LAB 9 ASSIGNMENT

Name: Birva Babaria

Roll no.: CE010

ID: 19CEUON064

Aim: Write the programs for the solution of Reader-Writer Problem.

1). Write a program for 'Readers have priority'.

CODE:

```
//Readers having priority
#include<stdio.h>
#include<pthread.h>
#include<semaphore.h>
#include<unistd.h>
int count = 0;
int value = 0;
sem_t x,wsem;
void *reader(void *arg)
{
      while(1)
      {
            int n = (intptr_t)(arg);
            sem_wait(&x);
            count++;
            if(count==1)
            {
                  sem_wait(&wsem);
            }
            sem_post(&x);
            //READUNIT START
```

```
            printf("Reader %d is reading the value %d.\n",n,value);
            //READUNIT END
            sem_wait(&x);
            count--;
            if(count==0)
            {
                  sem_post(&wsem);
            }
            sem_post(&x);
            sleep(1);
      }
}
void *writer()
{
      while(1)
      {
            sem_wait(&wsem);
            //WRITEUNIT START
            value++;
            printf("Write is updating the value as %d.\n",value);
            //WRITEUNIT END
            sem_post(&wsem);
            sleep(1);
      }
}
void main()
{
      pthread_t r[3],w;
      sem_init(&x,0,1);
      sem_init(&wsem,0,1);
      for(int i=0;i<3;i++)
      {
            pthread_create(&r[i],NULL,(void *)reader,(void *)(intptr_t)i);
      }
```

```
    pthread_create(&w,NULL,(void *)writer,NULL);
    pthread_join(r[0],NULL);
    pthread_join(r[1],NULL);
    pthread_join(r[2],NULL);
    pthread_join(w,NULL);
    sem_destroy(&x);
    sem_destroy(&wsem);
}
```

OUTPUT:

- Readers sleeping time: sleep(1)

  Writers sleeping time: sleep(1)

```
birva@LAPTOP-TJ5CO14G:/mnt/c/Users/Admin/Documents/OS/LAB-9$ gcc task1.c -pthread
birva@LAPTOP-TJ5CO14G:/mnt/c/Users/Admin/Documents/OS/LAB-9$ ./a.out
Reader 0 is reading the value 0.
Reader 1 is reading the value 0.
Reader 2 is reading the value 0.
Write is updating the value as 1.
Write is updating the value as 2.
Reader 0 is reading the value 2.
Reader 1 is reading the value 2.
Reader 2 is reading the value 2.
Write is updating the value as 3.
Reader 0 is reading the value 3.
Reader 1 is reading the value 3.
Reader 2 is reading the value 3.
Reader 0 is reading the value 3.
Write is updating the value as 4.
Reader 2 is reading the value 4.
Reader 1 is reading the value 4.
Reader 0 is reading the value 4.
Write is updating the value as 5.
Reader 2 is reading the value 5.
Reader 1 is reading the value 5.
Reader 0 is reading the value 5.
Reader 2 is reading the value 5.
Reader 1 is reading the value 5.
Write is updating the value as 6.
Reader 0 is reading the value 6.
Reader 2 is reading the value 6.
Reader 1 is reading the value 6.
Write is updating the value as 7.
```

- Readers sleeping time: sleep(3)

  Writers sleeping time: sleep(1)

```
birva@LAPTOP-TJ5CO14G:/mnt/c/Users/Admin/Documents/OS/LAB-9$ gcc task1.c -pthread
birva@LAPTOP-TJ5CO14G:/mnt/c/Users/Admin/Documents/OS/LAB-9$ ./a.out
Reader 0 is reading the value 0.
Reader 1 is reading the value 0.
Reader 2 is reading the value 0.
Write is updating the value as 1.
Write is updating the value as 2.
Write is updating the value as 3.
Reader 0 is reading the value 3.
Reader 1 is reading the value 3.
Reader 2 is reading the value 3.
Write is updating the value as 4.
Write is updating the value as 5.
Write is updating the value as 6.
Reader 1 is reading the value 6.
Reader 0 is reading the value 6.
Reader 2 is reading the value 6.
Write is updating the value as 7.
Write is updating the value as 8.
Write is updating the value as 9.
Reader 1 is reading the value 9.
Reader 0 is reading the value 9.
Reader 2 is reading the value 9.
Write is updating the value as 10.
Write is updating the value as 11.
```

