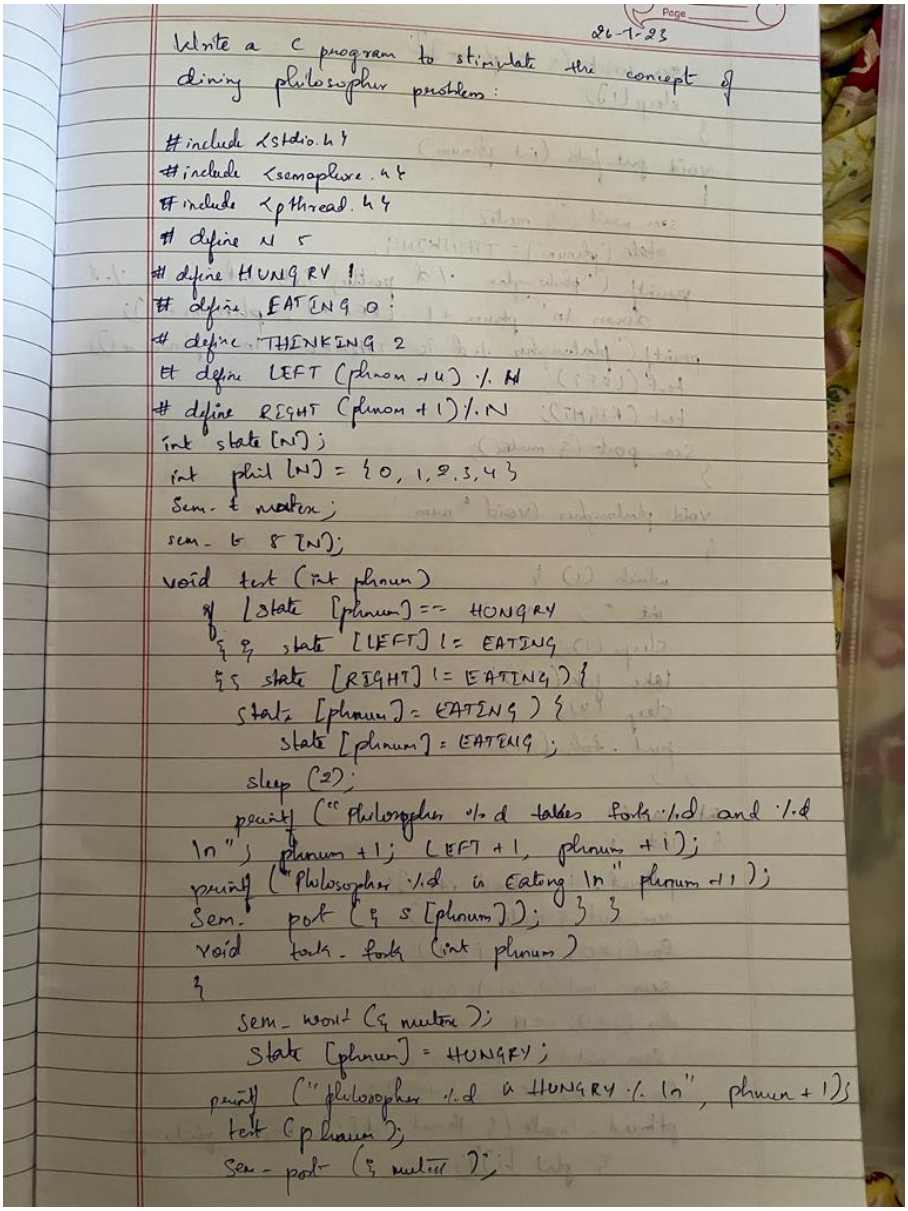
WEEK5

a)Write a C program to simulate the concept of Dining-Philosophers problem.

b)Write a C program to simulate producer-consumer problem using



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Write a C program to stimulate the concept of dining philosopher problem:

```
#include <stdio.h>
#include <semaphore.h>
#include <pthread.h>
#define N 5
#define HUNGRY 1
#define EATING 0
#define THINKING 2
#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;
      state[phnum] = EATING;
    sleep(2);
    printf("Philosopher %d takes fork %d and %d
In", 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
    down in", phnum+1, LEFT+1, phnum+1);
printf ("philosopher %d is THINKING in", 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++)
sem_init (&s[i], 0, 0);
for (i=0; i<N; i++) {
pthread_create (&thread_id[i], NULL, philosopher
    &phil[i]);
```

```
    sem_wait (& s[phnum]);
    sleep[1]);
}
void put_fork (int phnum)
{
    sem_wait (& mutex);
    state [phnum] = THINKING;
printf ("philosopher %d putting fork %d and
    down \n", phnum + 1, LEFT + 1, phnum + 1);
printf ("philosopher %d is THINKING \n", phnum +
    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++)
sem_init (& s[i], 0, 0);
for (i=0; i<N; i++) {
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);
}
```

Output:

philosopher 1 is thinking
philosopher 2 is thinking
philosopher 3 is thinking
philosopher 4 is thinking
philosopher 2 is HUNGRY
philosopher 1 is HUNGRY
philosopher 4 is HUNGRY
philosopher 5 is HUNGRY
philosopher 5 takes fork 4 and 5
philosopher 5 is EATING
philosopher 3 is HUNGRY
philosopher 3 takes fork 2 and 3
philosopher 3 is EATING
philosopher 5 putting fork 4 and 5 down
philosopher 5 is thinking.

