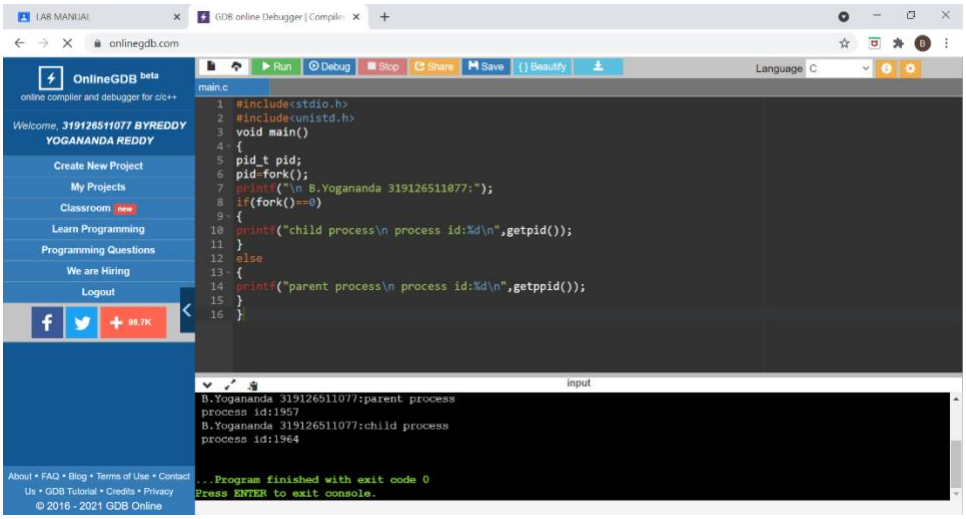
Output-

```
 B.Yogananda 319126511077:
enter n value4
4!=24
sum of 4 terms:10
```

b)Parent and child process ids

```
#include<stdio.h>
#include<unistd.h>
main()
{
pid_t pid;
pid=fork();
if(fork()==0)
printf("child process\n process id:%d\n",getpid());
else
printf("parent process\n process id:%d\n",getppid());
}
```

Output-



c) Open Directory

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

```
#include<dirent.h>
main()
{
char dirname[10];
DIR *p;
struct dirent *d;
printf("Enter directory name\n");
scanf("%s",dirname);
p=opendir(dirname);
if(p==NULL)
  {
  perror("Cannot find directory");
  exit(0);
  }
while(d=readdir(p))
  printf("%s\n",d->d_name);
}
```

Output-

3.Write programs using the I/O system calls of LINUX operating system (open, read, write, etc) and error reporting using errno

Copy content from one file to another file

```
#include<stdio.h>
#include<unistd.h>
int main()
{
FILE *f1,*f2;
int fd[2];
char n1[20],n2[20],buf[20];
printf("This is 319126511077 B.Yogananda Reddy's Output\n");
printf("enter first file name");
scanf("%s",n1);
printf("enter second file name");
scanf("%s",n2);
f2=fopen(n2,"w");f1=fopen(n1,"r");
while(fread(buf,1,1,f1)!=0)
{
fwrite(buf,1,1,f2);
}
```

```
fclose(f1);
fclose(f2);
}
```
Output-

write all content from file to another file

```
#include<stdio.h>
#include<unistd.h>
int main()
{
FILE *f1,*f2;
int fd[2];
char n1[20],n2[20],buf[20];
printf("This is 319126511077 B.Yogananda Reddy's Output\n");
printf("enter first file name");
scanf("%s",n1);
printf("enter second file name");
scanf("%s",n2);
f2=fopen(n2,"w");f1=fopen(n1,"r");
while(fread(buf,1,1,f1)!=0)
{
fwrite(buf,1,1,f2);
}
fclose(f1);fclose(f2);}
```

Output-

4. Write a C programs to simulate UNIX commands like ls, grep,etc.

```
#include<stdio.h>
#include<unistd.h>
#include<stdlib.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <unistd.h>
#include<string.h>
#include <fcntl.h>
```

```
void match_pattern(char *argv[])
{
printf("This is 319126511077 B.Yogananda Reddy's Output\n");
   int fd,r,j=0;
   char temp,line[100];
   if((fd=open(argv[2],O_RDONLY)) != -1)
   {
      while((r=read(fd,&temp,sizeof(char)))!= 0)
      {
         if(temp!='\n')
         {
            line[j]=temp;
            j++;
         }
         else
         {
            if(strstr(line,argv[1])!=NULL)
               printf("%s\n",line);
            memset(line,0,sizeof(line));
            j=0;
         }

      }
   }
}

main(int argc,char *argv[])
{
   struct stat stt;
   if(argc==3)
   {
      if(stat(argv[2],&stt)==0)
         match_pattern(argv);
      else
      {
         perror("stat()");
         exit(1);
      }
   }
}
```

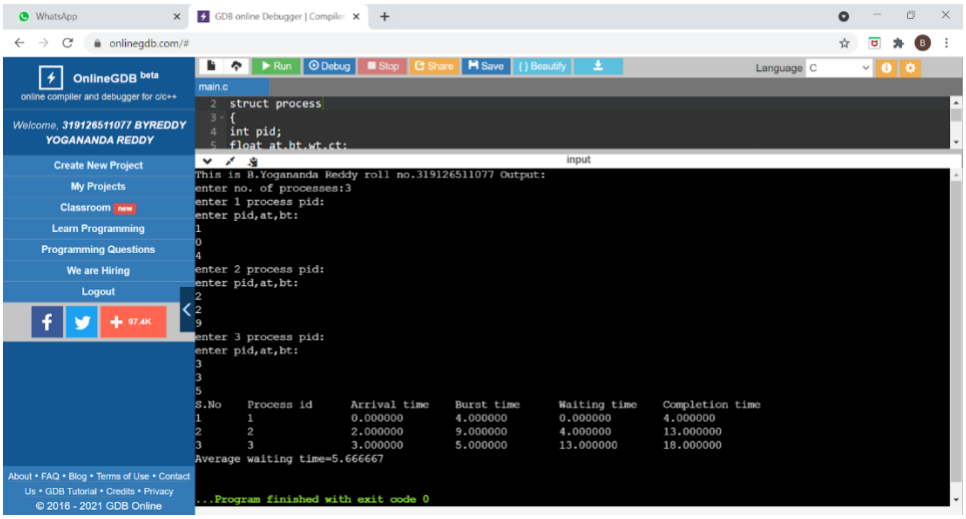
5.Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for scheduling algorithms FCFS,SJF, PRIORITY & RR. For each of the scheduling policies, compute and print the average waiting time, average turnaround time and Gantt chart

FCFS

```
#include<stdio.h>
struct process
{
int pid;
float at,bt,wt,ct;
};
main()
{
int n,i,j;
float sum=0;
printf("enter no. of processes:");
scanf("%d",&n);
struct process p[1000],t;
for(i=0;i<n;i++)
{
printf("This is B.Yoganada Reddy roll no 319126511077 Output\n");

printf("enter %d process pid:\nenter pid,at,bt:\n",i+1);
scanf("%d%f%f",&p[i].pid,&p[i].at,&p[i].bt);
}
for(i=1;i<n;i++)
{
t=p[i];
for(j=i-1;j<i&&j>=0;j--)
{
if(t.at<p[j].at)
{
p[j+1]=p[j];
p[j]=t;
}
}
}
for(i=0;i<n;i++)
{
if(i==0)
{
```

```
p[i].wt=0;
p[i].ct=p[i].wt+p[i].bt;
}
else
{
p[i].wt=p[i-1].wt+p[i-1].bt;
p[i].ct=p[i].wt+p[i].bt;
sum+=p[i].wt;
}
}
printf("S.No\tProcess id\tArrival time\tBurst time\tWaiting time\tCompletion time\n");
for(i=0;i<n;i++)
printf("%d\t%d\t\t%f\t%f\t%f\t%f\n",i+1,p[i].pid,p[i].at,p[i].bt,p[i].wt,p[i].ct);
printf("Average waiting time=%f\n",sum/n);
}
```

Output:

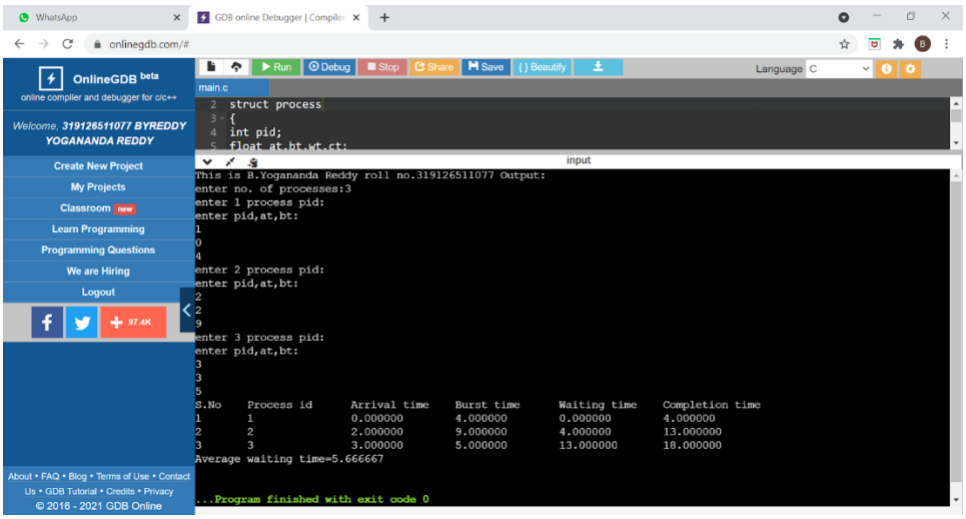


SJF

```
#include<stdio.h>
struct process
{
int pid;
float at,bt,wt,ct;
};
main()
{
printf("This is B.Yoganada Reddy roll no 319126511077 Output\n");

int n,i,j;
```

```
float sum=0;
printf("enter no. of processes:");
scanf("%d",&n);
struct process p[1000],t;
for(i=0;i<n;i++)
{
printf("enter %d process pid:\nenter pid,at,bt:\n",i+1);
scanf("%d%f%f",&p[i].pid,&p[i].at,&p[i].bt);
}
for(i=1;i<n;i++)
{
t=p[i];
for(j=i-1;j<i&&j>=0;j--)
{
if(t.bt<p[j].bt)
{
p[j+1]=p[j];
p[j]=t;
}
}
}
for(i=0;i<n;i++)
{
if(i==0)
{
p[i].wt=0;
p[i].ct=p[i].wt+p[i].bt;
}
else
{
p[i].wt=p[i-1].wt+p[i-1].bt;
p[i].ct=p[i].wt+p[i].bt;
sum+=p[i].wt;
}
}
printf("S.No\tProcess id\tArrival time\tBurst time\tWaiting time\tCompletion time\n");
for(i=0;i<n;i++)
printf("%d\t%d\t\t%f\t%f\t%f\t%f\n",i+1,p[i].pid,p[i].at,p[i].bt,p[i].wt,p[i].ct);
printf("Average waiting time=%f\n",sum/n);
}
```

