Reg.No:

OS Lab Manual

Experiment - 1 :

Aim : Write a C program to simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time for the above problem.

a) FCFS b) SJF c) Round Robin d) Priority

a)FCFS CPU SCHEDULING ALGORITHM *:*

PROGRAM:

```
#include<stdio.h>
main()
{
        int bt[20], wt[20], tat[20], i, n;
        float wtavg, tatavg;
        printf("\nEnter the number of processes -- ");
        scanf("%d", &n);
        for(i=0;i<n;i++)
        {
                printf("\nEnter Burst Time for Process %d -- ", i);
                scanf("%d", &bt[i]);
        }
        wt[0] = wtavg = 0;
        tat[0] = tatavg = bt[0];
        for(i=1;i<n;i++)
        {
                wt[i] = wt[i-1] +bt[i-1];
                tat[i] = tat[i-1] +bt[i];
                wtavg = wtavg + wt[i];
                tatavg = tatavg + tat[i];
        }
```

```
        printf("\t PROCESS \tBURST TIME \t WAITING TIME\t TURNAROUND
        TIME\n");
        for(i=0;i<n;i++)
                printf("\n\t P%d \t\t %d \t\t %d \t\t %d", i, bt[i], wt[i], tat[i]);
        printf("\nAverage Waiting Time -- %f", wtavg/n);
        printf("\nAverage Turnaround Time -- %f", tatavg/n);
}
```

INPUT:

Enter the number of processes -- 3
Enter Burst Time for Process 0 -- 24
Enter Burst Time for Process 1 -- 3
Enter Burst Time for Process 2 -- 3

OUTPUT:

PROCESS	BURST TIME	WAITING TIME	TURNAROUND TIME
P0	24	0	24
P1	3	24	27
P2	3	27	30

Average Waiting Time-- 17.000000
Average Turnaround Time -- 27.000000

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b)SJF CPU SCHEDULING ALGORITHM :

PROGRAM:

```
#include<stdio.h>
main()
{
	int p[20], bt[20], wt[20], tat[20], i, k, n, temp;
	float wtavg, tatavg;
	printf("\nEnter the number of processes -- ");
	scanf("%d", &n);
	for(i=0;i<n;i++)
	{
		p[i]=i;
		printf("Enter Burst Time for Process %d -- ", i);
		scanf("%d", &bt[i]);
	}
	for(i=0;i<n;i++)
		for(k=i+1;k<n;k++)
			if(bt[i]>bt[k])
			{
			temp=bt[i];
			bt[i]=bt[k];
			bt[k]=temp;
			temp=p[i];
			p[i]=p[k];
			p[k]=temp;
			}
	wt[0] = wtavg = 0;
	tat[0] = tatavg = bt[0];
	for(i=1;i<n;i++)
	{
		wt[i] = wt[i-1] +bt[i-1];
		tat[i] = tat[i-1] +bt[i];
		wtavg = wtavg + wt[i];
		tatavg = tatavg + tat[i];
	}
```

```
        printf("\n\t PROCESS \tBURST TIME \t WAITING TIME\t TURNAROUND
        TIME\n");
        for(i=0;i<n;i++)
                printf("\n\t P%d \t\t %d \t\t %d \t\t %d", p[i], bt[i], wt[i], tat[i]);
                printf("\nAverage Waiting Time -- %f", wtavg/n);
        printf("\nAverage Turnaround Time -- %f", tatavg/n);
}
```

INPUT:

Enter the number of processes -- 4
Enter Burst Time for Process 0 -- 6
Enter Burst Time for Process 1 -- 8
Enter Burst Time for Process 2 -- 7
Enter Burst Time for Process 3 -- 3

OUTPUT:

PROCESS	BURST TIME	WAITING TIME	TURNAROUND TIME
P3	3	0	3
P0	6	3	9
P2	7	9	16
P1	8	16	24

Average Waiting Time -- 7.000000
Average Turnaround Time -- 13.000000

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c)ROUND ROBIN CPU SCHEDULING ALGORITHM

PROGRAM:

```
#include<stdio.h>
main()
{
        int i,j,n,bu[10],wa[10],tat[10],t,ct[10],max;
        float awt=0,att=0,temp=0;
        clrscr();
        printf("Enter the no of processes -- ");
        scanf("%d",&n);
        for(i=0;i<n;i++)
        {
                printf("\nEnter Burst Time for process %d -- ", i+1);
                scanf("%d",&bu[i]);
                ct[i]=bu[i];
        }
        printf("\nEnter the size of time slice -- ");
        scanf("%d",&t);
        max=bu[0];
        for(i=1;i<n;i++)
                if(max<bu[i])
                        max=bu[i];
        for(j=0;j<(max/t)+1;j++)
                for(i=0;i<n;i++)
                        if(bu[i]!=0)
                                if(bu[i]<=t)
                                 {
                                        tat[i]=temp+bu[i];
                                        temp=temp+bu[i];
                                        bu[i]=0;
                                 }
                                else
                                 {
                                        bu[i]=bu[i]-t;
                                        temp=temp+t;
```

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```
                        }
        for(i=0;i<n;i++)
        {
                wa[i]=tat[i]-ct[i];
                att+=tat[i];
                awt+=wa[i];
         }
        printf("\nThe Average Turnaround time is -- %f",att/n);
        printf("\nThe Average Waiting time is -- %f ",awt/n);
        printf("\n\tPROCESS\t BURST TIME \t WAITING TIME\tTURNAROUND
        TIME\n");
        for(i=0;i<n;i++)
                printf("\t%d \t %d \t\t %d \t\t %d \n",i+1,ct[i],wa[i],tat[i]);
        getch();
}
```

INPUT:

Enter the no of processes – 3
Enter Burst Time for process 1 – 24
Enter Burst Time for process 2 -- 3
Enter Burst Time for process 3 -- 3
Enter the size of time slice – 3

OUTPUT:

The Average Turnaround time is – 15.666667
The Average Waiting time is -- 5.666667

PROCESS	BURST TIME	WAITING TIME	TURNAROUND TIME
1	24	6	30
2	3	4	7
3	3	7	10

Reg.No:

d)PRIORITY CPU SCHEDULING ALGORITHM

PROGRAM :

