WEEK 5

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Producer consumer:

INPUT:

```
#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);
}
```

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

Consumer consumes item 2
Enter your choice:2

Consumer consumes item 1
Enter your choice:2
Buffer is empty!!
Enter your choice:3

Process returned 0 (0x0)   execution time : 7.845 s
Press any key to continue.
```

Dining Philosopher:

INPUT:

```
#include <pthread.h>

#include <semaphore.h>

#include <stdio.h>


#define N 5

#define THINKING 2

#define HUNGRY 1

#define EATING 0
```

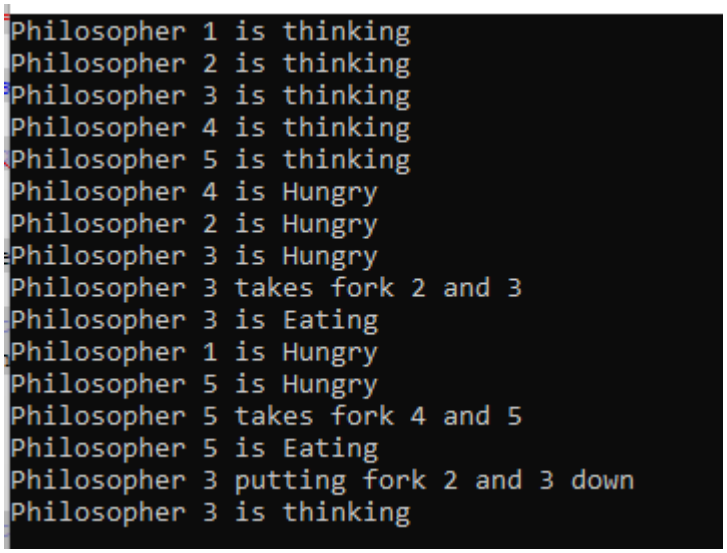
```
#define LEFT (phnum + 4) % N
#define RIGHT (phnum + 1) % N

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 that 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]) has no effect
        // during takefork
        // used to wake up hungry philosophers
        // during putfork
        sem_post(&S[phnum]);
    }
}
```

```
// take up chopsticks
void take_fork(int phnum)
{

   sem_wait(&mutex);

   // state that hungry
   state[phnum] = HUNGRY;

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

   // eat if neighbours are not eating
   test(phnum);

   sem_post(&mutex);

   // if unable to eat wait to be signalled
   sem_wait(&S[phnum]);

   sleep(1);
}

// put down chopsticks
void put_fork(int phnum)
{

   sem_wait(&mutex);

   // state that thinking
   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];

    // initialize the semaphores
    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);
}
```

OUTPUT:


Philosopher 1 is thinking
Philosopher 2 is thinking
Philosopher 3 is thinking
Philosopher 4 is thinking
Philosopher 5 is thinking
Philosopher 4 is Hungry
Philosopher 2 is Hungry
Philosopher 3 is Hungry
Philosopher 3 takes fork 2 and 3
Philosopher 3 is Eating
Philosopher 1 is Hungry
Philosopher 5 is Hungry
Philosopher 5 takes fork 4 and 5
Philosopher 5 is Eating
Philosopher 3 putting fork 2 and 3 down
Philosopher 3 is thinking