Output:

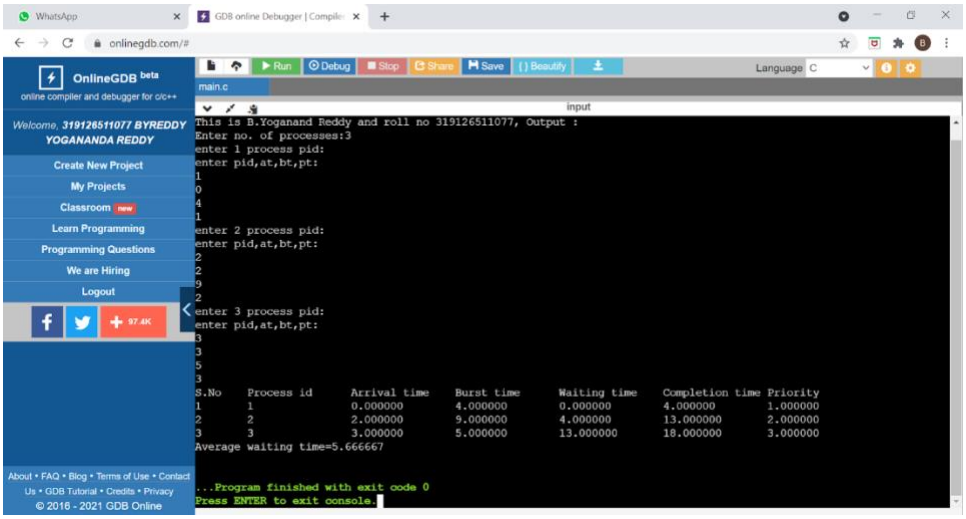


Priority scheduling

```
#include<stdio.h>
struct process
{
int pid;
float at,bt,wt,ct,pt;
};
main()
{
int n,i,j;
float sum=0;
printf("enter no. of processes:");
scanf("%d",&n);
struct process p[1000],t;
for(i=0;i<n;i++)
{
printf("This is B.Yoganada Reddy and roll no 319126511077 Output\n");
scanf("%d%f%f%f",&p[i].pid,&p[i].at,&p[i].bt,&p[i].pt);
}
for(i=1;i<n;i++)
{
t=p[i];
for(j=i-1;j<i&&j>=0;j--)
{
if(t.pt<p[j].pt)
{
p[j+1]=p[j];
p[j]=t;
}
```

```
}
}
for(i=0;i<n;i++)
{
if(i==0)
{
p[i].wt=0;
p[i].ct=p[i].wt+p[i].bt;
}
else
{
p[i].wt=p[i-1].wt+p[i-1].bt;
p[i].ct=p[i].wt+p[i].bt;
sum+=p[i].wt;
}
}
printf("S.No\tProcess id\tPriority\tArrival time\tBurst time\tWaiting time\tCompletion time\n");
for(i=0;i<n;i++)
printf("%d\t%d\t\t%f\t%f\t%f\t%f\t%f\n",i+1,p[i].pid,p[i].pt,p[i].at,p[i].bt,p[i].wt,p[i].ct);
printf("Average time=%f\n",sum/n);
}
```

Output:



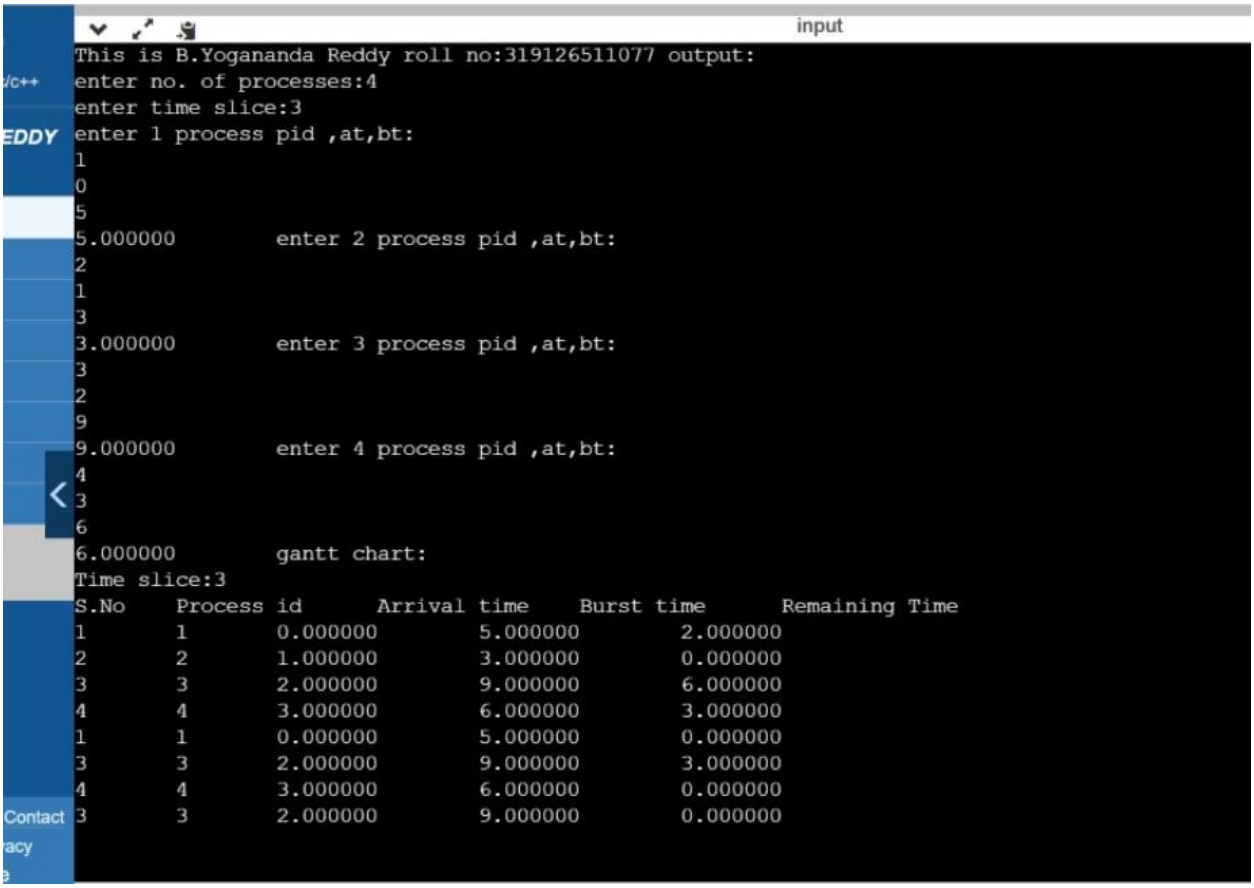
Round robin

```
#include<stdio.h>
struct process
{
```

```
int pid;
float at,bt,rt;
};
int n,i,j,ts;
struct process p[1000],t;
void sort()
{
for(i=1;i<n;i++)
{
t=p[i];
for(j=i-1;j<i&& j>=0;j--)
{
if(t.at<p[j].at)
{
p[j+1]=p[j];
p[j]=t;
}
}
}
}
main()
{
float tt=0;
int k=0;
printf("This is B.Yoganada Reddy roll no 319126511077 Output\n");
printf("enter no. of processes:");
scanf("%d",&n);
printf("enter time slice");
scanf("%d",&ts);
for(k=0;k<n;k++)
{
printf("enter %d process pid ,at,bt",k+1);
scanf("%d%f%f",&p[k].pid,&p[k].at,&p[k].bt);
p[k].rt=p[k].bt;
printf("%f\t",p[k].rt);
}
printf("gantt chart:\n");
printf("Time slice:%d",ts);
printf("\nS.No\tProcess id\tArrival time\tBurst time\tRemaining Time\n");
do
{
sort();
tt=0;
for(i=0;i<n;i++)
```

```
{
if(p[i].rt>0)
{
if(p[i].rt<ts)
{
p[i].rt=0;
tt=tt+p[i].rt;
}
else
{
p[i].rt=p[i].rt-ts;
tt=tt+p[i].rt;
}
printf("%d\t%d\t\t%f\t%f\t%f\n",i+1,p[i].pid,p[i].at,p[i].bt,p[i].rt);
}
}
}while(tt>0);
}
```

Output:

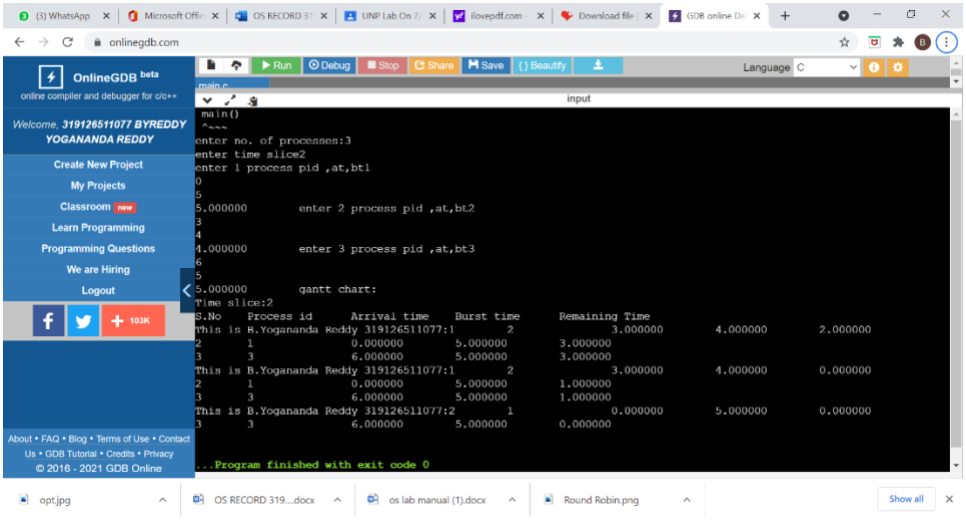


STRF

```
#include<stdio.h>
struct process
{
int pid;
float at,bt,rt;
};
int n,i,j,ts;
struct process p[1000],t;
void sort()
{
Printf(“This is B.Yogananda Reddy 319126511077:”);
for(i=1;i<n;i++)
{
t=p[i];
for(j=i-1;j<i&& j>=0;j--)
{
if(t.rt<p[j].rt)
{
p[j+1]=p[j];
p[j]=t;
}
}
}
}
main()
{
float tt=0;
int k=0;
printf("enter no. of processes:");
scanf("%d",&n);
printf("enter time slice");
scanf("%d",&ts);
for(k=0;k<n;k++)
{
printf("enter %d process pid ,at,bt",k+1);
scanf("%d%f%f",&p[k].pid,&p[k].at,&p[k].bt);
p[k].rt=p[k].bt;
printf("%f\t",p[k].rt);
}
printf("gantt chart:\n");
printf("Time slice:%d",ts);
printf("\nS.No\tProcess id\tArrival time\tBurst time\tRemaining Time\n");
```

```
do
{
sort();
tt=0;
for(i=0;i<n;i++)
{
if(p[i].rt>0)
{
if(p[i].rt<ts)
{
p[i].rt=0;
tt=tt+p[i].rt;
}
else
{
p[i].rt=p[i].rt-ts;
tt=tt+p[i].rt;
}
printf("%d\t%d\t\t\t%f\t%f\t%f\n",i+1,p[i].pid,p[i].at,p[i].bt,p[i].rt);
}
}
}while(tt>0);
}
```