```
#include<stdio.h>
main()
{
	int p[20],bt[20],pri[20], wt[20],tat[20],i, k, n, temp;
	float wtavg, tatavg;
	clrscr();
	printf("Enter the number of processes --- ");
	scanf("%d",&n);
	for(i=0;i<n;i++)
	{
		p[i] = i;
		printf("Enter the Burst Time & Priority of Process %d --- ",i);
		scanf("%d %d",&bt[i], &pri[i]);
	}
	for(i=0;i<n;i++)
		for(k=i+1;k<n;k++)
			if(pri[i] > pri[k])
			{
				temp=p[i];
				p[i]=p[k];
				p[k]=temp;
				temp=bt[i];
				bt[i]=bt[k];
				bt[k]=temp;
				temp=pri[i];
				pri[i]=pri[k];
				pri[k]=temp;
			}
	wtavg = wt[0] = 0;
	tatavg = tat[0] = bt[0];
	for(i=1;i<n;i++)
	{
		wt[i] = wt[i-1] + bt[i-1];
```

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```
            tat[i] = tat[i-1] + bt[i];
            wtavg = wtavg + wt[i];
            tatavg = tatavg + tat[i];
        }
        printf("\nPROCESS\t\tPRIORITY\tBURST TIME\tWAITING
        TIME\tTURNAROUND TIME");
        for(i=0;i<n;i++)
            printf("\n%d \t\t %d \t\t %d \t\t %d \t\t %d ",p[i],pri[i],bt[i],wt[i],tat[i]);
        printf("\nAverage Waiting Time is --- %f",wtavg/n);
        printf("\nAverage Turnaround Time is --- %f",tatavg/n);
        getch();
}
```

INPUT :

```
Enter the number of processes -- 5
Enter the Burst Time & Priority of Process 0 --- 10 3
Enter the Burst Time & Priority of Process 1 --- 1 1
Enter the Burst Time & Priority of Process 2 --- 2 4
Enter the Burst Time & Priority of Process 3 --- 1 5
Enter the Burst Time & Priority of Process 4 --- 5 2
```

OUTPUT :

PROCESS	PRIORITY	BURST TIME	WAITING TIME	TURNAROUND TIME
1	1	1	0	1
4	2	5	1	6
0	3	10	6	16
2	4	2	16	18
3	5	1	18	19

Average Waiting Time is --- 8.200000
Average Turnaround Time is --- 12.000000

Reg.No:

Experiment - 2 :

Aim :

Write a C program to simulate the MVT and MFT memory management techniques

a)MFT MEMORY MANAGEMENT TECHNIQUE :

PROGRAM :

```
#include<stdio.h>
main()
{
        int ms, bs, nob, ef,n, mp[10],tif=0;
        int i,p=0;
        printf("Enter the total memory available (in Bytes) -- ");
        scanf("%d",&ms);
        printf("Enter the block size (in Bytes) -- ");
        scanf("%d", &bs);
        nob=ms/bs;
        ef=ms - nob*bs;
        printf("\nEnter the number of processes -- ");
        scanf("%d",&n);
        for(i=0;i<n;i++)
        {
                printf("Enter memory required for process %d (in Bytes)-- ",i+1);
                scanf("%d",&mp[i]);
        }
        printf("\nNo. of Blocks available in memory -- %d",nob);
        printf("\n\nPROCESS\tMEMORY REQUIRED\t ALLOCATED\tINTERNAL
        FRAGMENTATION");


        for(i=0;i<n && p<nob;i++)
        {
```

```
            printf("\n %d\t\t%d",i+1,mp[i]);
            if(mp[i] > bs)
            printf("\t\tNO\t\t---");
            else
            {
                  printf("\t\tYES\t%d",bs-mp[i]);
                  tif = tif + bs-mp[i];
                  p++;
            }
      }
      if(i<n)
            printf("\nMemory is Full, Remaining Processes cannot be accomodated");
      printf("\n\nTotal Internal Fragmentation is %d",tif);
      printf("\nTotal External Fragmentation is %d",ef);
}
```

INPUT :

Enter the total memory available (in Bytes) -- 1000
Enter the block size (in Bytes)-- 300
Enter the number of processes – 5
Enter memory required for process 1 (in Bytes) -- 275
Enter memory required for process 2 (in Bytes) -- 400
Enter memory required for process 3 (in Bytes) -- 290
Enter memory required for process 4 (in Bytes) -- 293
Enter memory required for process 5 (in Bytes) -- 100
No. of Blocks available in memory -- 3

OUTPUT:

PROCESS	MEMORY REQUIRED	ALLOCATED	INTERNAL FRAGMENTATION
1	275	YES	25
2	400	NO	-----
3	290	YES	10
4	293	YES	7

Memory is Full, Remaining Processes cannot be accommodated
Total Internal Fragmentation is 42
Total External Fragmentation is 100

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b)MVT MEMORY MANAGEMENT TECHNIQUE :

PROGRAM :

```
#include<stdio.h>
main()
{
	int ms,mp[10],i, temp,n=0;
	char ch = 'y';
	printf("\nEnter the total memory available (in Bytes)-- ");
	scanf("%d",&ms);
	temp=ms;
	for(i=0;ch=='y';i++,n++)
	{
		printf("\nEnter memory required for process %d (in Bytes) -- ",i+1);
		scanf("%d",&mp[i]);
		if(mp[i]<=temp)
		{
			printf("\nMemory is allocated for Process %d ",i+1);
			temp = temp - mp[i];
		}
		else
		{
			printf("\nMemory is Full");
			break;
		}
		printf("\nDo you want to continue(y/n) -- ");
		scanf(" %c", &ch);
	}
	printf("\n\nTotal Memory Available -- %d", ms);
	printf("\n\n\tPROCESS\t\t MEMORY ALLOCATED ");
	for(i=0;i<n;i++)
		printf("\n \t%d\t\t%d",i+1,mp[i]);
	printf("\n\nTotal Memory Allocated is %d",ms-temp);
	printf("\nTotal External Fragmentation is %d",temp);
}
```

Reg.No:

INPUT:

Enter the total memory available (in Bytes) -- 1000
Enter memory required for process 1 (in Bytes) -- 400
Memory is allocated for Process 1
Do you want to continue(y/n) -- y
Enter memory required for process 2 (in Bytes) -- 275
Memory is allocated for Process 2
Do you want to continue(y/n) -- y
Enter memory required for process 3 (in Bytes) -- 550

OUTPUT:

Memory is Full
Total Memory Available -- 1000

PROCESS	MEMORY ALLOCATED
1	400
2	275

Total Memory Allocated is 675
Total External Fragmentation is 325

Reg.No:

Experiment - 3:

