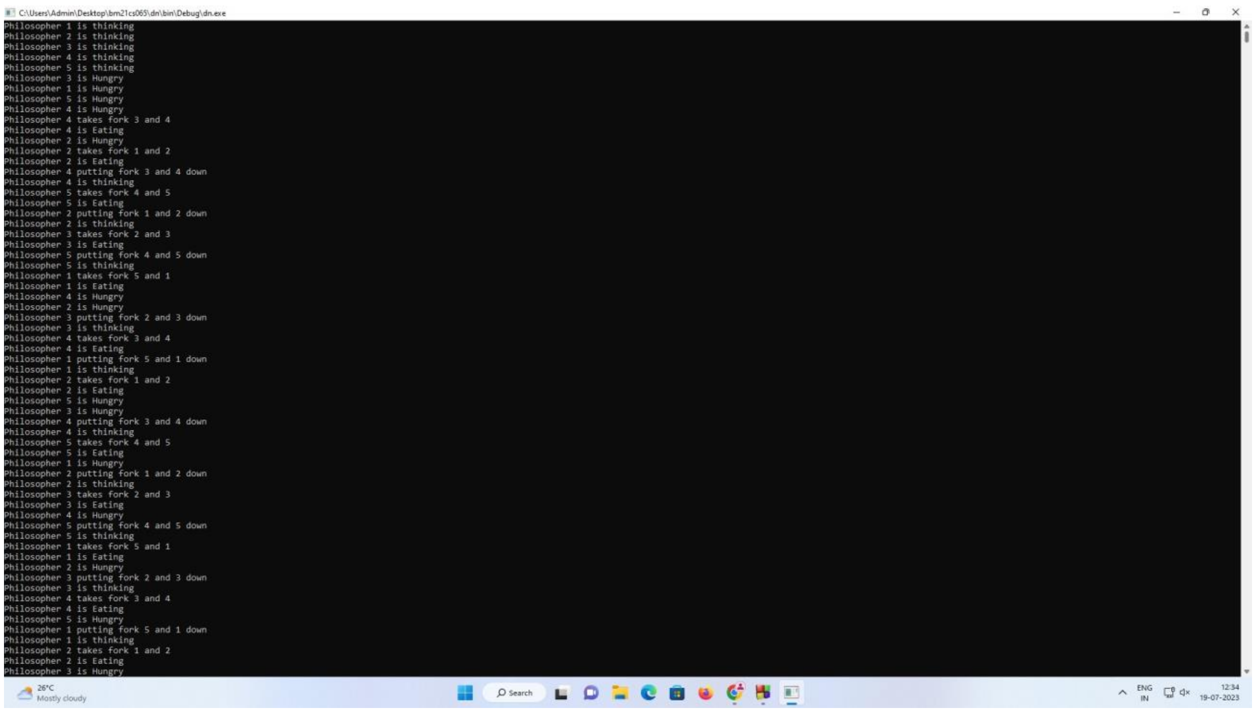
a)Write a C program to simulate the concept of Dining-Philosophers problem.
b)Write a C program to simulate producer-consumer problem using semaphores.