Output:

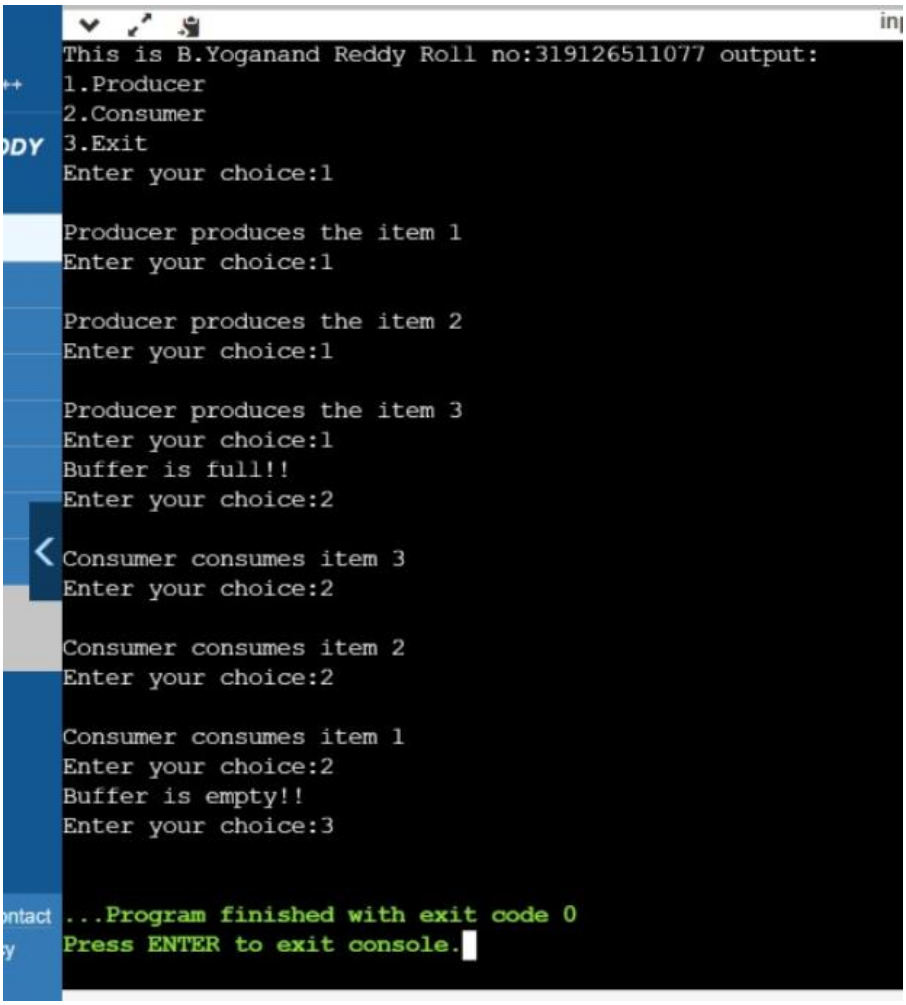


6.Implement the Producer – Consumer problem using semaphores (using LINUX system calls).

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

```
void main()
{
printf("This is B.Yoganada Reddy roll no 319126511077 Output\n");
int buffer[10], bufsize,in,out,produce,consume,choice=0;
in = 0;
out = 0;
bufsize = 10;
while(choice !=3)
{
printf("\n 1. Produce \t 2. Consume \t3. Exit");
printf("\n Enter your choice: ");
scanf("%d", &choice);
switch(choice) {
case 1: if((in+1)%bufsize==out)
printf("\n Buffer is Full");
else
{
printf("\nEnter the item no: ");
scanf("%d", &produce);
buffer[in] = produce;
in = (in+1)%bufsize;
}
break;
case 2: if(in == out)
printf("\nBuffer is Empty");
else
{
consume = buffer[out];
printf("\nThe consumed value is %d", consume);
out = (out+1)%bufsize;
}
break;
} } }
```

Output:



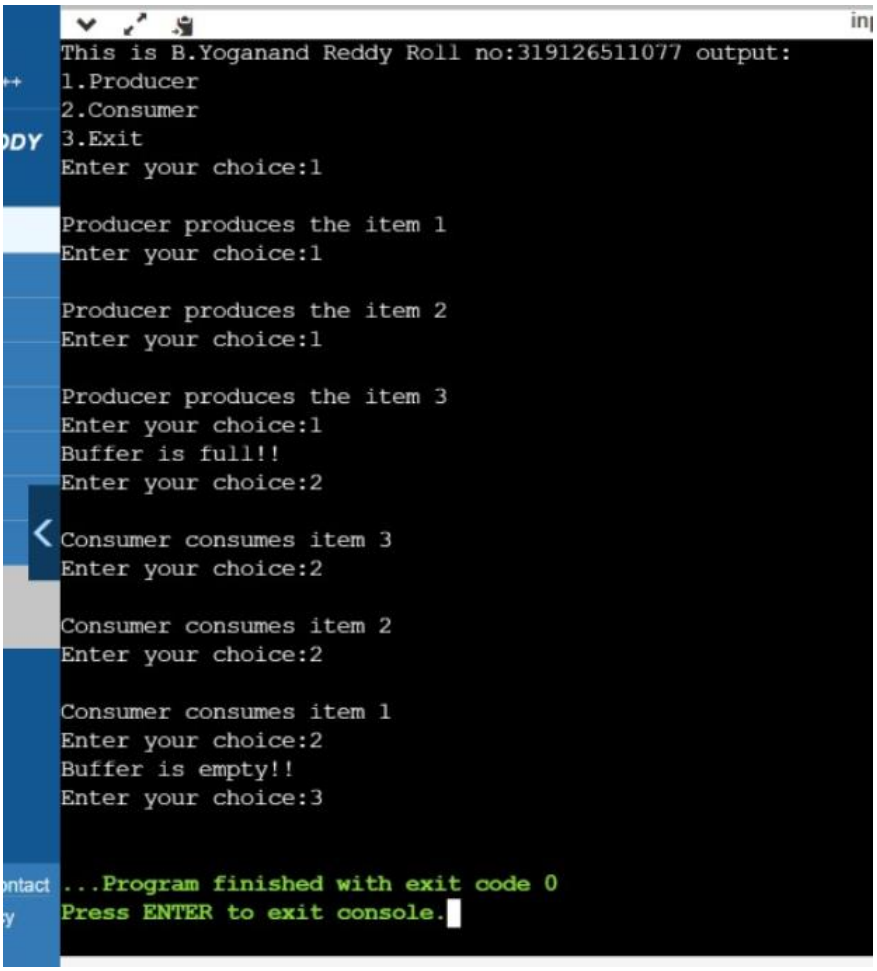
b)Producer Consumer Problem

```
#include<stdio.h>
#include<stdlib.h>
int mutex=1,full=0,empty=3,x=0;
int main()
{
        int n;
        void producer();
        void consumer();
        int wait(int);
        int signal(int);
printf("This is B.Yoganada Reddy roll no 319126511077 Output\n");
        printf("\n1.Producer\n2.Consumer\n3.Exit");
        while(1)
        {
                printf("\nEnter your choice:");
```

```
		scanf("%d",&n);
		switch(n)
		{
			case 1:if((mutex==1)&&(empty!=0))
					producer();
				else
					printf("Buffer is full!!");
				break;
			case 2:if((mutex==1)&&(full!=0))
					consumer();
				else
					printf("Buffer is empty!!");
				break;
			case 3:
				exit(0);
				break;
		}
	}
	return 0;
}
int wait(int s)
{
	return (--s);
}
int signal(int s)
{
	return(++s);
}
void producer()
{
	mutex=wait(mutex);
	full=signal(full);
	empty=wait(empty);
	x++;
	printf("\nProducer produces the item %d",x);
	mutex=signal(mutex);
}
void consumer()
{
	mutex=wait(mutex);
	full=wait(full);
	empty=signal(empty);
	printf("\nConsumer consumes item %d",x);
	x--;
```

```
        mutex=signal(mutex);
}
```

Output:



7. **Programs using pipes**

One way pipe-

Program-

```
#include<stdio.h>
#include<unistd.h>
int main()
{
int fd[2];
char buf[20];
pipe(fd);
if(fork()==0)
{
write(fd[1],"anits",20);
}
```

```
else
{
read(fd[0],&buf,5);
printf("This is B.Yoganada Reddy roll no 319126511077 Output\n");
printf(" Given message is:%s",buf);
}
}
```