Aim:Write a program to implement BANKER'S ALGORITHM

PROGRAM:

```
#include<stdio.h>
struct da
{
        int max[10],a1[10],need[10],before[10],after[10];
 }p[10];
 void main()
 {
      int i,j,k,l,r,n,tot[10],av[10],cn=0,cz=0,temp=0,c=0;
     printf("\n ENTER THE NO. OF PROCESSES:");
     scanf("%d",&n);
    printf("\n ENTER THE NO. OF RESOURCES:");
    scanf("%d",&r);
    for(i=0;i<n;i++)
          {
               printf("PROCESS %d \n",i+1);
              for(j=0;j<r;j++)
             {
                  printf("MAXIMUM 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++)
        {
                for(j=0;j<n;j++)
              {
                    temp=temp+p[j].a1[i];
                    av[i]=tot[i]-temp;
                  temp=0;
              }
        }
 printf("\n\t RESOURCES  ALLOCATED   NEEDED   TOTAL  AVAIL");
```

Reg.No:

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

```
}
 printf("\n\n\t AVAIL  BEFORE\T AVAIL AFTER ");
 for(l=0;l<n;l++)
 {
        for(i=0;i<n;i++)
        {
         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("\n P %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]);
             cn=0;
             cz=0;
             c++;
             break;
   }
   else
   {
            cn=0;cz=0;
   }
  }
}
 if(c==n)
 printf("\n THE ABOVE SEQUENCE IS A SAFE SEQUENCE");
            else
            printf("\n DEADLOCK OCCURED");
            getch();
}
```

Reg.No:

INPUT:

//TEST CASE 1:

ENTER THE NO. OF PROCESSES:4

ENTER 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

Reg.No:

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

OUTPUT:

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

INPUT:

//TEST CASE:2

ENTER THE NO. OF PROCESSES:4

ENTER 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 3:1

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

Reg.No:

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 3:2

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

Reg.No:

	RESOURCES	ALLOCATED	NEEDED	TOTAL	AVAIL
P1	322	101	221	936	110
P2	613	511	102		
P3	314	212	102		
P4	422	002	420		

OUTPUT:

AVAIL BEFORE AVAIL AFTER

DEADLOCK OCCURED

Reg.No:

Experiment –4 :

AIM: Write a program to implement the producer-consumer problem using semaphores.

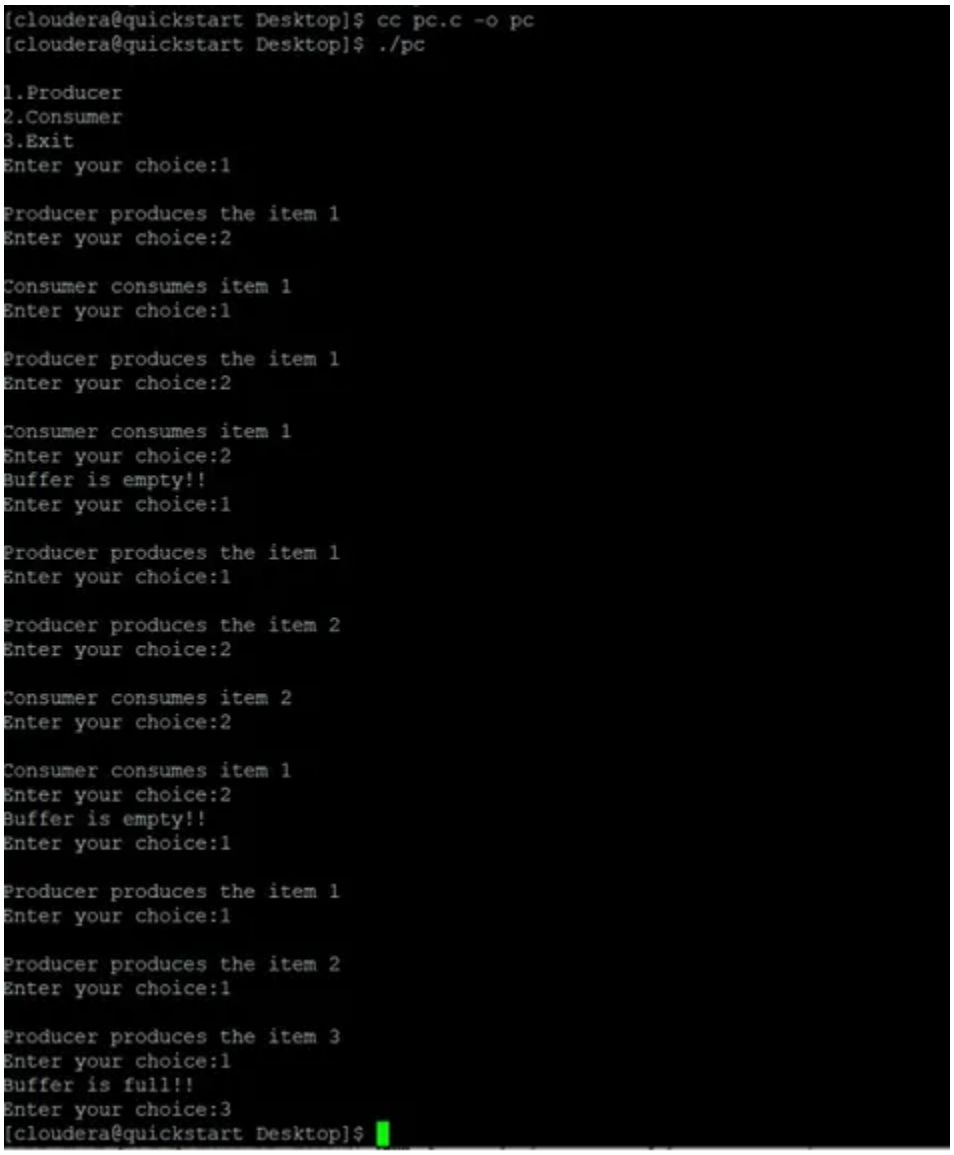
Program:

```
#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("\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);
}
```

Reg.No:

Output:



Reg.No:

EXPERIMENT - 5:

AIM: Write a program to implement IPC using shared memory.

Shared Memory is a type of IPC where the two processes share same memory chunk and use it for IPC. One process writes into that memory and other reads it.