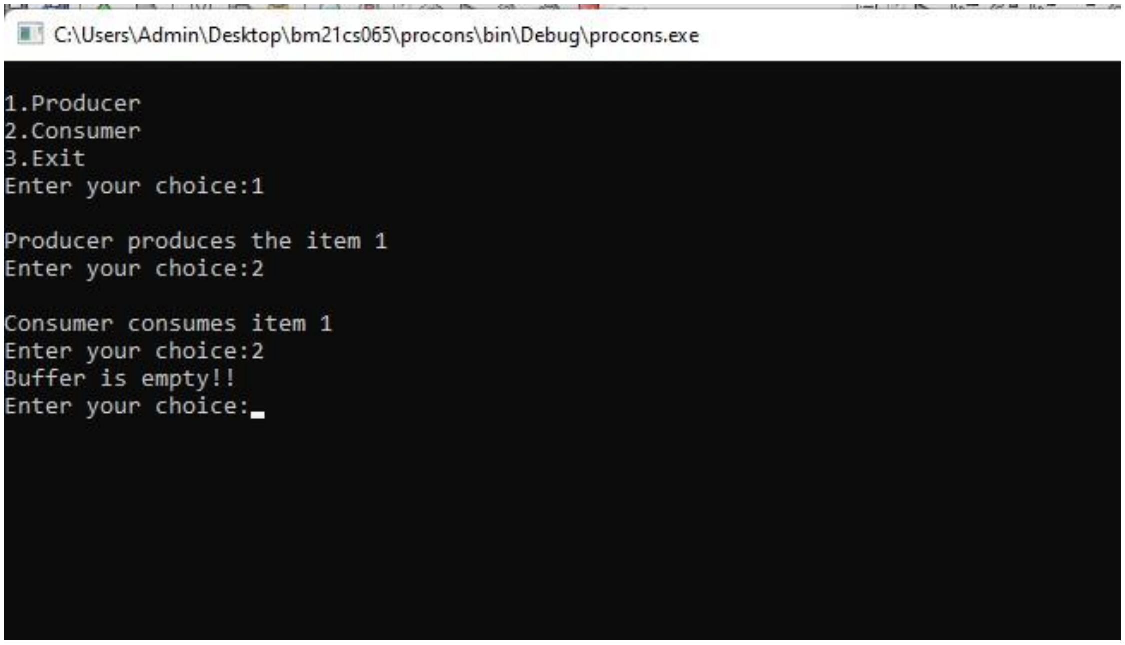
```
#include <pthread.h>
#include <semaphore.h>

#include <stdio.h>

#define N 5
#define THINKING 2
#define HUNGRY 1
#define EATING 0
#define LEFT (phnum + 4) % N #define
RIGHT (phnum + 1) % N

int state[N]; int phil[N] = { 0,
1, 2, 3, 4 };

sem_t mutex; sem_t
S[N];

void test(int phnum)
{
        if (state[phnum] == HUNGRY
                && state[LEFT] != EATING &&
                state[RIGHT] != EATING) {
                state[phnum] = EATING;

                sleep(2);

                printf("Philosopher %d takes fork %d and %d\n", phnum +
                                        1, LEFT + 1, phnum + 1);
                printf("Philosopher %d is Eating\n", phnum + 1);
                sem_post(&S[phnum]);
        }
}

void take_fork(int phnum)
{

        sem_wait(&mutex); state[phnum] = HUNGRY;

        printf("Philosopher %d is Hungry\n", phnum + 1);

        test(phnum); sem_post(&mutex);

        sem_wait(&S[phnum]);

        sleep(1);
}

void put_fork(int phnum)
{

        sem_wait(&mutex); state[phnum]

        = THINKING;

        printf("Philosopher %d putting fork %d and %d down\n", phnum +
                1, LEFT + 1, phnum + 1);
        printf("Philosopher %d is thinking\n", phnum + 1);

        test(LEFT); test(RIGHT);

        sem_post(&mutex);
}

void* philosopher(void* num)
{
        while (1) { int* i =

                num;

                sleep(1); take_fork(*i);

                sleep(0);

                put_fork(*i);
        }
}

int main()
{

        int i;
        pthread_t thread_id[N];

        sem_init(&mutex, 0, 1); for (i

        = 0; i < N; i++) sem_init(&S[i],

        0, 0); for (i = 0; i < N; i++) {

                // create philosopher processes pthread_create(&thread_id[i],
                NULL,
                                    philosopher, &phil[i]);

                printf("Philosopher %d is thinking\n", i + 1);
        }

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

                pthread_join(thread_id[i], NULL);
}
```



```
C:\Users\Admin\Desktop\bm21cs065\dn\bin\Debug\dn.exe
Philosopher 1 is thinking
Philosopher 2 is thinking
Philosopher 3 is thinking
Philosopher 4 is thinking
Philosopher 5 is thinking
Philosopher 3 is Hungry
Philosopher 1 is Hungry
Philosopher 5 is Hungry
Philosopher 4 is Hungry
Philosopher 4 takes fork 3 and 4
Philosopher 4 is Eating
Philosopher 2 is Hungry
Philosopher 2 takes fork 1 and 2
Philosopher 2 is Eating
Philosopher 4 putting fork 3 and 4 down
Philosopher 4 is thinking
Philosopher 5 takes fork 4 and 5
Philosopher 5 is Eating
Philosopher 2 putting fork 1 and 2 down
Philosopher 2 is thinking
Philosopher 3 takes fork 2 and 3
Philosopher 3 is Eating
Philosopher 5 putting fork 4 and 5 down
Philosopher 5 is thinking
Philosopher 1 takes fork 5 and 1
Philosopher 1 is Eating
Philosopher 4 is Hungry
Philosopher 2 is Hungry
Philosopher 3 putting fork 2 and 3 down
Philosopher 3 is thinking
Philosopher 4 takes fork 3 and 4
Philosopher 4 is Eating
Philosopher 1 putting fork 5 and 1 down
Philosopher 1 is thinking
Philosopher 2 takes fork 1 and 2
Philosopher 2 is Eating
Philosopher 5 is Hungry
Philosopher 3 is Hungry
Philosopher 4 putting fork 3 and 4 down
Philosopher 4 is thinking
Philosopher 5 takes fork 4 and 5
Philosopher 5 is Eating
Philosopher 1 is Hungry
Philosopher 2 putting fork 1 and 2 down
Philosopher 2 is thinking
Philosopher 3 takes fork 2 and 3
Philosopher 3 is Eating
Philosopher 4 is Hungry
Philosopher 5 putting fork 4 and 5 down
Philosopher 5 is thinking
Philosopher 1 takes fork 5 and 1
Philosopher 1 is Eating
Philosopher 2 is Hungry
Philosopher 3 putting fork 2 and 3 down
Philosopher 3 is thinking
Philosopher 4 takes fork 3 and 4
Philosopher 4 is Eating
Philosopher 5 is Hungry
Philosopher 1 putting fork 5 and 1 down
Philosopher 1 is thinking
Philosopher 2 takes fork 1 and 2
Philosopher 2 is Eating
Philosopher 3 is Hungry
```

b)

```
#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);
}
```



C:\Users\Admin\Desktop\bm21cs065\procons\bin\Debug\procons.exe

```
1.Producer
2.Consumer
3.Exit
Enter your choice:1

Producer produces the item 1
Enter your choice:2

Consumer consumes item 1
Enter your choice:2
Buffer is empty!!
Enter your choice:
```