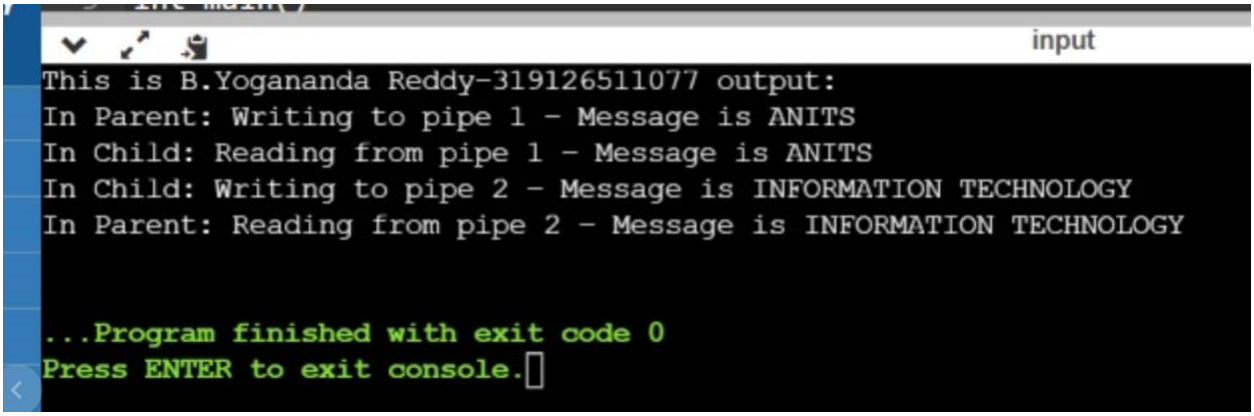
Output-

Two way pipes-

Program-

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

int main() {
printf("This is B.Yoganada Reddy - 319126511077 Output\n");
  int pipefds1[2], pipefds2[2];
  int returnstatus1, returnstatus2;
  int pid;
  char pipe1writemessage[20] = "This is anits";
  char pipe2writemessage[20] = "IT-B";
  char readmessage[20];
  returnstatus1 = pipe(pipefds1);
  returnstatus2 = pipe(pipefds2);

  pid = fork();

  if (pid != 0)
  {
    close(pipefds1[0]);
    close(pipefds2[1]);
    printf("In Parent: Writing to pipe 1 –  Given message is %s\n", pipe1writemessage);
    write(pipefds1[1], pipe1writemessage, sizeof(pipe1writemessage));
    read(pipefds2[0], readmessage, sizeof(readmessage));
    printf("In Parent: Reading from pipe 2 – Given message is %s\n", readmessage);
  } else {
    close(pipefds1[1]);
    close(pipefds2[0]);
    read(pipefds1[0], readmessage, sizeof(readmessage));
    printf("In Child: Reading from pipe 1 – Given message is %s\n", readmessage);
    printf("In Child: Writing to pipe 2 – Given message is %s\n", pipe2writemessage);
    write(pipefds2[1], pipe2writemessage, sizeof(pipe2writemessage));
  }
```

```
  return 0;
}
```
Output-



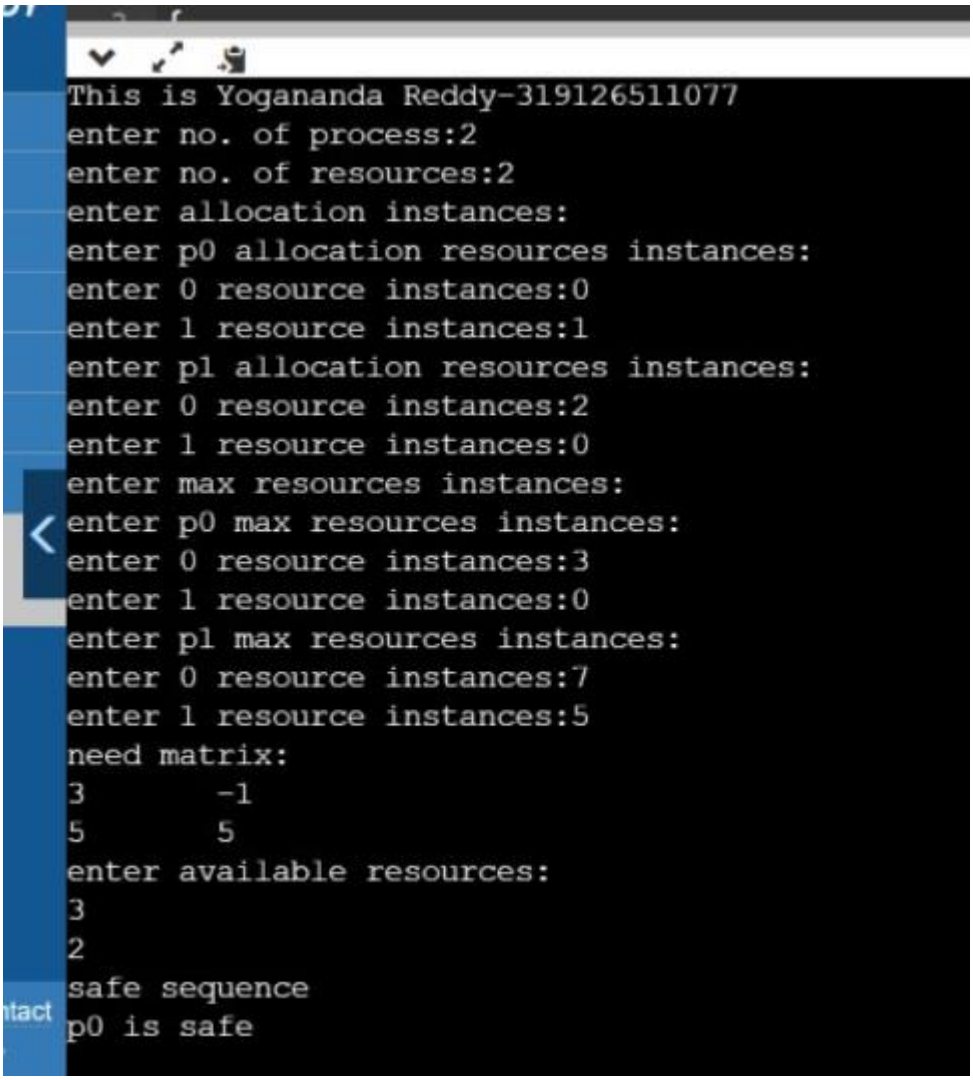
8. Implement Banker's algorithm for handling deadlock

Banker's algorithm for handling deadlock-

Program-

```
#include<stdio.h>
main()
{
printf("This is B.Yoganada Reddy - 319126511077\n");
int n,r,all[20][20],max[20][20],need[20][20],avl[20],i,j,k=0,l=0,p[20],t=0;;
printf("enter no. of process:");
scanf("%d",&n);
printf("enter no. of resources:");
scanf("%d",&r);
printf("enter allocation instances:\n");
for(i=0;i<n;i++)
{
printf("enter p%d allocation resources instances:\n",i);
for(j=0;j<r;j++)
{
printf("enter %d resource instances:",j);
scanf("%d",&all[i][j]);
}
}
printf("enter max resources instances:\n");
for(i=0;i<n;i++)
{
printf("enter p%d max resources instances:\n",i);
for(j=0;j<r;j++)
{
```

```
printf("enter %d resource instances:",j);
scanf("%d",&max[i][j]);
}
}
printf("need matrix:\n");
for(i=0;i<n;i++)
{
for(j=0;j<r;j++)
{
need[i][j]=max[i][j]-all[i][j];
printf("%d\t",need[i][j]);
}
printf("\n");
}l=0,p[20],t=0;
printf("enter available resources:\n");
for(i=0;i<r;i++)
scanf("%d",&avl[i]);

for(i=0;i<n;i++)
p[i]=0;
printf("safe sequence\n");
do
{
for(i=0;i<n;i++)
{
k=0;
for(j=0;j<r;j++)
{if(need[i][j]<=avl[j])
k++;}
if(k==j)
{
for(l=0,j=0;j<r;j++,l++)
{avl[l]=avl[l]+all[i][j];
if(p[i]==0)
{printf("p%d is safe\n",i);
p[i]=1;
t=t+1;
}}}}
}while(t<i);
}
```
Output-



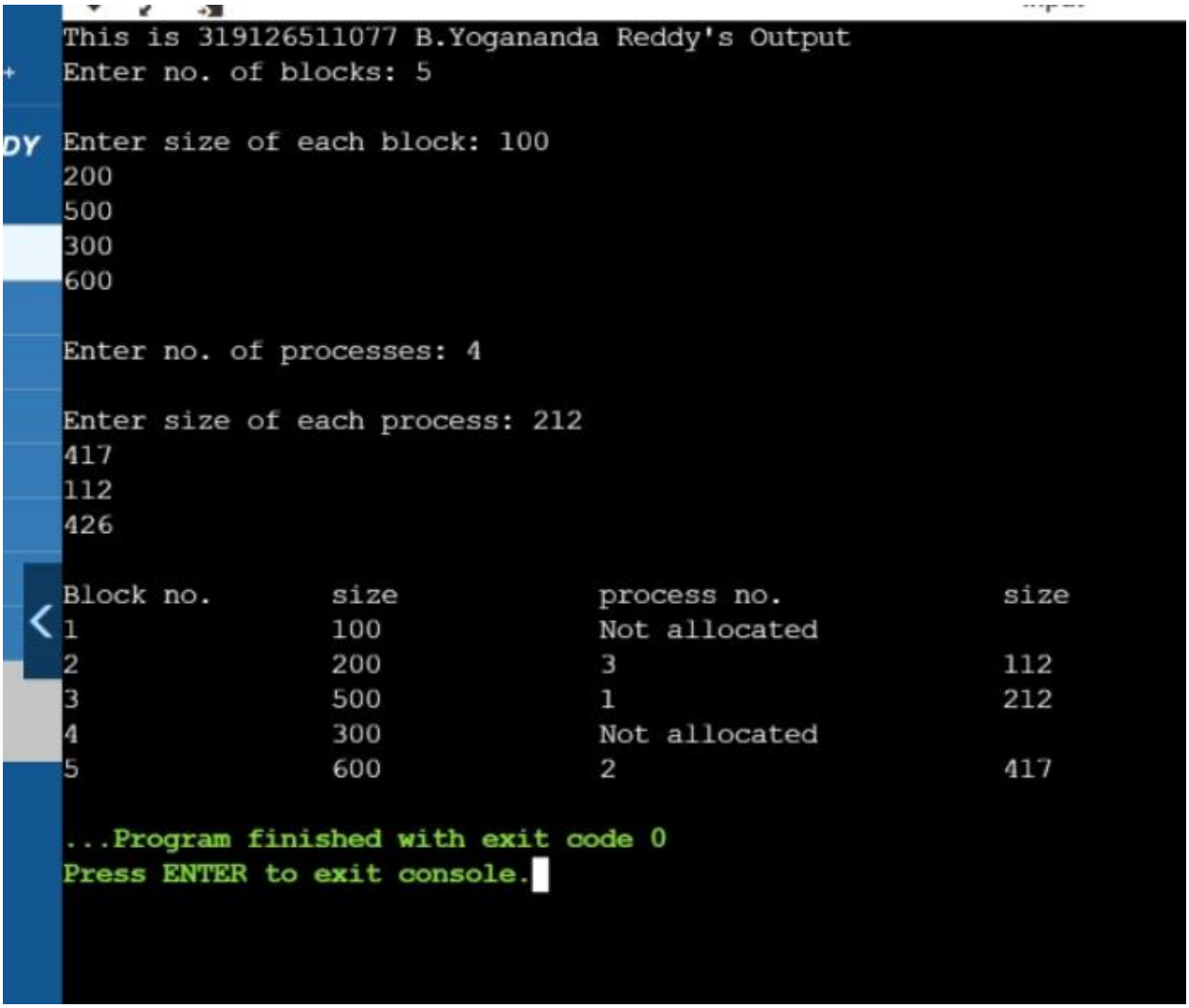
9. Implement free space management strategies such as First fit, Best fit and Worstfit

FIRST FIT

