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① Write a C program to Simulate the concept of Dining - Philosophers problem.

```
#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("philosophu %d takes fork %d and
                    %d\n", phnum + 1, LEFT+1,
                    phnum+1);
            printf("philosophu %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);
    test(LEFT);
    test(RIGHT);
    Sem_post(&mutex);
}

void* philosopher(void* num)
{
    While(1) {
        int* i = num;
        Sleep(1);
        take_fork(*i);
        Slep(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++){
        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 5 is Hungry
philosopher 4 is Hungry
philosopher 3 is Hungry
philosopher 2 is Hungry
philosopher 1 is Hungry
philosopher 1 takes fork 5 and 1
philosopher 1 is Eating
philosopher 1 putting fork 5 and 1 down
philosopher 1 is thinking
philosopher 5 takes fork 4 and 5
philosopher 5 is Eating