- Readers sleeping time: sleep(1)

  Writers sleeping time: sleep(5)

```
birva@LAPTOP-TJ5CO14G:/mnt/c/Users/Admin/Documents/OS/LAB-9$ gcc task1.c -pthread
birva@LAPTOP-TJ5CO14G:/mnt/c/Users/Admin/Documents/OS/LAB-9$ ./a.out
Reader 0 is reading the value 0.
Reader 1 is reading the value 0.
Reader 2 is reading the value 0.
Write is updating the value as 1.
Reader 0 is reading the value 1.
Reader 2 is reading the value 1.
Reader 1 is reading the value 1.
Reader 0 is reading the value 1.
Reader 2 is reading the value 1.
Reader 1 is reading the value 1.
Reader 0 is reading the value 1.
Reader 2 is reading the value 1.
Reader 1 is reading the value 1.
Reader 0 is reading the value 1.
Reader 2 is reading the value 1.
Reader 1 is reading the value 1.
Write is updating the value as 2.
Reader 0 is reading the value 2.
Reader 2 is reading the value 2.
Reader 1 is reading the value 2.
Reader 0 is reading the value 2.
Reader 2 is reading the value 2.
Reader 1 is reading the value 2.
Reader 0 is reading the value 2.
Reader 2 is reading the value 2.
Reader 1 is reading the value 2.
```

2). Write a program for ‘Writers have priority’.

CODE:

```
//Writers having priority
#include<stdio.h>
#include<pthread.h>
#include<semaphore.h>
#include<unistd.h>
#define max 3
sem_t x, y, z, rsem, wsem;
int readcount, writecount;
void *reader();
void *writer();
int value = 1;
void *reader(void *arg)
{
    while (1)
    {
        int n = (intptr_t)arg;
        sem_wait(&z);
        sem_wait(&rsem);
        sem_wait(&x);
        readcount++;
        if (readcount == 1)
        {
            sem_wait(&wsem);
        }
        sem_post(&x);
        sem_post(&rsem);
        sem_post(&z);
        printf("Reader %d is Reading the Value as %d.\n",n,value);
        sem_wait(&x);
        readcount--;
        if (readcount == 0)
```

```
        {
            sem_post(&wsem);
        }
        sem_post(&x);
        sleep(1);
    }
}
void *writer(void *arg)
{
    while (1)
    {
        sem_wait(&y);
        writecount++;
        if (writecount == 1)
        {
            sem_wait(&rsem);
        }
        sem_post(&y);
        sem_wait(&wsem);
        value++;
        int n=(intptr_t)arg;
        printf("Writer %d has updated the Value to %d.\n",n,value);
        sem_post(&wsem);
        sem_wait(&y);
        writecount--;
        if (writecount == 0)
        {
            sem_post(&rsem);
        }
        sem_post(&y);
        sleep(1);
    }
}
void main()
```

```
{
    pthread_t read[max], write[max];
    sem_init(&x, 0, 1);
    sem_init(&y, 0, 1);
    sem_init(&z, 0, 1);
    sem_init(&rsem, 0, 1);
    sem_init(&wsem, 0, 1);
    for (int i = 0; i < max; i++)
    {
        pthread_create(&read[i], NULL, (void *)reader, (void *)(intptr_t)i);
    }
    for (int i=0; i<max; i++)
    {
        pthread_create(&write[i], NULL, (void *)writer, (void *)(intptr_t)i);
    }
    for (int i=0; i<max; i++)
    {
        pthread_join(read[i], NULL);
    }
    for (int i=0; i<max; i++)
    {
        pthread_join(write[i], NULL);
    }
    sem_destroy(&x);
    sem_destroy(&y);
    sem_destroy(&z);
    sem_destroy(&rsem);
    sem_destroy(&wsem);
}
```

OUTPUT:

- Readers sleeping time: sleep(1)

  Writers sleeping time: sleep(1)

```
birva@LAPTOP-TJ5CO14G:/mnt/c/Users/Admin/Documents/OS/LAB-9$ gcc task2.c -pthread
birva@LAPTOP-TJ5CO14G:/mnt/c/Users/Admin/Documents/OS/LAB-9$ ./a.out
Reader 0 is Reading the Value as 1.
Reader 1 is Reading the Value as 1.
Reader 2 is Reading the Value as 1.
Writer 0 has updated the Value to 2.
Writer 1 has updated the Value to 3.
Writer 2 has updated the Value to 4.
Reader 0 is Reading the Value as 4.
Reader 2 is Reading the Value as 4.
Reader 1 is Reading the Value as 4.
Writer 0 has updated the Value to 5.
Writer 2 has updated the Value to 6.
Writer 1 has updated the Value to 7.
Reader 1 is Reading the Value as 7.
Reader 0 is Reading the Value as 7.
Reader 2 is Reading the Value as 7.
Writer 0 has updated the Value to 8.
Writer 2 has updated the Value to 9.
Writer 1 has updated the Value to 10.
Reader 1 is Reading the Value as 10.
Writer 0 has updated the Value to 11.
Reader 0 is Reading the Value as 11.
Reader 2 is Reading the Value as 11.
Writer 2 has updated the Value to 12.
Writer 1 has updated the Value to 13.
Reader 1 is Reading the Value as 13.
Reader 2 is Reading the Value as 13.
Writer 0 has updated the Value to 14.
Reader 0 is Reading the Value as 14.
```

- Readers sleeping time: sleep(3)

  Writers sleeping time: sleep(1)

```
birva@LAPTOP-TJ5CO14G:/mnt/c/Users/Admin/Documents/OS/LAB-9$ gcc task2.c -pthread
birva@LAPTOP-TJ5CO14G:/mnt/c/Users/Admin/Documents/OS/LAB-9$ ./a.out
Reader 0 is Reading the Value as 1.
Reader 1 is Reading the Value as 1.
Reader 2 is Reading the Value as 1.
Writer 0 has updated the Value to 2.
Writer 1 has updated the Value to 3.
Writer 2 has updated the Value to 4.
Writer 1 has updated the Value to 5.
Writer 0 has updated the Value to 6.
Writer 2 has updated the Value to 7.
Writer 1 has updated the Value to 8.
Writer 0 has updated the Value to 9.
Writer 2 has updated the Value to 10.
Reader 0 is Reading the Value as 10.
Reader 1 is Reading the Value as 10.
Reader 2 is Reading the Value as 10.
Writer 1 has updated the Value to 11.
Writer 0 has updated the Value to 12.
Writer 2 has updated the Value to 13.
Writer 1 has updated the Value to 14.
Writer 0 has updated the Value to 15.
Writer 2 has updated the Value to 16.
Writer 1 has updated the Value to 17.
Writer 0 has updated the Value to 18.
Writer 2 has updated the Value to 19.
```

- Readers sleeping time: sleep(1)

  Writers sleeping time: sleep(3)

```
birva@LAPTOP-TJ5CO14G:/mnt/c/Users/Admin/Documents/OS/LAB-9$ gcc task2.c -pthread
birva@LAPTOP-TJ5CO14G:/mnt/c/Users/Admin/Documents/OS/LAB-9$ ./a.out
Reader 0 is Reading the Value as 1.
Reader 1 is Reading the Value as 1.
Reader 2 is Reading the Value as 1.
Writer 0 has updated the Value to 2.
Writer 1 has updated the Value to 3.
Writer 2 has updated the Value to 4.
Reader 0 is Reading the Value as 4.
Reader 1 is Reading the Value as 4.
Reader 2 is Reading the Value as 4.
Reader 0 is Reading the Value as 4.
Reader 1 is Reading the Value as 4.
Reader 2 is Reading the Value as 4.
Writer 0 has updated the Value to 5.
Writer 1 has updated the Value to 6.
Writer 2 has updated the Value to 7.
Reader 0 is Reading the Value as 7.
Reader 1 is Reading the Value as 7.
Reader 2 is Reading the Value as 7.
Reader 0 is Reading the Value as 7.
Reader 1 is Reading the Value as 7.
Reader 2 is Reading the Value as 7.
Reader 0 is Reading the Value as 7.
Reader 1 is Reading the Value as 7.
Reader 2 is Reading the Value as 7.
Writer 0 has updated the Value to 8.
Writer 1 has updated the Value to 9.
```