```
#include<stdio.h>
void main()
{
	int bsize[10], psize[10], bno, pno, flags[10], allocation[10], i, j;
	for(i = 0; i < 10; i++)
	{
		flags[i] = 0;
		allocation[i] = -1;
	}
printf("This is  319126511077 B.Yogananada Reddy's Output\n");
```

```
	printf("Enter no. of blocks: ");
	scanf("%d", &bno);
	printf("\nEnter size of each block: ");
	for(i = 0; i < bno; i++)
		scanf("%d", &bsize[i]);
	printf("\nEnter no. of processes: ");
	scanf("%d", &pno);
	printf("\nEnter size of each process: ");
	for(i = 0; i < pno; i++)
		scanf("%d", &psize[i]);
	for(i = 0; i < pno; i++)	//allocation as per first fit
		for(j = 0; j < bno; j++)
			if(flags[j] == 0 && bsize[j] >= psize[i])
			{
				allocation[j] = i;
				flags[j] = 1;
				break;
			}
	//display allocation details
	printf("\nBlock no.\tsize\t\tprocess no.\t\tsize");
	for(i = 0; i < bno; i++)
	{
		printf("\n%d\t\t%d\t\t", i+1, bsize[i]);
		if(flags[i] == 1)
			printf("%d\t\t\t%d",allocation[i]+1,psize[allocation[i]]);
		else
			printf("Not allocated");
	}
}
```

Output:



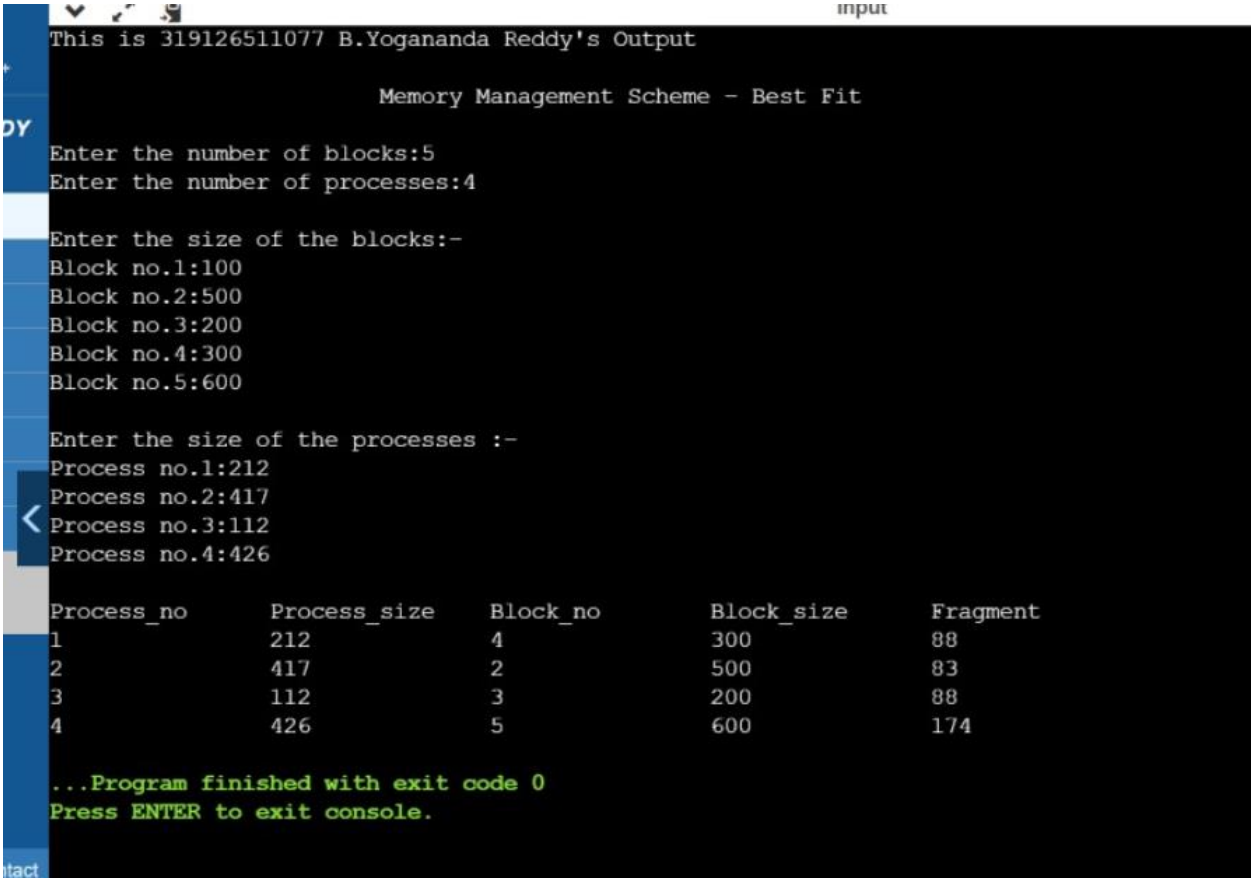
best fit

```
#include<stdio.h>
int main()
{
   int n,m,a[100],b[100],c[100],d[100],i,j,t,t1;
  printf("This is B.Yoganada Reddy roll no 319126511077 Output\n");
   printf("enter no of process u want...\n");
   scanf("%d",&n);
   printf("enter no block size elements u want...\n");
   scanf("%d",&m);
   printf("enter process elements\n");
   for(i=0;i<n;i++)
   {
      scanf("%d",&a[i]);
      c[i]=a[i];
```

```
}
printf("enter block size elements....\n");
for(j=0;j<m;j++)
{
    scanf("%d",&b[j]);
    d[j]=j;

}
//sort the elements in the block size according to increasing order
for(i=0;i<m;i++)
{
    for(j=0;j<m-i-1;j++)
    {
        if(b[j]>b[j+1])
        {
            t=b[j];
            b[j]=b[j+1];
            b[j+1]=t;
            t1=d[j];
            d[j]=d[j+1];
            d[j+1]=t1;
        }
    }
}
//after sorting apply best fit algorithm
for(i=0;i<n;i++)
{
for(j=0;j<m;j++)
{  if(b[j]>=a[i])
{
   b[j]=b[j]-a[i];
   a[i]=d[j];//passing previous index value of the process to array a
   //so that we can get the actual no of block size which was there
   //before sorting

   break;
}
}
if(j==m)
{
    a[i]=-1;//process not allocations
}
}
 //printing table
```

```
    for(i=0;i<n;i++)
    {
        printf("%d\t%d\t",c[i],a[i]);
        printf("\n");
    }
    return 0;
}
```

Output:



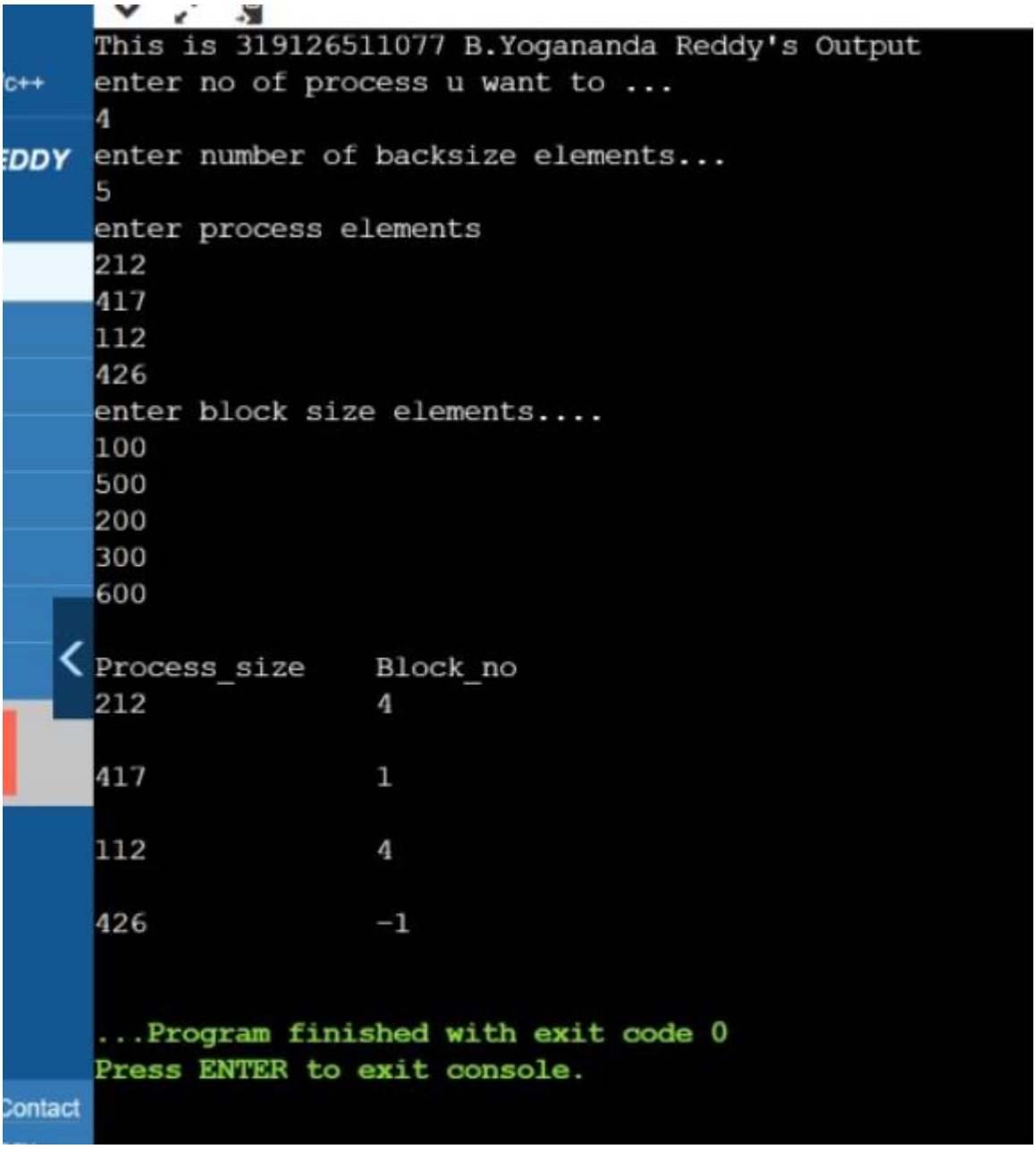
Worst fit

```
#include<stdio.h>
int main()
{
int n,m,a[100],b[100],c[100],d[100],i,j,t,t1;
printf("This is 319126511077 B.Yogananda Reddy's Output\n");
    printf("enter no of process u want to ...\n");
    scanf("%d",&n);
    printf("enter number of backsize elements...\n");
    scanf("%d",&m);
    printf("enter process elements\n");
```

