OS Assignment

MD ASIBUR RAHMAN AKASH

Roll: 19 Reg:11800427

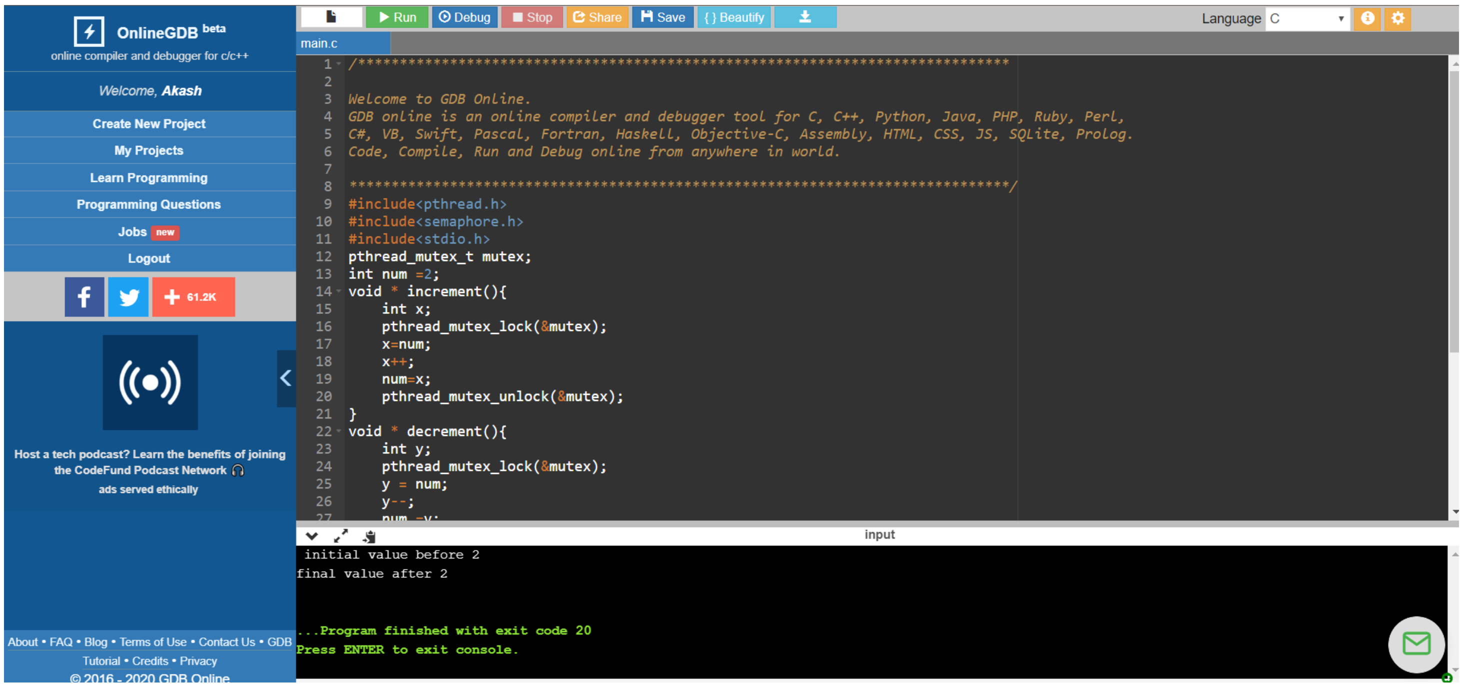
Section: K18PT Group: 1

Q1. Write a program to sync 5 readers and 3 writers such that multiple readers should be allowed to read at same time but reader and writer cannot simultaneously enter into critical section. Program should be implemented with the help of thread and use semaphore for synchronization.

Q2. Write program to create two threads and both the thread are sharing a common variable whose value is initialized by 2. First thread should increment the shared value by 1 and the other thread should decrement by 1. In order to avoid context switching and to attain consistency use Mutex Lock. Create a scenario such that after execution, the value of the shared variable should be consistent.

```
#include<pthread.h>

#include<semaphore.h>
```

```
#include<stdio.h>
pthread_mutex_t mutex;
int num =2;
void * increment(){
        int x;
        pthread_mutex_lock(&mutex);
        x=num;
        x++;
        num=x;
        pthread_mutex_unlock(&mutex);
}
void * decrement(){
        int y;
        pthread_mutex_lock(&mutex);
        y = num;
        y--;
        num =y;
        pthread_mutex_unlock(&mutex);
}
void main(){
        pthread_t t1,t2;
        pthread_create(&t1,NULL,*increment,NULL);
        pthread_create(&t2,NULL,*decrement,NULL);
        printf(" initial value before %d\n",num);
        pthread_join(t1,NULL);
        pthread_join(t2,NULL);
        printf("final value after %d\n",num);
```