After running the Server you can see the attached Shared Memory

```
vgupta80@linux unixprog> ipcs -m

------ Shared Memory Segments --------
key        shmid      owner      perms      bytes      nattch     status
0x0000162e 65537      vgupta80  666        27         1
```

After running the client the memory is freed.

```
------ Shared Memory Segments --------
key        shmid      owner      perms      bytes      nattch     status
0x0000162e 65537      vgupta80  666        27         0
```

```
//SHMServer.C
#include <sys/types.h>
#include <sys/ipc.h>
#include <sys/shm.h>
#include <stdio.h>
#include <stdlib.h>

#define MAXSIZE     27

void die(char *s)
{
   perror(s);
   exit(1);
}

int main()
{
   char c;
   int shmid;
   key_t key;
   char *shm, *s;

   key = 5678;

   if ((shmid = shmget(key, MAXSIZE, IPC_CREAT | 0666)) < 0)
```

```
        die("shmget");

    if ((shm = shmat(shmid, NULL, 0)) == (char *) -1)
        die("shmat");

    /*
     *      * Put some things into the memory for the
     *        other process to read.
     *        */
    s = shm;

    for (c = 'a'; c <= 'z'; c++)
        *s++ = c;

    /*
     * Wait until the other process
     * changes the first character of our memory
     * to '*', indicating that it has read what
     * we put there.
     */
    while (*shm != '*')
        sleep(1);

    exit(0);
}


//SHMClient.C

#include <sys/types.h>
#include <sys/ipc.h>
#include <sys/shm.h>
#include <stdio.h>
#include <stdlib.h>
#define MAXSIZE     27

void die(char *s)
{
    perror(s);
    exit(1);
}

int main()
{
    int shmid;
    key_t key;
```

```
    char *shm, *s;

    key = 5678;

    if ((shmid = shmget(key, MAXSIZE, 0666)) < 0)
        die("shmget");

    if ((shm = shmat(shmid, NULL, 0)) == (char *) -1)
        die("shmat");

    //Now read what the server put in the memory.
    for (s = shm; *s != '\0'; s++)
        putchar(*s);
    putchar('\n');

    /*
     *Change the first character of the
     *segment to '*', indicating we have read
     *the segment.
     */
    *shm = '*';

    exit(0);
}
```

Reg.No:

EXPERIMENT - 6:

AIM: Write a C program to simulate page replacement algorithms

a) FIFO b) LRU c) LFU

a) FIFO PAGE REPLACEMENT ALGORITHM

PROGRAM:

```
#include<stdio.h>
main()
{
        int i, j, k, f, pf=0, count=0, rs[25], m[10], n;
        printf("\n Enter the length of reference string -- ");
        scanf("%d",&n);
        printf("\n Enter the reference string -- ");
        for(i=0;i<n;i++)
        scanf("%d",&rs[i]);
        printf("\n Enter no. of frames -- ");
        scanf("%d",&f);
        for(i=0;i<f;i++)
                m[i]=-1;
        printf("\n The Page Replacement Process is -- \n");
        for(i=0;i<n;i++)
        {
                for(k=0;k<f;k++)
                  {
```

Reg.No:

```
                    if(m[k]==rs[i])
                        break;
                }
            if(k==f)
                {
                    m[count++]=rs[i];
                    pf++;
                }
        for(j=0;j<f;j++)
        printf("\t%d",m[j]);
                if(k==f)
                    printf("\tPF No. %d",pf);
        printf("\n");
                if(count==f)
                count=0;
        }
printf("\n The number of Page Faults using FIFO are %d",pf);
}
```

INPUT

Enter the length of reference string – 20

Enter the reference string -- 7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1

Enter no. of frames – 3

Reg.No:

OUTPUT

The Page Replacement Process is –

7	-1	-1	PF No. 1
7	0	-1	PF No. 2
7	0	1	PF No. 3
2	0	1	PF No. 4
2	0	1	
2	3	1	PF No. 5
2	3	0	PF No. 6
4	3	0	PF No. 7
4	2	0	PF No. 8
4	2	3	PF No. 9
0	2	3	PF No. 10
0	2	3	
0	2	3	
0	1	3	PF No. 11
0	1	2	PF No. 12
0	1	2	
0	1	2	
7	1	2	PF No. 13
7	0	2	PF No. 14
7	0	1	PF No. 15

The number of Page Faults using FIFO are 15

Reg.No:

b.) LRU PAGE REPLACEMENT ALGORITHM

PROGRAM:

```
#include<stdio.h>
#include<conio.h>
main()
{
inti, j , k, min, rs[25], m[10], count[10], flag[25], n, f, pf=0, next=1;
clrscr();
printf("Enter the length of reference string -- ");
scanf("%d",&n);
printf("Enter the reference string -- ");
for(i=0;i<n;i++)
{
scanf("%d",&rs[i]);
flag[i]=0;
}
printf("Enter the number of frames -- ");
scanf("%d",&f);
for(i=0;i<f;i++)
{
count[i]=0;
m[i]=-1;
}
```

```
printf("\nThe Page Replacement process is -- \n");
for(i=0;i<n;i++)
{
for(j=0;j<f;j++)
{
if(m[j]==rs[i])
{
flag[i]=1;
count[j]=next;
next++;
}
}
if(flag[i]==0)
{
if(i<f)
{
m[i]=rs[i];
count[i]=next;
next++;
}
else
{
min=0;
```

```
for(j=1;j<f;j++)
if(count[min] > count[j])
min=j;
m[min]=rs[i];
count[min]=next;
next++;
}
pf++;
}
for(j=0;j<f;j++)
printf("%d\t", m[j]);
if(flag[i]==0)
printf("PF No. -- %d" ,pf);
printf("\n");
}
printf("\nThe number of page faults using LRU are %d",pf);
getch();
}
```

INPUT

Enter the length of reference string -- 20

Enter the reference string -- 7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1

Enter the number of frames – 3

Reg.No:

OUTPUT

The Page Replacement process is --

7 -1 -1 PF No. -- 1

7 0 -1 PF No. -- 2

7 0 1 PF No. -- 3

2 0 1 PF No. -- 4

2 0 1

2 0 3 PF No. -- 5

2 0 3

4 0 3 PF No. -- 6

4 0 2 PF No. -- 7

4 3 2 PF No. -- 8

0 3 2 PF No. -- 9

0 3 2

0 3 2

1 3 2 PF No. -- 10

1 3 2

1 0 2 PF No. -- 11

1 0 2

1 0 7 PF No. -- 12

1 0 7

1 0 7

The number of page faults using LRU are 12

Reg.No:

c.) LFU PAGE REPLACEMENT ALGORITHM

PROGRAM:

```
#include<stdio.h>

main()

{

intrs[50], i, j, k, m, f, cntr[20], a[20], min, pf=0;

printf("\nEnter number of page references -- ");

scanf("%d",&m);

printf("\nEnter the reference string -- ");

for(i=0;i<m;i++)

scanf("%d",&rs[i]);

printf("\nEnter the available no. of frames -- ");

scanf("%d",&f);

for(i=0;i<f;i++)

{

cntr[i]=0;

a[i]=-1;

}

printf(“\nThe Page Replacement Process is – \n“);

for(i=0;i<m;i++)

{

for(j=0;j<f;j++)

if(rs[i]==a[j])
```

```
{
cntr[j]++;
break;
}
if(j==f)
{
min = 0;
for(k=1;k<f;k++)
if(cntr[k]<cntr[min])
min=k;
a[min]=rs[i];
cntr[min]=1;
pf++;
}
printf("\n");
for(j=0;j<f;j++)
printf("\t%d",a[j]);
if(j==f)
printf("\tPF No. %d",pf);
 }
printf("\n\n Total number of page faults -- %d",pf);
}
```

