Name: VENNELA G

Register No: 20BDS0146

Lab Course Name: OPERATING SYSTEMS

Lab Slot: L21+L22

Assesment No :   4

Question 1

Write a C program using POSIX Shared Memory with two processes namely a Writer and Reader to implement the following tasks.

 Let the Writer write 'n' bytes (read from stdin) into the shared memory and the reader be reading the same. Subsequently let the Writer change the contents of bytes '5 to 10' to '------' and terminate itself. Finally, let the Reader read the updated contents of the shared memory and present them on stdout.

Answer:

SOURCE CODE:

Writer process:

```
#include<unistd.h>

#include<stdio.h>

#include<sys/types.h>

#include<sys/mman.h>

#include<fcntl.h>

#include<stdlib.h>

#include<string.h>

char msg[100];

int main()
{int shmFD,s;
```

```c
char mod[100];
char * addr;

shmFD=shm_open("Shm1",O_RDWR|O_CREAT,0666);
if(shmFD==-1)
{perror("shm_open");
exit(-1);}

if(ftruncate(shmFD,512)==-1)
{perror("ftruncate");
exit(-1);}

addr=mmap(NULL,512,PROT_WRITE,MAP_SHARED,shmFD,0);
if(addr==MAP_FAILED)
{perror("mmap");
exit(-1);}

printf("Enter the message:");
scanf("%[^\n]s",msg);
memcpy(addr,msg,strlen(msg)+1);

printf("This message:\n %s \nis written to the shared memory\n",msg);
printf("Enter data for replacement:");
fgets(mod,100,stdin);
scanf("%[^\n]s",mod);
```

```c
int j;
for(int i=0;msg[i]!='\0';i++)
 {j=i+5;
  addr[j]=mod[i];
  j++;
}
printf("This modified message:\n %s \nis written to the shared memory",addr);
return 0;
}
```

Reader process:

```c
#include<stdio.h>
#include<sys/types.h>
#include<sys/mman.h>
#include<fcntl.h>
#include<stdlib.h>
#include<string.h>

int main()
{int shmFD;
void *addr;
char msg[100];

shmFD=shm_open("Shm1",O_RDONLY,0666);
if(shmFD==-1)
```

```c
{perror("shm_open");

exit(-1);}


addr=mmap(NULL,512,PROT_READ,MAP_SHARED,shmFD,0);

if(addr==MAP_FAILED)

{perror("mmap");

exit(-1);}

memcpy(msg,addr,sizeof(msg));

printf("Process read:\n %s \n from shared memory\n",msg);

return 0;

}
```