```
 for(i=0;i<n;i++)
{
    scanf("%d",&a[i]);
    c[i]=a[i];
}
 printf("enter block size elements....\n");
for(j=0;j<m;j++)
{
    scanf("%d",&b[j]);
    d[j]=j;

}
//sort the elements in the block size according to increasing order
for(i=0;i<m;i++)
{
    for(j=0;j<m-i-1;j++)
    {
        if(b[j]<b[j+1])
        {
            t=b[j];
            b[j]=b[j+1];
            b[j+1]=t;
            t1=d[j];
            d[j]=d[j+1];
            d[j+1]=t1;
        }
    }
}
//after sorting apply best fit algorithm
for(i=0;i<n;i++)
{
for(j=0;j<m;j++)
{  if(b[j]>=a[i])
{
   b[j]=b[j]-a[i];
   a[i]=d[j];//passing previous index value of the process to array a
          break;
}
}
if(j==m)
{
    a[i]=-1;//process not allocations
}
}
```

```
    //printing table
   for(i=0;i<n;i++)
   {
      printf("%d\t%d\t",c[i],a[i]);
      printf("\n");
   }
   return 0;
}
```

Output:



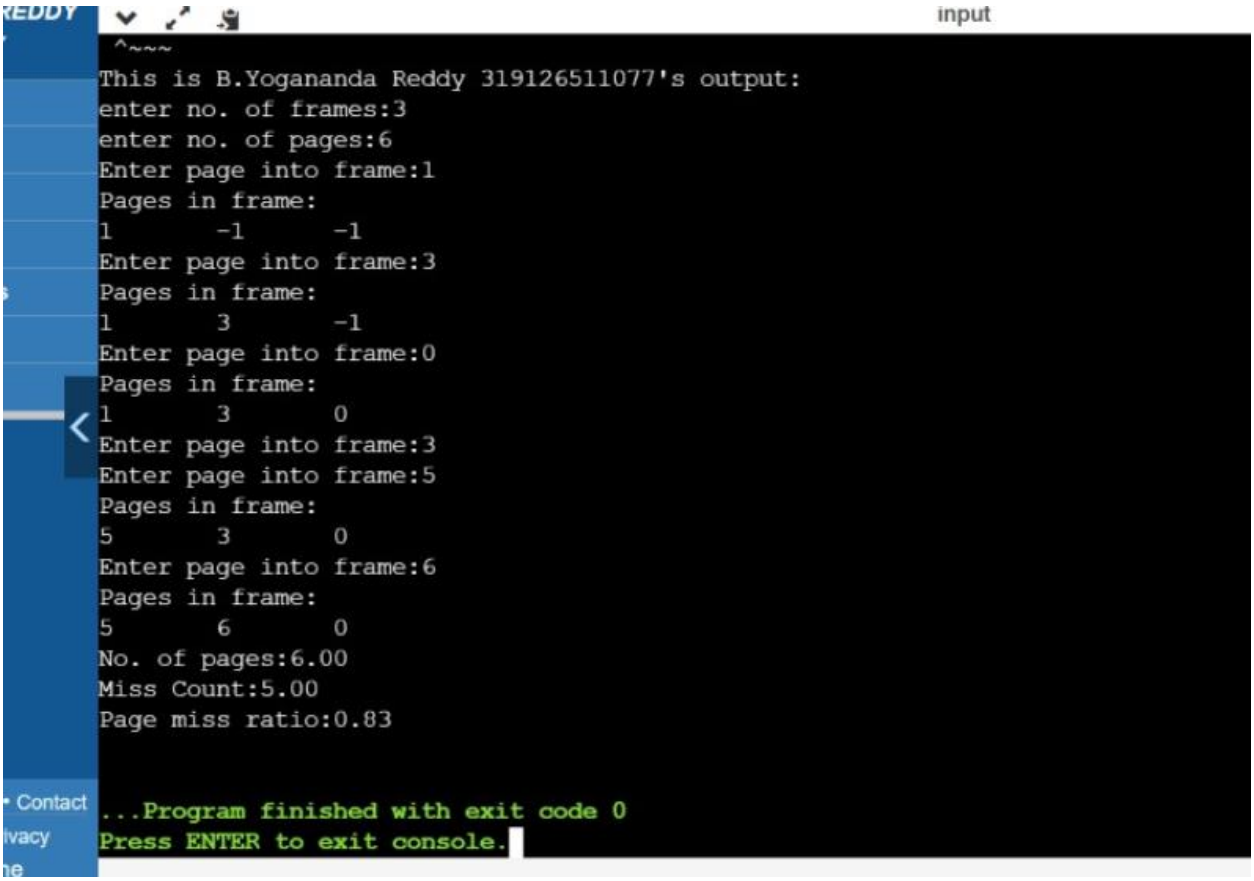
10.Implement page replacement algorithms such as FIFO,LRU

FIFO-

```
#include<stdio.h>
int search(int);
void enqueue();
int i,front=-1,rear=-1,e,max,q[100];
main()
{
int s=0,j;
float count=0,n;
printf("This is B.Yoganada Reddy 319126511077’s Output\n");
printf("enter no. of frames:");
scanf("%d",&max);
printf("enter no. of pages:");
scanf("%f",&n);
for(i=0;i<max;i++)
{
q[i]=-1;
}
j=0;
while(j<n)
{
printf("Enter page into frame:");
scanf("%d",&e);
j++;
s=search(e);
if(s==0)
{
++count;
enqueue();
}
}
printf("No. of pages:%.2f\n",n);
printf("Miss Count:%.2f\n",count);
printf("Page miss ratio:%.2f\n",(count/n));
}
int search(int a)
{
int k=0;
for(i=0;i<max;i++)
{
if(q[i]==a)
{
k=1;
```

```
break;
}
}
if(k==1)
return 1;
else
return 0;
}
void enqueue()
{
if(rear==-1)
{
front=0;
rear=0;
q[rear]=e;
}
else if(rear==max-1)
{
rear=0;
q[rear]=e;
}
else
{
rear++;
q[rear]=e;
}
printf("Pages in frame:\n");
for(i=0;i<=max-1;i++)
printf("%d\t",q[i]);
printf("\n");
}
```

Output:



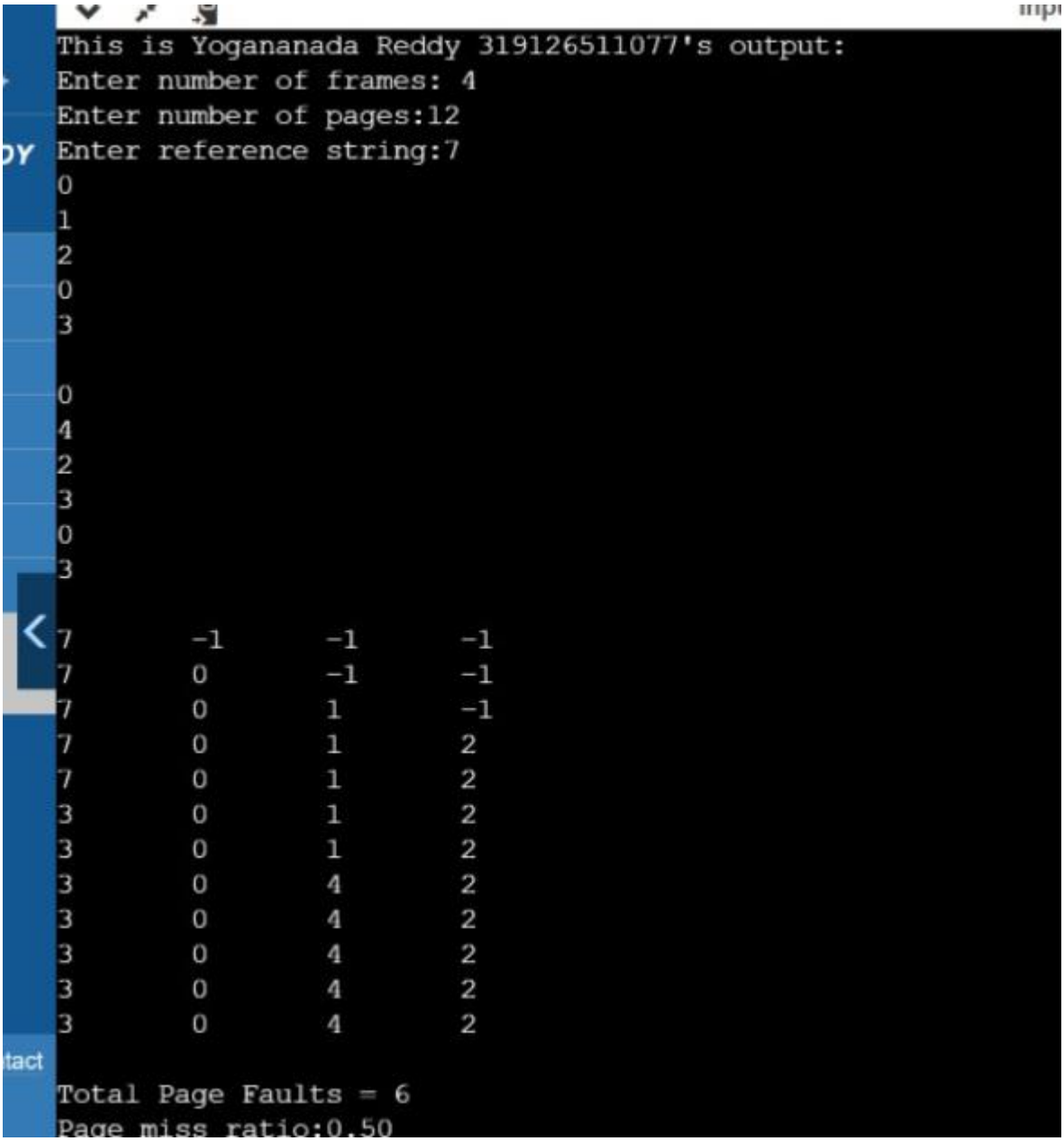
LRU

```
#include<stdio.h>

int findLRU(int time[], int n)
{
int i, minimum = time[0], pos = 0;
for(i = 1; i < n; ++i)
{
        if(time[i] < minimum)
        {
                minimum = time[i];
                pos = i;
        }
}
return pos;
}
int main()
{
```

```
int no_of_frames, no_of_pages, frames[10], pages[30], counter = 0, time[10], flag1, flag2, i, j,
pos, faults = 0;
printf("This is B.Yoganada Reddy  319126511077's Output\n");
printf("Enter number of frames: ");
scanf("%d", &no_of_frames);
printf("Enter number of pages: ");
scanf("%d", &no_of_pages);
printf("Enter reference string: ");
for(i = 0; i < no_of_pages; ++i)
{
        scanf("%d", &pages[i]);
}
for(i = 0; i < no_of_frames; ++i)
{
        frames[i] = -1;
}
for(i = 0; i < no_of_pages; ++i)
{
        flag1 = flag2 = 0;
   for(j = 0; j < no_of_frames; ++j)
        {
        if(frames[j] == pages[i])
                {
                        counter++;
                time[j] = counter;
                        flag1 = flag2 = 1;
                        break;
                }
   }
        if(flag1 == 0)
        {
                for(j = 0; j < no_of_frames; ++j)
                {
                if(frames[j] == -1)
                        {
                        counter++;
                        faults++;
                        frames[j] = pages[i];
                        time[j] = counter;
                        flag2 = 1;
                        break;
                }
        }
   }
```

```
    if(flag2 == 0)
        {
        pos = findLRU(time, no_of_frames);
        counter++;
        faults++;
        frames[pos] = pages[i];
        time[pos] = counter;
    }
        printf("\n");
    for(j = 0; j < no_of_frames; ++j)
        {
            printf("%d\t", frames[j]);
    }
}
printf("\n\nTotal Page Faults = %d", faults);
printf("\nPage miss ratio:%.2f\n",(float)faults/no_of_pages);
return 0;
}
```

Output:



OPTIMAL

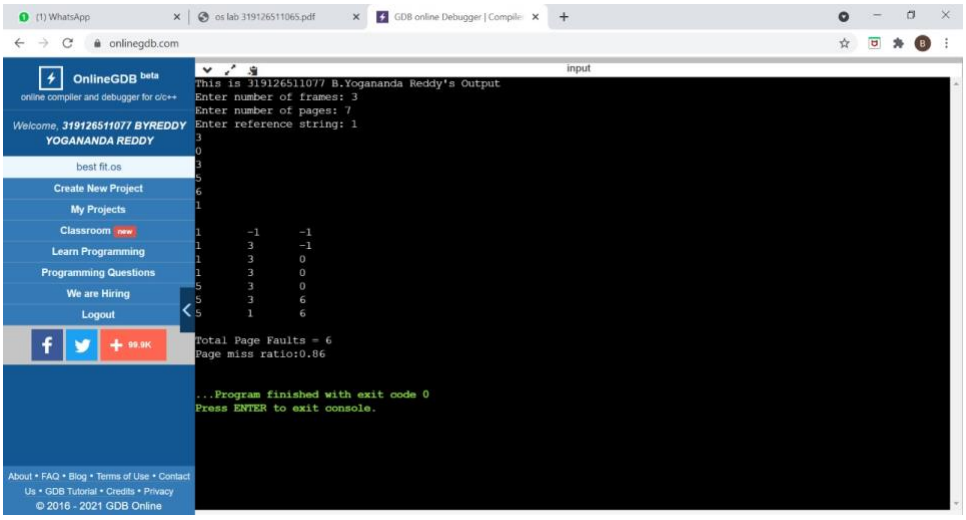
```
#include<stdio.h>
int main()
{
   int no_of_frames, no_of_pages, frames[10], pages[30], temp[10], flag1, flag2, flag3, i, j, k,
pos, max, faults = 0;
   printf("This is 319126511077 B.Yogananda Reddy's Output\n");
   printf("Enter number of frames: ");
   scanf("%d", &no_of_frames);
   printf("Enter number of pages: ");
```

```
    scanf("%d", &no_of_pages);
    printf("Enter page reference string: ");
    for(i = 0; i < no_of_pages; ++i)
    {
        scanf("%d", &pages[i]);
    }

    for(i = 0; i < no_of_frames; ++i)
    {
        frames[i] = -1;
    }

    for(i = 0; i < no_of_pages; ++i)
{
        flag1 = flag2 = 0;

        for(j = 0; j < no_of_frames; ++j)
                    {
            if(frames[j] == pages[i])
                                {
                                flag1 = flag2 = 1;
            break;
            }
        }
        if(flag1 == 0)
                    {
            for(j = 0; j < no_of_frames; ++j)
                                {
                if(frames[j] == -1)
                                            {
                    faults++;
                    frames[j] = pages[i];
                    flag2 = 1;
                    break;
                }
            }
        }

        if(flag2 == 0)
                    {
            flag3 =0;
            for(j = 0; j < no_of_frames; ++j)
                                {
            temp[j] = -1;
```

```
        for(k = i + 1; k < no_of_pages; ++k)
                                        {
                if(frames[j] == pages[k])
                                                {
                        temp[j] = k;
                        break;
                }
        }
        }

        for(j = 0; j < no_of_frames; ++j)
        {
        if(temp[j] == -1)
                {
                pos = j;
                flag3 = 1;
                break;
        }
        }

        if(flag3 ==0)
                        {
        max = temp[0];
        pos = 0;
        for(j = 1; j < no_of_frames; ++j)
                                        {
                if(temp[j] > max)
                                                {
                        max = temp[j];
                        pos = j;
                }
        }
        }

                        frames[pos] = pages[i];
                        faults++;
    }
    printf("\n");
    for(j = 0; j < no_of_frames; ++j)
                {
        printf("%d\t", frames[j]);
    }
}
```

```
    printf("\n\nTotal Page Faults = %d", faults);

    return 0;
}
```

Output:



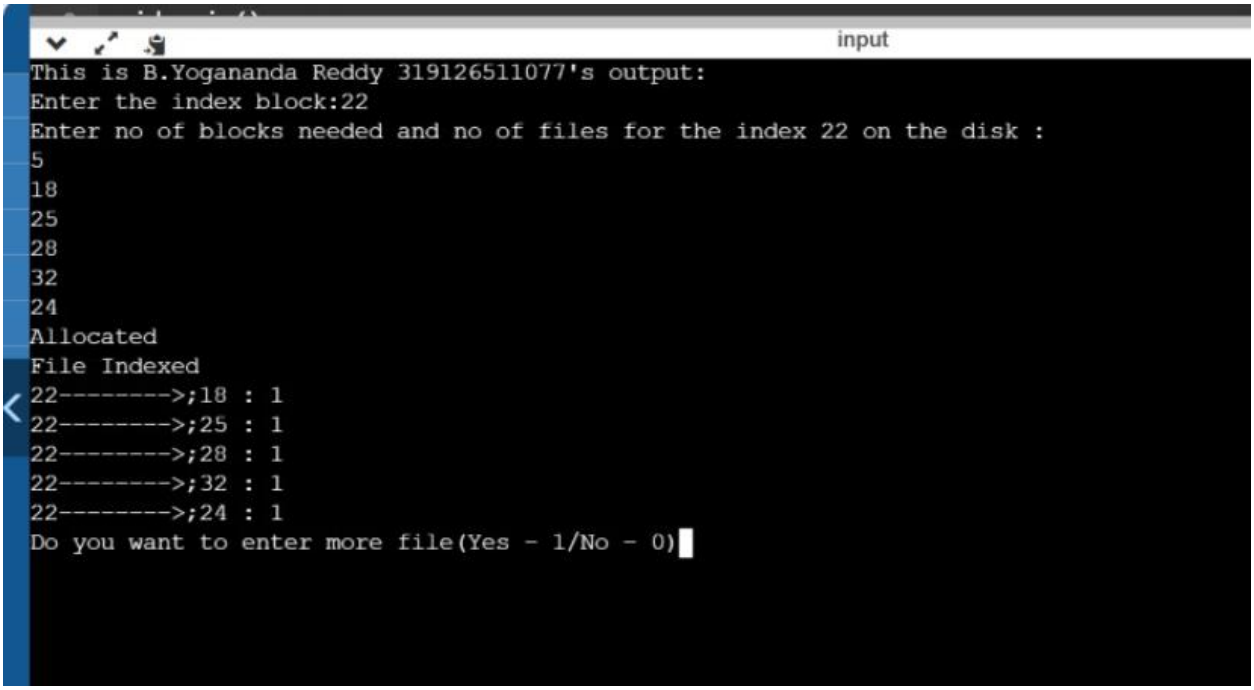
11. Implement file allocation techniques (Linked, Indexed and Contiguous)

Indexed Allocation

```
#include<stdio.h>
#include<stdlib.h>
void main()
{
    printf("This is 319126511077 B.Yogananda Reddy's Output\n");
int f[50], index[50],i, n, st, len, j, c, k, ind,count=0;
for(i=0;i<50;i++)
f[i]=0;
x:printf("Enter the index block: ");
scanf("%d",&ind);
if(f[ind]!=1)
{

printf("Enter no of blocks needed and no of files for the index %d on the disk : \n", ind);
scanf("%d",&n);
}
else
{
```

```
printf("%d index is already allocated \n",ind);
goto x;
}
y: count=0;
for(i=0;i<n;i++)
{
scanf("%d", &index[i]);
if(f[index[i]]==0)
count++;
}
if(count==n)
{
for(j=0;j<n;j++)
f[index[j]]=1;
printf("Allocated\n");
printf("File Indexed\n");
for(k=0;k<n;k++)
printf("%d-------->%d : %d\n",ind,index[k],f[index[k]]);
}
else
{
printf("File in the index is already allocated \n");
printf("Enter another file indexed");
goto y;
}
printf("Do you want to enter more file(Yes - 1/No - 0)");
scanf("%d", &c);
if(c==1)
goto x;
else
exit(0);
}
```

Output:

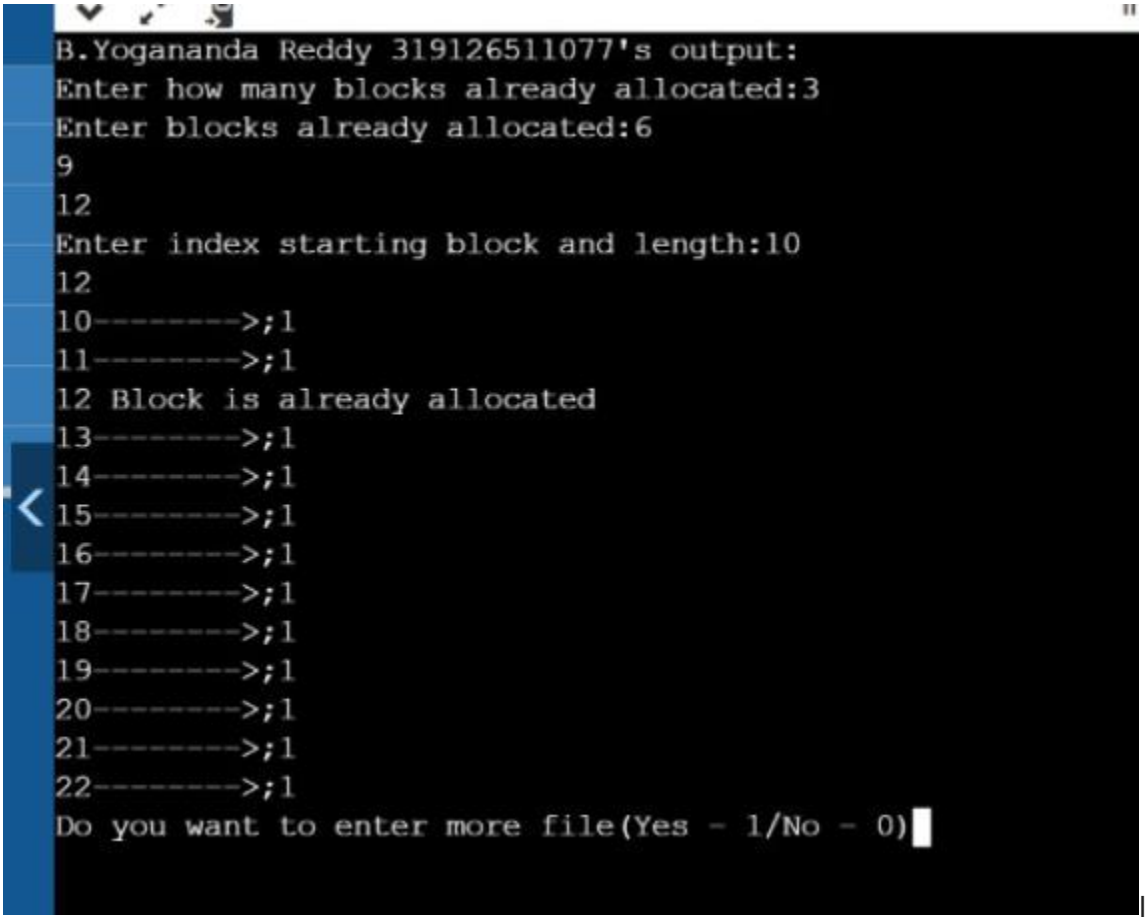


Linked Allocation

```
#include<stdio.h>
#include<stdlib.h>
void main()
{
int f[50], p,i, st, len, j, c, k, a;
for(i=0;i<50;i++)
f[i]=0;
    printf("This is 319126511077 B.Yogananda Reddy's Output\n");
printf("Enter how many blocks already allocated: ");
scanf("%d",&p);
printf("Enter blocks already allocated: ");
for(i=0;i<p;i++)
{
 scanf("%d",&a);
 f[a]=1;
}
x: printf("Enter index starting block and length: ");
scanf("%d%d", &st,&len);
k=len;
if(f[st]==0)
{
 for(j=st;j<(st+k);j++)
 {
 if(f[j]==0)
```

```
{
f[j]=1;
printf("%d-------->%d\n",j,f[j]);
}
else
{
printf("%d Block is already allocated \n",j);
k++;
}
}}
else
printf("%d starting block is already allocated \n",st);
printf("Do you want to enter more file(Yes - 1/No - 0)");
scanf("%d", &c);
if(c==1)
goto x;
else
exit(0);}
```

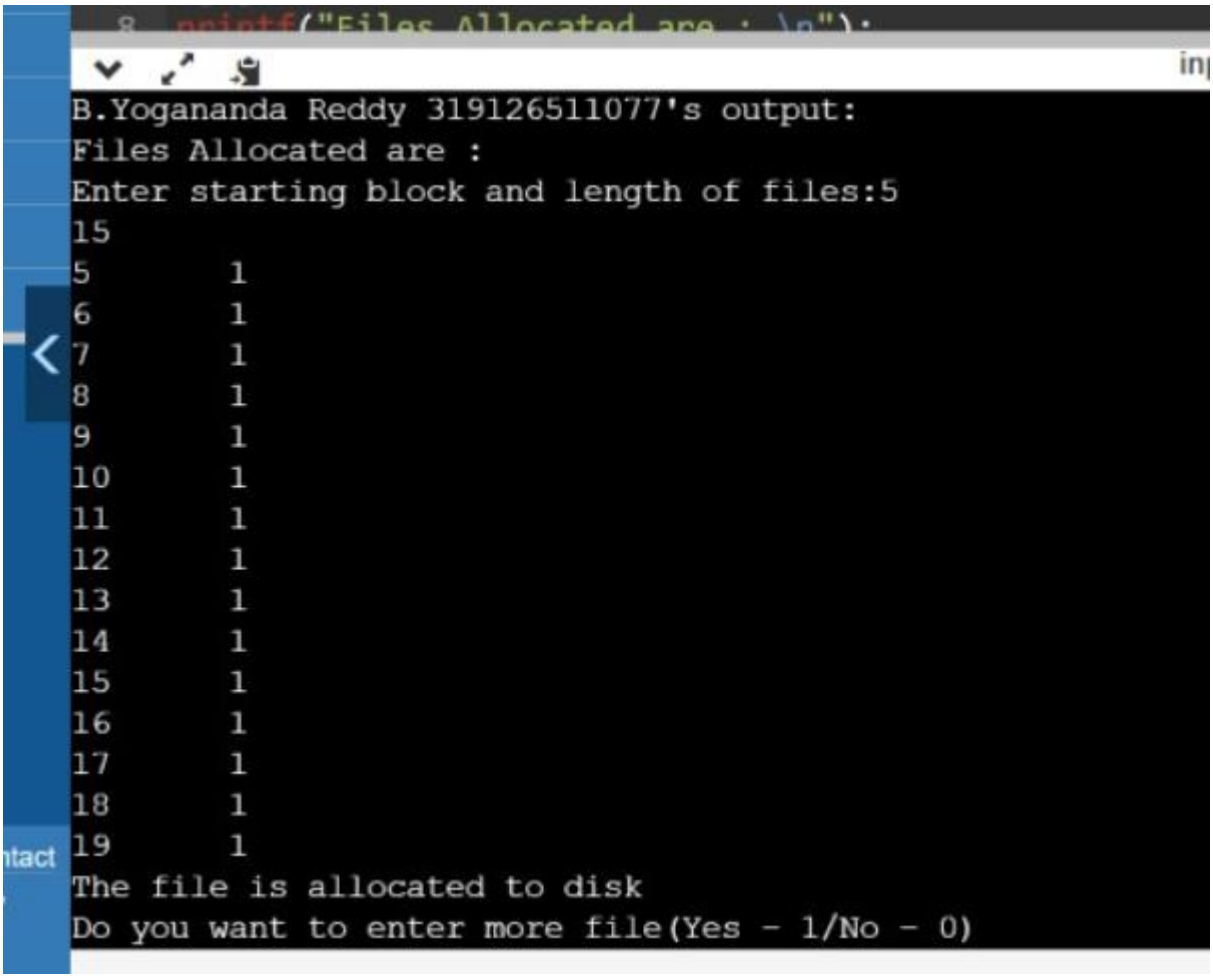
Output:



Contiguous Allocation

```
#include<stdio.h>
void main()
{
int f[50],i,st,len,j,c,k,count = 0;
for(i=0;i<50;i++)
f[i]=0;
    printf("This is 319126511077 B.Yogananda Reddy's Output\n");
printf("Files Allocated are : \n");
x: count=0;
printf("Enter starting block and length of files:");
scanf("%d%d", &st,&len);
for(k=st;k<(st+len);k++)
if(f[k]==0)
count++;
if(len==count)
{
for(j=st;j<(st+len);j++)
if(f[j]==0)
{
f[j]=1;
printf("%d\t%d\n",j,f[j]);
}
if(j!=(st+len-1))
printf("The file is allocated to disk\n");
}
else
printf("The file is not allocated \n");
printf("Do you want to enter more file(Yes - 1/No - 0)");
scanf("%d", &c);
if(c==1)
goto x;
else
exit(0);}
```

Output:



12. Implement disk arm scheduling algorithms such as FCFS,SSTF

Disk FCFS

```
#include<stdio.h>
main()
{
int queue[10],n,head,i,j,k,seek=0,max,diff;
float avg;
printf("This is 319126511077 B.Yogananda Reddy's Output\n");
printf("enter max disk range:\n");
scanf("%d",&max);
printf("enter queue size:\n");
scanf("%d",&n);
printf("enter the queue of disk positions to be read\n");
for(i=1;i<=n;i++)
scanf("%d",&queue[i]);
printf("enter the initial head position\n");
scanf("%d",&head);
```

```
queue[0]=head;
for(j=0;j<=n-1;j++)
{
diff=queue[j+1]-queue[j];
seek+=diff;
printf("disk head moves from %d to %d with seek %d\n",queue[j],queue[j+1],diff);
}
printf("total seek time:%d\n",seek);
avg=seek/n;
printf("avg seek time:%f\n",avg);
}
```

Output:

```
 ^~~~
This is 319126511077 B.Yogananda Reddy's Output
enter max disk range:
100
enter queue size:
5
enter the queue of disk positions to be read
20
10
30
509
40
enter the initial head position
1
disk head moves from 1 to 20 with seek 19
disk head moves from 20 to 10 with seek -10
disk head moves from 10 to 30 with seek 20
disk head moves from 30 to 509 with seek 479
disk head moves from 509 to 40 with seek -469
total seek time:39
avg seek time:7.000000
```

Disk Sstf

```
#include <stdio.h>
#include <stdlib.h>
#include <math.h>
int main()
{
  int queue[100], queue2[100], q_size, head, seek=0, temp,i,j;
  float avg;
printf("This is 319126511077 B.Yogannada Reddy's Output\n");
  printf("%s\n", "-----SSTF Disk Scheduling Algorithm-----");
  printf("%s\n", "Enter the size of the queue");
  scanf("%d", &q_size);
  printf("%s\n", "Enter queue elements");
```

```
 for(i=0; i<q_size; i++)
 {
  scanf("%d",&queue[i]);
 }
 printf("%s\n","Enter initial head position");
 scanf("%d", &head);
 for(i=0; i<q_size; i++)
 {
  queue2[i] = abs(head-queue[i]);
 }
 for(i=0; i<q_size; i++)
 {
    for(j=i+1; j<q_size;j++)
          {
      if(queue2[i]>queue2[j]){
          temp = queue2[i];
          queue2[i]=queue[j];
          queue2[j]=temp;

          temp=queue[i];
          queue[i]=queue[j];
          queue[j]=temp;
      }
  }
 }
 for(i=1; i<q_size; i++)
 {
  seek = seek+abs(head-queue[i]);
  head = queue[i];
 }
 printf("\nTotal seek time is %d\t",seek);
 avg = seek/(float)q_size;
 printf("\nAverage seek time is %f\t", avg);
 return 0;
}
```

Output:

```
This is 319126511077 B.Yogannada Reddy's Output
-----SSTF Disk Scheduling Algorithm-----
Enter the size of the queue
5
Enter queue elements
20
10
11
23
46
Enter initial head position
32

Total seek time is 53
Average seek time is 10.600000
```