Reg.No:

INPUT:

Enter number of page references --10

Enter the reference string -- 1 2 3 4 5 2 5 2 5 1 4 3

Enter the available no. of frames – 3

OUTPUT:

The Page Replacement Process is –

1 -1 -1 PF No. 1

1 2 -1 PF No. 2

1 2 3 PF No. 3

4 2 3 PF No. 4

5 2 3 PF No. 5

5 2 3

5 2 3

5 2 1 PF No. 6

5 2 4 PF No. 7

5 2 3 PF No. 8

Total number of page faults -- 8

Reg.No:

EXPERIMENT - 7:

AIM : Write a program to simulate the following contiguous memory allocation techniques
a) Worst-fit b) Best-fit c) First-fit

a) Worst Fit

PROGRAM:

```
#include<stdio.h>
#include<conio.h>
#define max 25
void main()
{
int frag[max],b[max],f[max],i,j,nb,nf,temp;
static int bf[max],ff[max];
clrscr();
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:\tFragement");
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]);
getch();
}
```

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

Reg.No:

b) Best Fit

PROGRAM:

```
#include<stdio.h>
#include<conio.h>
#define max 25
void main()
{
int frag[max],b[max],f[max],i,j,nb,nf,temp,lowest=10000;
static int bf[max],ff[max];
clrscr();
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)
if(lowest>temp)
{
ff[i]=j;

lowest=temp;
}
}
}
frag[i]=lowest;
bf[ff[i]]=1;
lowest=10000;
}
```

Reg.No:

```
printf("\nFile No\tFile Size \tBlock No\tBlock Size\tFragment");
for(i=1;i<=nf && ff[i]!=0;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]);
getch();
}
```

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	2	2	1
2	4	1	5	1

Reg.No:

c) First Fit

PROGRAM:

```
#include<stdio.h>
#include<conio.h>
#define max 25
void main()
{
int frag[max],b[max],f[max],i,j,nb,nf,temp,highest=0;
static int bf[max],ff[max];
clrscr();
printf("\n\tMemory Management Scheme - Worst 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) //if bf[j] is not allocated
{
temp=b[j]-f[i];
if(temp>=0)
if(highest<temp)
{
ff[i]=j;
highest=temp;
}
}
}
frag[i]=highest;
bf[ff[i]]=1;
highest=0;
```

Reg.No:

```
}
printf("\nFile_no:\tFile_size :\tBlock_no:\tBlock_size:\tFragement");
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]);
getch();
}
```

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	3	7	6
2	4	1	5	1

Reg.No:

EXPERIMENT - 8:

Aim: Write a program to implement Paging technique for memory management.

Program:

```
#include<stdio.h>
#include<conio.h>
main()
{
 int ms, ps, nop, np, rempages, i, j, x, y, pa, offset;
 int s[10], fno[10][20];
printf("\nEnter the memory size -- ");
scanf("%d",&ms);
printf("\nEnter the page size -- ");
scanf("%d",&ps);
nop = ms/ps;
printf("\nThe no. of pages available in memory are -- %d ",nop);
printf("\nEnter number of processes -- ");
 scanf("%d",&np);
rempages = nop;
for(i=1;i<=np;i++)
{
printf("\nEnter no. of pages required for p[%d]-- ",i);
 scanf("%d",&s[i]);
if(s[i] >rempages)
{
printf("\nMemory is Full");
break;
}
rempages = rempages - s[i];
printf("\nEnter pagetable for p[%d] --- ",i);
 for(j=0;j<s[i];j++)
scanf("%d",&fno[i][j]);
}
printf("\nEnter Logical Address to find Physical Address ");
printf("\nEnter process no. and pagenumber and offset -- ");
scanf("%d %d %d",&x,&y, &offset);
if(x>np || y>=s[i] || offset>=ps)
printf("\nInvalid Process or Page Number or offset");
else
{
```

```
 pa=fno[x][y]*ps+offset;
printf("\nThe Physical Address is -- %d",pa);
}
getch();
}
```

INPUT

Enter the memory size – 1000 Enter the page size -- 100
The no. of pages available in memory are -- 10
Enter number of processes -- 3
Enter no. of pages required for p[1]-- 4
Enter pagetable for p[1] --- 8 6
9
5
Enter no. of pages required for p[2]-- 5
Enter pagetable for p[2] --- 1 4 5 7 3
Enter no. of pages required for p[3]—5

OUTPUT

Memory is Full
Enter Logical Address to find Physical Address Enter process no. and pagenumber and offset --
2
3
60
The Physical Address is -- 760

Reg.No:

EXPERIMENT -9:

AIM :

Write a C program to simulate the following file allocation strategies.
a) Sequential b) Linked c)) Indexed

a)SEQUENTIAL FILE ALLOCATION :

PROGRAM :

```
#include<stdio.h>
struct fileTable
{
        char name[20];
        int sb, nob;
}ft[30];
void main()
{
        int i, j, n;
        char s[20];
        printf("Enter no of files :");
        scanf("%d",&n);
        for(i=0;i<n;i++)
        {
                printf("\nEnter file name %d :",i+1);
                scanf("%s",ft[i].name);
                printf("Enter starting block of file %d :",i+1);
                scanf("%d",&ft[i].sb);
                printf("Enter no of blocks in file %d :",i+1);
                scanf("%d",&ft[i].nob);
        }
        printf("\nEnter the file name to be searched-- ");
        scanf("%s",s);
        for(i=0;i<n;i++)
                if(strcmp(s, ft[i].name)==0)
                        Break;
        if(i==n)
                printf("\nFile Not Found");
        else
```

```
        {
                printf("\nFILE NAME START BLOCK NO OF BLOCKS BLOCKS
                OCCUPIED\n");
                printf("\n%s\t\t%d\t\t%d\t",ft[i].name,ft[i].sb,ft[i].nob);
                for(j=0;j<ft[i].nob;j++)
                        printf("%d, ",ft[i].sb+j);
        }
}
```