Concatenating files


```
vennela@vennela-VirtualBox:~$ cat sharedmemwriter.c sharedmemreader.c
#include<unistd.h>
#include<stdio.h>
#include<sys/types.h>
#include<sys/mman.h>
#include<fcntl.h>
#include<stdlib.h>
#include<string.h>

char msg[100];


int main()
{int shmFD,s;

char mod[100];
char * addr;

shmFD=shm_open("Shm1",O_RDWR|O_CREAT,0666);
if(shmFD==-1)
{perror("shm_open");
exit(-1);}

if(ftruncate(shmFD,512)==-1)
{perror("ftruncate");
exit(-1);}

addr=mmap(NULL,512,PROT_WRITE,MAP_SHARED,shmFD,0);
if(addr==MAP_FAILED)
{perror("mmap");
exit(-1);}

printf("Enter the message:");
scanf("%[^\n]s",msg);
memcpy(addr,msg,strlen(msg)+1);

printf("This message:\n %s \nis written to the shared memory\n",msg);
printf("Enter data for replacement:");
fgets(mod,100,stdin);
scanf("%[^\n]s",mod);

int j;
for(int i=0;msg[i]!='\0';i++)
 {j=i+5;
  addr[j]=mod[i];
  j++;
```



```
printf("This message:\n %s \nis written to the shared memory\n",msg);
printf("Enter data for replacement:");
fgets(mod,100,stdin);
scanf("%[^\n]s",mod);

int j;
for(int i=0;msg[i]!='\0';i++)
 {j=i+5;
  addr[j]=mod[i];
  j++;

}

printf("This modified message:\n %s \nis written to the shared memory",addr);


return 0;
}
#include<stdio.h>
#include<sys/types.h>
#include<sys/mman.h>
#include<fcntl.h>
#include<stdlib.h>
#include<string.h>

int main()
{int shmFD;
void *addr;
char msg[100];

shmFD=shm_open("Shm1",O_RDONLY,0666);
if(shmFD==-1)
{perror("shm_open");
exit(-1);}

addr=mmap(NULL,512,PROT_READ,MAP_SHARED,shmFD,0);
if(addr==MAP_FAILED)
{perror("mmap");
exit(-1);}

memcpy(msg,addr,sizeof(msg));

printf("Process read:\n %s \n from shared memory\n",msg);
return 0;
}
vennela@vennela-VirtualBox:~$
```
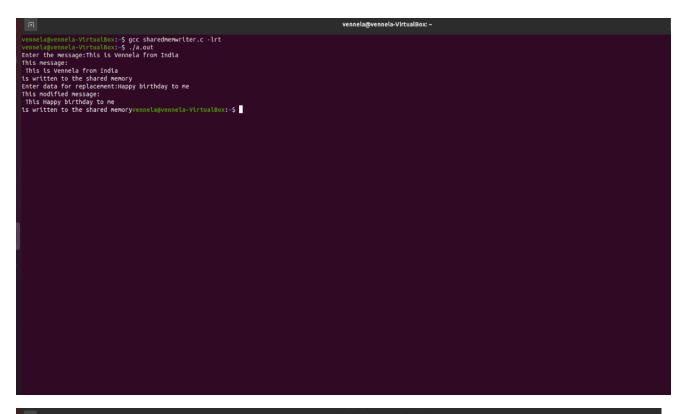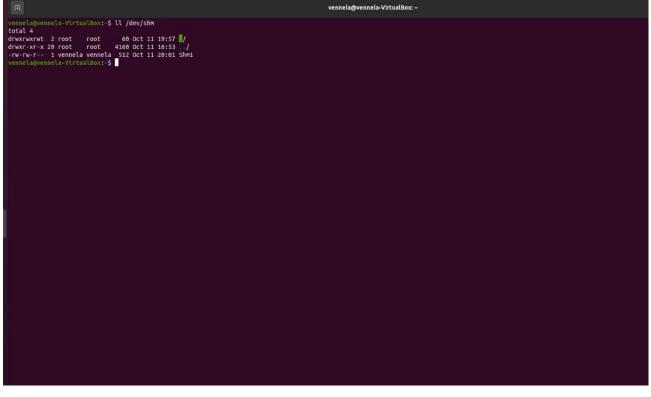
OUTPUT:

vennela@vennela-VirtualBox:~$ gcc sharedmemwriter.c -lrt
vennela@vennela-VirtualBox:~$ ./a.out
Enter the message:Hello world Good morning
This message:
 Hello world Good morning
is written to the shared memory
Enter data for replacement:Hii india is a country
This modified message:
 HelloHii india is a country
is written to the shared memoryvennela@vennela-VirtualBox:~$ gcc sharedmemreader.c -lrt
vennela@vennela-VirtualBox:~$ ./a.out
Process read:
 HelloHii india is a country
 from shared memory
vennela@vennela-VirtualBox:~$

```
vennela@vennela-VirtualBox:~$ gcc sharedmemwriter.c -lrt
vennela@vennela-VirtualBox:~$ ./a.out
Enter the message:This is Vennela from India
This message:
 This is Vennela from India
is written to the shared memory
Enter data for replacement:Happy birthday to me
This modified message:
 This Happy birthday to me
is written to the shared memoryvennela@vennela-VirtualBox:~$
```



```
vennela@vennela-VirtualBox:~$ ll /dev/shm
total 4
drwxrwxrwt  2 root    root      60 Oct 11 19:57 ./
drwxr-xr-x 20 root    root    4160 Oct 11 16:53 ../
-rw-rw-r--  1 vennela vennela  512 Oct 11 20:01 Shm1
vennela@vennela-VirtualBox:~$
```

Question 2

Implement the tasks mentioned in Question 1 using a Writer thread and reader thread.