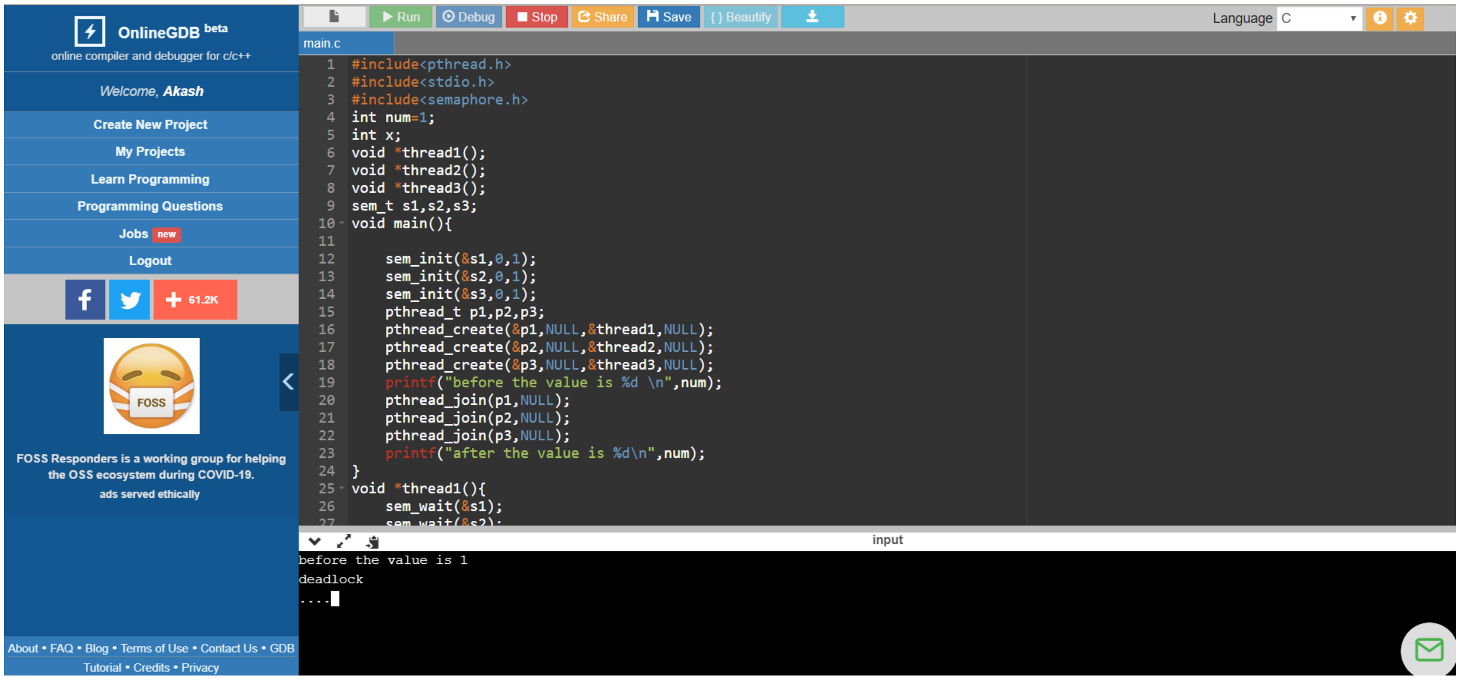
```
/*******************************************************************************

Welcome to GDB Online.
GDB online is an online compiler and debugger tool for C, C++, Python, Java, PHP, Ruby, Perl,
C#, VB, Swift, Pascal, Fortran, Haskell, Objective-C, Assembly, HTML, CSS, JS, SQLite, Prolog.
Code, Compile, Run and Debug online from anywhere in world.

*******************************************************************************/
#include<pthread.h>
#include<semaphore.h>
#include<stdio.h>
pthread_mutex_t mutex;
int num =2;
void * increment(){
    int x;
    pthread_mutex_lock(&mutex);
    x=num;
    x++;
    num=x;
    pthread_mutex_unlock(&mutex);
}
void * decrement(){
    int y;
    pthread_mutex_lock(&mutex);
    y = num;
    y--;
    num =y;
```

```
 initial value before 2
final value after 2


...Program finished with exit code 20
Press ENTER to exit console.
```

```
}
```

Q3. Write a program to create three threads and three binary semaphore S1 ,S2andS3 that are initialized with value 1. Threads should acquire semaphore in such a manner that deadlock is achieved.

```
#include<pthread.h>
#include<stdio.h>
#include<semaphore.h>
int num=1;
int x;
void *thread1();
void *thread2();
void *thread3();
sem_t s1,s2,s3;
void main(){

        sem_init(&s1,0,1);
        sem_init(&s2,0,1);
        sem_init(&s3,0,1);
        pthread_t p1,p2,p3;
        pthread_create(&p1,NULL,&thread1,NULL);
        pthread_create(&p2,NULL,&thread2,NULL);
        pthread_create(&p3,NULL,&thread3,NULL);
        printf("before the value is %d \n",num);
        pthread_join(p1,NULL);
        pthread_join(p2,NULL);
        pthread_join(p3,NULL);
        printf("after the value is %d\n",num);
}
void *thread1(){
        sem_wait(&s1);
        sem_wait(&s2);
        x=num;
        x++;
        num=x;
        sem_post(&s2);
}
void *thread2(){
        sem_wait(&s2);
        sem_wait(&s3);
        x=num;
        num=x;
        sem_post(&s3);
}
void *thread3(){
        sem_wait(&s3);
        sem_wait(&s1);
        x=num;
        x--;
        num=x;
        sem_post(&s1);
}
```