INPUT :

```
Enter no of files :3
Enter file name 1 :A
Enter starting block of file 1 :85
Enter no of blocks in file 1 :6
Enter file name 2 :B
Enter starting block of file 2 :102
Enter no of blocks in file 2 :4
Enter file name 3 :C
Enter starting block of file 3 :60
Enter no of blocks in file 3 :4
Enter the file name to be searched -- B
```

OUTPUT :

FILE NAME	START BLOCK	NO OF BLOCKS	BLOCKS OCCUPIED
B	102	4	102, 103, 104, 105

Reg.No:

b)LINKED FILE ALLOCATION :

PROGRAM :

```
#include<stdio.h>
>
struct fileTable
{
        char name[20];
        int nob;
        struct block *sb;
}ft[30];
struct block
{
        int bno;
        struct block *next;
};
void main()
{
        int i, j, n;
        char s[20];
        struct block *temp;
        printf("Enter no of files :");
        scanf("%d",&n);
        for(i=0;i<n;i++)
        {
                printf("\nEnter file name %d :",i+1);
                scanf("%s",ft[i].name);
                printf("Enter no of blocks in file %d :",i+1);
                scanf("%d",&ft[i].nob);
                ft[i].sb=(struct block*)malloc(sizeof(struct block));
                temp = ft[i].sb;
                printf("Enter the blocks of the file :");
                scanf("%d",&temp->bno);
                temp->next=NULL;
                for(j=1;j<ft[i].nob;j++)
                {
                        temp->next = (struct block*)malloc(sizeof(struct block));
                        temp = temp->next;
                        scanf("%d",&temp->bno);
```

```
            }
            temp->next = NULL;
        }
        printf("\nEnter the file name to be searched -- ");
        scanf("%s",s);
        for(i=0;i<n;i++)
            if(strcmp(s, ft[i].name)==0)
                break;
        if(i==n)
            printf("\nFile Not Found");
        else
        {
            printf("\nFILE NAME NO OF BLOCKS BLOCKS OCCUPIED");
            printf("\n %s\t\t%d\t",ft[i].name,ft[i].nob);
            temp=ft[i].sb;
            for(j=0;j<ft[i].nob;j++)
            {
                printf("%d -> ",temp->bno);
                temp = temp->next;
            }
        }
}
```

INPUT :

Enter no of files : 2
Enter file 1 : A
Enter no of blocks in file 1 : 4
Enter the blocks of the file 1 : 12 23 9 4
Enter file 2 : G
Enter no of blocks in file 2 : 5
Enter the blocks of the file 2 : 88 77 66 55 44
Enter the file to be searched : G

OUTPUT :

FILE NAME	NO OF BLOCKS	BLOCKS OCCUPIED
G	5	88-> 77-> 66-> 55-> 44

Reg.No:

c)INDEXED FILE ALLOCATION :

PROGRAM :

```
#include<stdio.h>
struct fileTable
{
	char name[20];
	int nob, blocks[30];
}ft[30];
void main()
{
	int i, j, n;
	char s[20];
	printf("Enter no of files :");
	scanf("%d",&n);
	for(i=0;i<n;i++)
	{
		printf("\nEnter file name %d :",i+1);
		scanf("%s",ft[i].name);
		printf("Enter no of blocks in file %d :",i+1);
		scanf("%d",&ft[i].nob);
		printf("Enter the blocks of the file :");
		for(j=0;j<ft[i].nob;j++)
			scanf("%d",&ft[i].blocks[j]);
	}
	printf("\nEnter the file name to be searched-- ");
	scanf("%s",s);
	for(i=0;i<n;i++)
		if(strcmp(s, ft[i].name)==0)
			break;
	if(i==n)
		printf("\nFile Not Found");
	else
	{
		printf("\nFILE NAME NO OF BLOCKS BLOCKS OCCUPIED");
		printf("\n %s\t\t%d\t",ft[i].name,ft[i].nob);
		for(j=0;j<ft[i].nob;j++)
			printf("%d, ",ft[i].blocks[j]);
	}
```

Reg.No:

}

INPUT :

Enter no of files : 2
Enter file 1 : A
Enter no of blocks in file 1 : 4
Enter the blocks of the file 1 : 12 23 9 4
Enter file 2 : G
Enter no of blocks in file 2 : 5
Enter the blocks of the file 2 : 88 77 66 55 44
Enter the file to be searched : G

OUTPUT :

FILE NAME	NO OF BLOCKS	BLOCKS OCCUPIED
G	5	88, 77, 66, 55, 44

Reg.No:

EXPERIMENT - 10:

Aim: Simulate the following Disk Scheduling Algorithms
(a) FCFS (b) SSTF (c) SCAN

a) FCFS Disk Scheduling

Program:

```
#include<stdio.h>
#include<stdlib.h>
int main()
{
   int RQ[100],i,n,TotalHeadMoment=0,initial;
printf("Enter the number of Requests\n");
scanf("%d",&n);
   printf("Enter the Requests sequence\n");
   for(i=0;i<n;i++)
    scanf("%d",&RQ[i]);
   printf("Enter initial head position\n");
   scanf("%d",&initial);

   // logic for FCFS disk scheduling

   for(i=0;i<n;i++)
   {
      TotalHeadMoment=TotalHeadMoment+abs(RQ[i]-initial);
      initial=RQ[i];
   }

   printf("Total head moment is %d",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
```

Reg.No:

b) SSTF Disk Scheduling

Program:

```
#include<stdio.h>
#include<stdlib.h>
int main()
{
   int RQ[100],i,n,TotalHeadMoment=0,initial,count=0;
   printf("Enter the number of Requests\n");
   scanf("%d",&n);
   printf("Enter the Requests sequence\n");
   for(i=0;i<n;i++)
    scanf("%d",&RQ[i]);
   printf("Enter initial head position\n");
   scanf("%d",&initial);

   // logic for sstf disk scheduling

      /* loop will execute until all process is completed*/
   while(count!=n)
   {
      int min=1000,d,index;
      for(i=0;i<n;i++)
      {
        d=abs(RQ[i]-initial);
        if(min>d)
        {
           min=d;
           index=i;
        }

      }
      TotalHeadMoment=TotalHeadMoment+min;
      initial=RQ[index];
      // 1000 is for max
      // you can use any number
      RQ[index]=1000;
      count++;
   }

   printf("Total head movement is %d",TotalHeadMoment);
   return 0;
}
```

Reg.No:

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
```

Reg.No:

c) SCAN Disk Scheduling

Program:

```
#include<stdio.h>
#include<stdlib.h>
int main()
{
   int RQ[100],i,j,n,TotalHeadMoment=0,initial,size,move;
   printf("Enter the number of Requests\n");
   scanf("%d",&n);
   printf("Enter the Requests sequence\n");
   for(i=0;i<n;i++)
    scanf("%d",&RQ[i]);
   printf("Enter initial head position\n");
   scanf("%d",&initial);
   printf("Enter total disk size\n");
   scanf("%d",&size);
   printf("Enter the head movement direction for high 1 and for low 0\n");
   scanf("%d",&move);

   // logic for Scan disk scheduling

      /*logic for sort the request array */
   for(i=0;i<n;i++)
   {
      for(j=0;j<n-i-1;j++)
      {
         if(RQ[j]>RQ[j+1])
         {
            int temp;
            temp=RQ[j];
            RQ[j]=RQ[j+1];
            RQ[j+1]=temp;
         }

      }
   }

   int index;
   for(i=0;i<n;i++)
   {
      if(initial<RQ[i])
      {
         index=i;
         break;
      }
   }
```

```
    // if movement is towards high value
    if(move==1)
    {
       for(i=index;i<n;i++)
       {
          TotalHeadMoment=TotalHeadMoment+abs(RQ[i]-initial);
          initial=RQ[i];
       }
       //  last movement for max size
       TotalHeadMoment=TotalHeadMoment+abs(size-RQ[i-1]-1);
       initial = size-1;
       for(i=index-1;i>=0;i--)
       {
           TotalHeadMoment=TotalHeadMoment+abs(RQ[i]-initial);
           initial=RQ[i];

       }
    }
    // if movement is towards low value
    else
    {
       for(i=index-1;i>=0;i--)
       {
          TotalHeadMoment=TotalHeadMoment+abs(RQ[i]-initial);
          initial=RQ[i];
       }
       //  last movement for min size
       TotalHeadMoment=TotalHeadMoment+abs(RQ[i+1]-0);
       initial =0;
       for(i=index;i<n;i++)
       {
           TotalHeadMoment=TotalHeadMoment+abs(RQ[i]-initial);
           initial=RQ[i];

       }
    }

    printf("Total head movement is %d",TotalHeadMoment);
    return 0;
}
```

Reg.No:

Output:-

```
Enter the number of Request
8
Enter the Requests Sequence
95 180 34 119 11 123 62 64
Enter initial head position
50
Enter total disk size
200
Enter the head movement direction for high 1 and for low 0
1
Total head movement is 337
```

Reg.No:

PART-2

Experiment-1

AIM : Implementation of Symbol Table

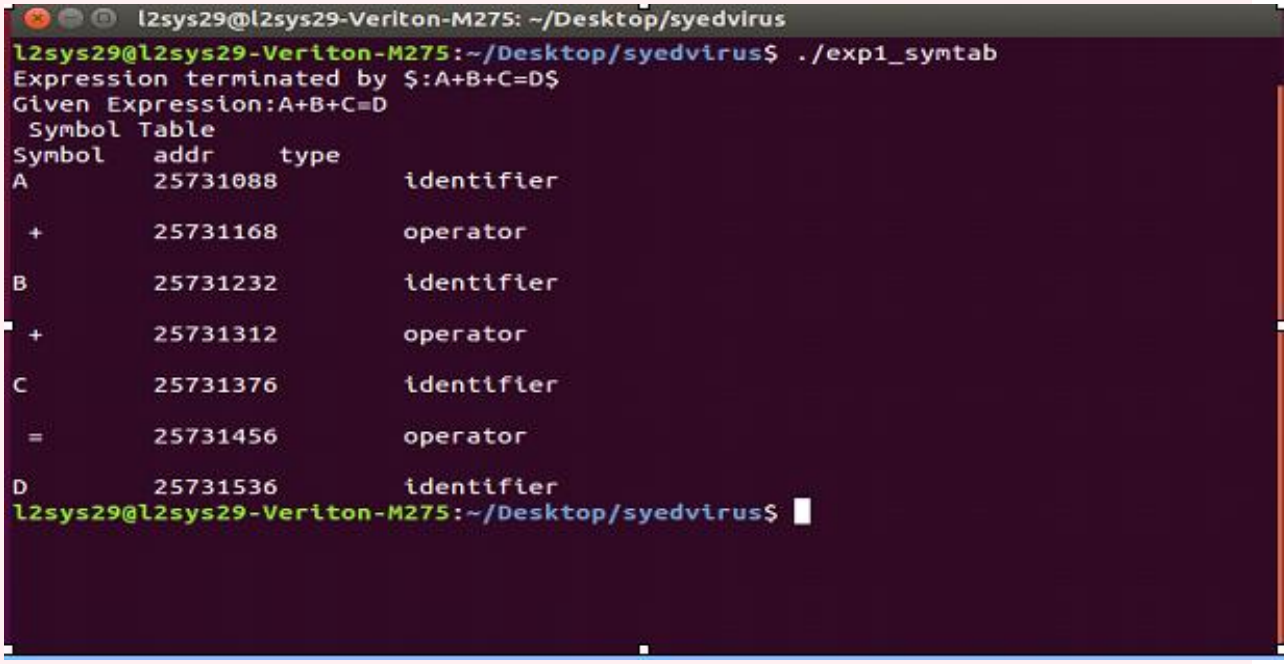
Program:

```
#include<stdio.h>
#include<ctype.h>
#include<stdlib.h>
#include<string.h>
#include<math.h>
void main()
{
 int i=0,j=0,x=0,n;
 void *p,*add[5];
 char ch,srch,b[15],d[15],c;
 printf("Expression terminated by $:");
 while((c=getchar())!='$')
 {
  b[i]=c;
  i++;
 }
 n=i-1;
 printf("Given Expression:");
 i=0;
 while(i<=n)
 {
  printf("%c",b[i]);
  i++;
 }
 printf("\n Symbol Table\n");
 printf("Symbol \t addr \t type");
 while(j<=n)
 {
  c=b[j];
  if(isalpha(toascii(c)))
  {
   p=malloc(c);
   add[x]=p;
   d[x]=c;
   printf("\n%c \t %d \t identifier\n",c,p);
   x++;
   j++;
  }
```

Reg.No:

```
else
{
 ch=c;
 if(ch=='+'||ch=='-'||ch=='*'||ch=='=')
 {
  p=malloc(ch);
  add[x]=p;
  d[x]=ch;
  printf("\n %c \t %d \t operator\n",ch,p);
  x++;
  j++;
 }}}}
```

OUTPUT:



RESULT:

Reg.No:

Experiment – 2

AIM : Develop a lexical analyzer to recognize a few patterns in C. (Ex. identifiers, constants, comments, operators etc.)

Program:

```
#include<ctype.h>

#include<string.h> void main()
{

FILE *fi,*fo,*fop,*fk; int flag=0,i=1;
char c,t,a[15],ch[15],file[20]; clrscr();
printf("\n Enter the File Name:"); scanf("%s",&file);
fi=fopen(file,"r"); fo=fopen("inter.c","w");
fop=fopen("Oper.c","r");

fk=fopen("key.c","r"); c=getc(fi); while(!feof(fi))
{
if(isalpha(c)||isdigit(c)||(c=='['||c==']'||c=='.'==1)) fputc(c,fo);

else

{

if(c=='\n') fprintf(fo,"\tS\t");
else fprintf(fo,"\t%c\t",c);

}

c=getc(fi);

}

fclose(fi); fclose(fo);
fi=fopen("inter.c","r"); printf("\n Lexical Analysis"); fscanf(fi,"%s",a);
printf("\n Line: %d\n",i++); while(!feof(fi))
```

```
{

if(strcmp(a,"$")==0)

{

printf("\n Line: %d \n",i++); fscanf(fi,"%s",a);
}

fscanf(fop,"%s",ch);

while(!feof(fop))

{

if(strcmp(ch,a)==0)

{

fscanf(fop,"%s",ch); printf("\t\t%s\t:\t%s\n",a,ch); flag=1;


}

fscanf(fop,"%s",ch);

}

rewind(fop); fscanf(fk,"%s",ch);
while(!feof(fk))

{
```

```
if(strcmp(ch,a)==0)

{

fscanf(fk,"%k",ch); printf("\t\t%s\t:\tKeyword\n",a); flag=1;
}

fscanf(fk,"%s",ch);

}

rewind(fk); if(flag==0)
{

if(isdigit(a[0])) printf("\t\t%s\t:\tConstant\n",a);
else

printf("\t\t%s\t:\tIdentifier\n",a);

}

flag=0; fscanf(fi,"%s",a);
}

getch();

}
```

Key.c

```
int void main char if
```

Reg.No:

for

while else printf scanf FILE
include stdio.h conio.h iostream.h
Oper.c

(open para

) closepara

{ openbrace

} closebrace

< lesser

> greater

" doublequote ' singlequote

: colon

; semicolon

preprocessor

= equal

== asign

% percentage

Reg.No:

^ bitwise

& reference

*** star**

+ add

- sub

\ backslash

/ slash

INPUT.c

```
#include "stdio.h"

#include "conio.h" void main()
{

int a=10,b,c; a=b*c; getch();
}
```

OUTPUT:

Line:1

 # : preprocessor include : Identifier " : doublequote stdio.h : Keyword " :

Reg.No:

Experiment-3

AIM: Implementation of Lexical Analyzer using Lex Tool

Program:

Description:

➢ A language for specifying lexical analyzer.

➢ There is a wide range of tools for construction of lexical analyzer. The majority of these tools are based on regular expressions.

➢ The one of the traditional tools of that kind is lex. Lex:-

➢ The lex is used in the manner depicted. A specification of the lexical analyzer is preferred by creating a program lex.1 in the lex language.

➢ Then lex.1 is run through the lex compiler to produce a 'c' program lex.yy.c.

➢ The program lex.yy.c consists of a tabular representation of a transition diagram constructed from the regular expression of lex.1 together with a standard routine that uses table of recognize leximes.

➢ Lex.yy.c is run through the 'C' compiler to produce as object program a.out, which is the lexical analyzer that transform as input stream into sequence of tokens.

Algorithm:

1. First, a specification of a lexical analyzer is prepared by creating a program lexp.l in the LEX language.

2. The Lexp.l program is run through the LEX compiler to produce an equivalent code in C language named Lex.yy.c

3. The program lex.yy.c consists of a table constructed from the Regular Expressions of Lexp.l, together with standard routines that uses the table to recognize lexemes.

4. Finally, lex.yy.c program is run through the C Compiler to produce an object program a.out, which is the lexical analyzer that transforms an input stream into a sequence of tokens.

Program:

lexp.l

```
%{
```

Reg.No:

```
 int COMMENT=0;
%}
 identifier [a-zA-Z][a-zA-Z0-9]*
 %%
 #.* {printf ("\n %s is a Preprocessor Directive",yytext);}
 int |
 float |
 main |
 if |
 else |
 printf |
 scanf |
 for |
 char |
 getch |
 while {printf("\n %s is a Keyword",yytext);
}
 "/*" {COMMENT=1;} "*/"
 {COMMENT=0;}
 {identifier}\( {if(!COMMENT) printf("\n Function:\t %s",yytext);}
 \{ {if(!COMMENT) printf("\n Block Begins"); \}
 {if(!COMMENT) printf("\n Block Ends");}
 {identifier}(\[[0-9]*\])? {if(!COMMENT) printf("\n %s is an Identifier",yytext);}
 \".*\" {if(!COMMENT) printf("\n %s is a String",yytext);}
 [0-9]+ {if(!COMMENT) printf("\n %s is a Number",yytext);}
```

Reg.No:

```
 \)(\;)? {if(!COMMENT) printf("\t");ECHO;printf("\n");}
 \( ECHO;
 = {if(!COMMENT) printf("\n%s is an Assmt oprtr",yytext);}
\<= |
 \>= |
 \< |
 == {if(!COMMENT) printf("\n %s is a Rel. Operator",yytext);}
 .|\n
 %%
int main(int argc, char **argv)
 {
 if(argc>1)
{
FILE *file;
 file=fopen(argv[1],"r");
 if(!file)
 {
printf("\n Could not open the file: %s",argv[1]);
 exit(0);
 }
 yyin=file;
 }
 yylex();
 printf("\n\n");
 return 0;
```

```
}
 int yywrap()
{
 return 0;
 }
```

Output:

test.c

```
 #include main()
 {
        int fact=1,n;
        for(int i=1;i<=n;i++)
         { fact=fact*i; }
        printf("Factorial Value of N is", fact);
         getch();
        }
         $ lex lexp.l
         $ cc lex.yy.c
        $ ./a.out test.c
        #include is a Preprocessor Directive
         Function: main( )
        Block Begins
        int is a Keyword
        fact is an Identifier
        = is an Assignment Operator
        1 is a Number
```

n is an Identifier

Function: for(

int is a Keyword

i is an Identifier

= is an Assignment Operator

1 is a Number

i is an Identifier

<= is a Relational Operator

n is an Identifier

i is an Identifier

);

Block Begins

fact is an Identifier

= is an Assignment Operator

fact is an Identifier

i is an Identifier

Block Ends

Function: printf("Factorial Value of N is" is a String fact is an Identifier);

Function: getch( );

Block Ends