Answer:

SOURCE CODE:

```c
#include<stdio.h>

#include<pthread.h>

#include<sys/types.h>

#include<unistd.h>

#include<semaphore.h>

#include<stdlib.h>

#include<string.h>


FILE *filePointer ;

char msg[100];

char mod[100];

char dataToBeRead[100];

sem_t rw_mutex,mutex ;

char buf[100];

char *ptr=msg;


int read_count=0;

void * writer(void * arg) {
```

```c
for(int i=0;i<1;i++){
sem_wait(&rw_mutex);
filePointer = fopen("write1.c", "w") ;

 if ( filePointer == NULL )
   {perror("fopen");
   exit(-1);
   }
   else
  { printf("Enter the data to be written:");

    scanf("%[^\n]s",msg);
    printf("The data written is:%s\n",msg);
    fputs(msg,filePointer);
    fputs("\n",filePointer);
   printf("Enter data for replacement:");
   fgets(mod,100,stdin);
   scanf("%[^\n]s",mod);

 int j;
for(int i=0;msg[i]!='\0';i++)
{j=i+5;
 ptr[j]=mod[i];
 j++;
}
fputs(ptr,filePointer);
```

```c
printf("This modified message:\n %s \nis written\n",ptr);

}

 fclose(filePointer) ;

sem_post( &rw_mutex );

}


}


void * reader(void * arg) {


for(int i=0;i<1;i++){


 sem_wait( &mutex );

 read_count++;

 if(read_count==1)

 {sem_wait(&rw_mutex);}

 sem_post(&mutex);

filePointer = fopen("write1.c", "r") ;

if ( filePointer == NULL )

   {

      perror( "fopen" ) ;

   }

   else

   {

      while( fgets ( dataToBeRead,strlen(msg)+1, filePointer ) != NULL )

      {
```

```c
        printf( "The data read is :%s\n" , dataToBeRead ) ;

    }


  }
fclose(filePointer) ;
sem_wait(&mutex);
read_count--;
if(read_count==0)
{sem_post(&rw_mutex);}
sem_post( &mutex );
}


}


int main() {
pthread_t wID, rID;
sem_init( &rw_mutex, 0 , 1);
sem_init( &mutex, 0 , 1);

 if( pthread_create( &wID, NULL, writer, NULL) < 0 ) {
perror("pthread_create");
exit( -1 );
}

 if( pthread_create( &rID, NULL, reader, NULL) < 0 ) {
perror("pthread_create");
```

```
exit( -1 );

}

pthread_join(wID, NULL);

pthread_join(rID, NULL);

return 0;

}
```

OUTPUT:

```
vennela@vennela-VirtualBox:~$ vi writerreader.c
vennela@vennela-VirtualBox:~$ gcc writerreader.c -lpthread
vennela@vennela-VirtualBox:~$ ./a.out
Enter the data to be written:Hello world welcome
The data written is:Hello world welcome
Enter data for replacement:Hi India is a country
This modified message:
 HelloHi India is a country
is written
The data read is :Hello world welcome

The data read is :HelloHi India is a country
vennela@vennela-VirtualBox:~$
```

```
vennela@vennela-VirtualBox:~$ gcc writerreader.c -lpthread
vennela@vennela-VirtualBox:~$ ./a.out
Enter the data to be written:This is Vennela
The data written is:This is Vennela
Enter data for replacement:I am from India
This modified message:
 This I am from India
is written
The data read is :This is Vennela

The data read is :This I am from India
vennela@vennela-VirtualBox:~$
```