

[Process Synchronization]

Considered there are N philosophers seated around a circular table with one chopstick between each pair of philosophers. There is one chopstick between each philosopher. A philosopher may eat if he can pick up the two chopsticks adjacent to him. One chopstick may be picked up by any one of its adjacent followers but not both. Write a program to solve the problem using process synchronization technique.

Code:-

```
GNU nano 8.7
#include <stdio.h>
#include <pthread.h>
#include <semaphore.h>
#include <unistd.h>

#define N 5

sem_t chopstick[N];

void* philosopher(void* num) {
    int id = *(int*)num;

    printf("Philosopher %d is thinking\n", id);
    sleep(1);

    if (id == N - 1) {
        sem_wait(&chopstick[(id + 1) % N]);
        sem_wait(&chopstick[id]);
    } else {
        sem_wait(&chopstick[id]);
        sem_wait(&chopstick[(id + 1) % N]);
    }

    printf("Philosopher %d is eating\n", id);
    sleep(2);

    sem_post(&chopstick[id]);
    sem_post(&chopstick[(id + 1) % N]);

    printf("Philosopher %d finished eating\n", id);
    return NULL;
}

int main() {
    pthread_t phil[N];
    int ids[N];

    for (int i = 0; i < N; i++)
        sem_init(&chopstick[i], 0, 1);

    for (int i = 0; i < N; i++) {
        ids[i] = i;
        pthread_create(&phil[i], NULL, philosopher, &ids[i]);
    }

    for (int i = 0; i < N; i++)
        pthread_join(phil[i], NULL);

    return 0;
}
```

⌘G Help ⌘O Write Out ⌘F Where Is ⌘K Cut ⌘T Execute
⌘X Exit ⌘R Read File ⌘\ Replace ⌘U Paste ⌘J Justify

Output:-

```
Dhanashri@LAPTOP-903LMFMK MSYS ~
$ nano pr6.c

Dhanashri@LAPTOP-903LMFMK MSYS ~
$ gcc pr6.c -o pr6
pr6.c: In function 'philosopher':
pr6.c:11:14: warning: cast from pointer to integer of different size [-Wpointer-to-int-cast]
    11 |         int id = (int)num;
        |                   ^

Dhanashri@LAPTOP-903LMFMK MSYS ~
$ ./pr6
Philosopher -13328 is thinking
Philosopher -13324 is thinking
Philosopher -13320 is thinking
Philosopher -13316 is thinking
Philosopher -13312 is thinking
Philosopher -13320 is eating
Philosopher -13324 is eating
Philosopher -13312 is eating
Philosopher -13328 is eating
Philosopher -13316 is eating
Philosopher -13324 finished eating
Philosopher -13312 finished eating
Philosopher -13320 finished eating
Philosopher -13328 finished eating
Philosopher -13316 finished eating
```