OnlineGDB beta
online compiler and debugger for c/c++
Welcome, Akash
Create New Project
My Projects
Learn Programming
Programming Questions
Jobs new
Logout
61.2K
FOSS
FOSS Responders is a working group for helping the OSS ecosystem during COVID-19.
ads served ethically
About • FAQ • Blog • Terms of Use • Contact Us • GDB Tutorial • Credits • Privacy
Run
Debug
Stop
Share
Save
{ } Beautify
Language C
main.c
input

```c
#include<pthread.h>
#include<stdio.h>
#include<semaphore.h>
int num=1;
int x;
void *thread1();
void *thread2();
void *thread3();
sem_t s1,s2,s3;
void main(){

    sem_init(&s1,0,1);
    sem_init(&s2,0,1);
    sem_init(&s3,0,1);
    pthread_t p1,p2,p3;
    pthread_create(&p1,NULL,&thread1,NULL);
    pthread_create(&p2,NULL,&thread2,NULL);
    pthread_create(&p3,NULL,&thread3,NULL);
    printf("before the value is %d \n",num);
    pthread_join(p1,NULL);
    pthread_join(p2,NULL);
    pthread_join(p3,NULL);
    printf("after the value is %d\n",num);
}
void *thread1(){
    sem_wait(&s1);
    sem_wait(&s2);
```

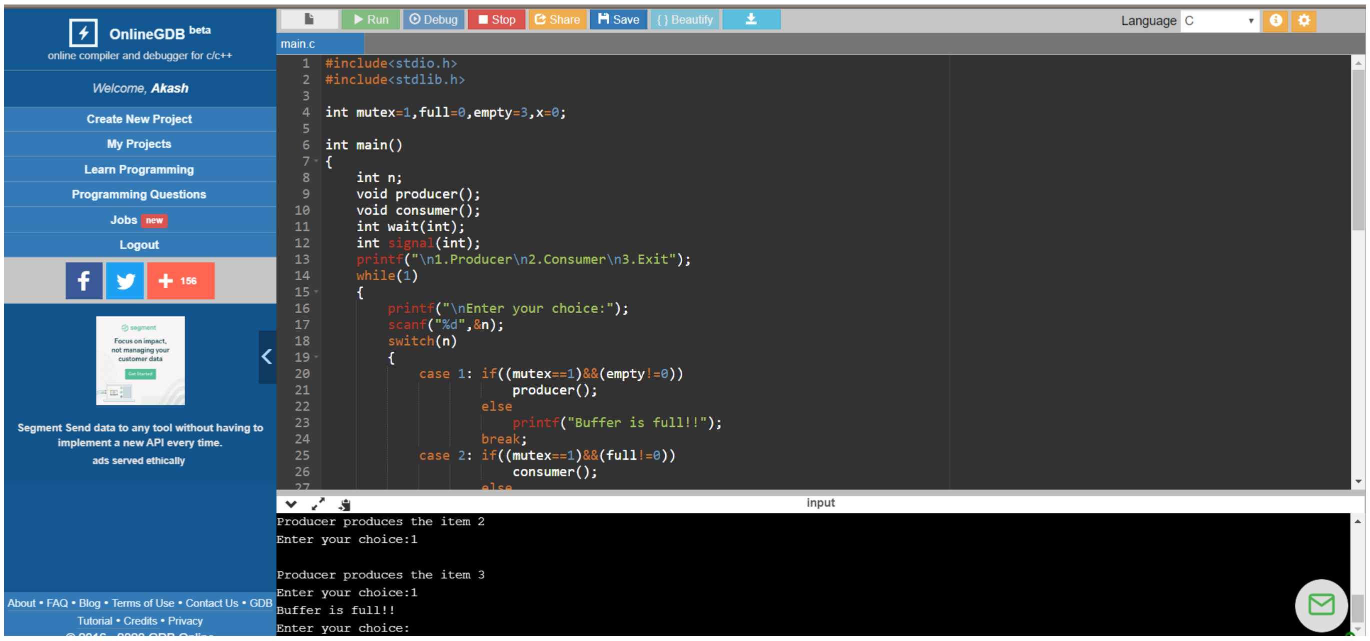
```
before the value is 1
deadlock
....
```

Q4. Write a program to implement producer consumer problem such that Maximum number of items produced by a producer are five. Producer should not produce any item if the buffer is full and should say" BUFFER IS ALREADY FULL" and the consumer should not consume if the buffer is empty. Problem should be implemented with the help of thread, semaphore and mutex lock.

```
#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);
}
```



```
#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();
```

```
Producer produces the item 2
Enter your choice:1

Producer produces the item 3
Enter your choice:1
Buffer is full!!
Enter your choice:
```