19/7/23

Lab: 5

* Write a C program to simulate producer-consumer using semaphores.

```
#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 (+1 s);
}
void producer()
{
    mutex = wait (mutex);
    full = signal (full);
    empty = wait (empty);
    x++;
    printf ("In Producer produces the item %d", x);
    mutex = signal (mutex);
}
void consumer()
{
    mutex = wait (mutex);
    full = wait (full);
    empty = signal (empty);
    printf ("In Consumer consumes item %d", x);
    x--;
    mutex = signal (mutex);
}
```

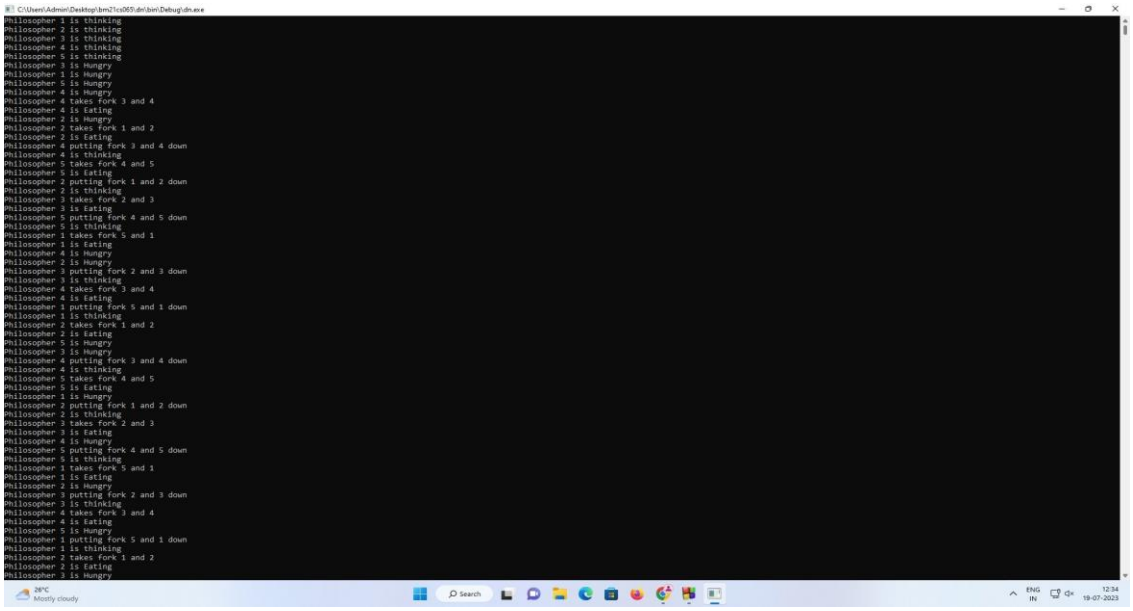
Output:

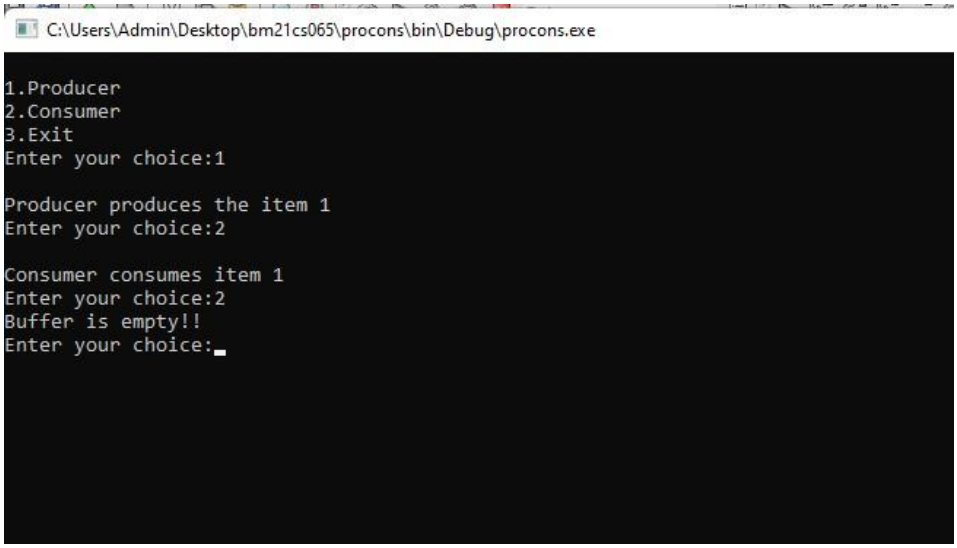
1. Producer
2. Consumer
3. Exit

Enter your choice: 1
Producer produces the item 1
Enter your choice: 1
Producer produces the item 2
Enter your choice: 1
Producer produces the item 3
Enter your choice: 1
Buffer is full!!

Enter your choice: 2
Consumer consumes item 3
Enter your choice: 2

OUTPUT:


C:\Users\Admin\Desktop\bm21cs065\din\bin\Debug\din.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


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: