📌 ASSIGNMENT 3

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PRN – 202101050031

Batch – B4

Problem Statement : Implement the synchronization for Dining Philosopher Problem using MPI Synchronization Primitives.

Code :-

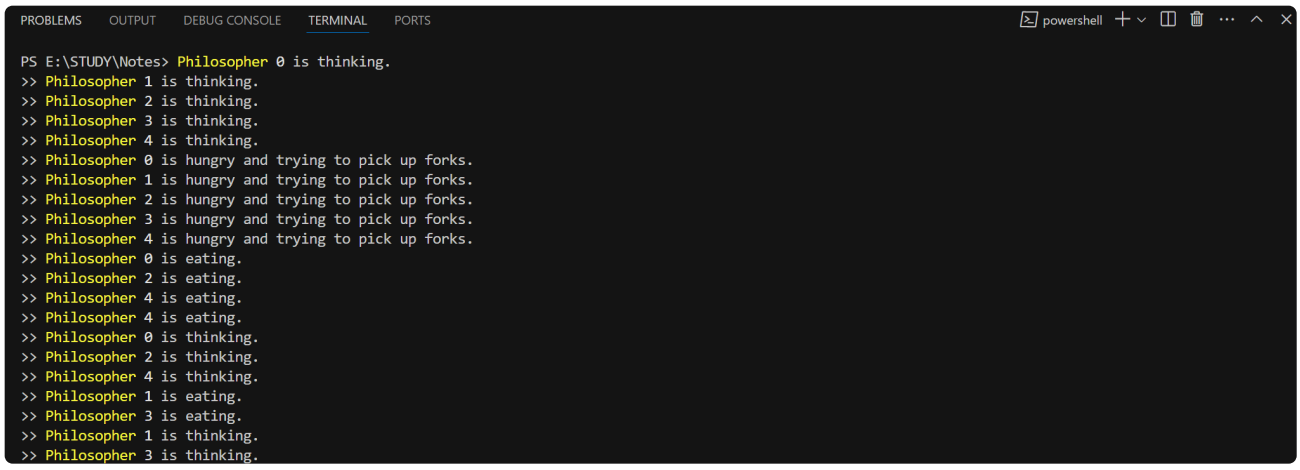
```
// Sarvesh Shingare
// 202101050031

#include <mpi.h>
#include <stdio.h>
#include <stdlib.h>

#define THINKING 0
#define HUNGRY 1
#define EATING 2
#define LEFT (philosopher_id + num_philosophers - 1) %
num_philosophers
#define RIGHT (philosopher_id + 1) % num_philosophers


void philosopher(int philosopher_id, int num_philosophers);

int main(int argc, char *argv[]) {

    int rank, num_procs;
```

```
    MPI_Init(&argc, &argv);

    MPI_Comm_rank(MPI_COMM_WORLD, &rank);

    MPI_Comm_size(MPI_COMM_WORLD, &num_procs);

    int num_philosophers = num_procs;

    if (rank < num_philosophers) {

        philosopher(rank, num_philosophers);

    }
    MPI_Finalize();

    return 0;

}

void philosopher(int philosopher_id, int num_philosophers) {

    int state = THINKING;

    int fork_left = LEFT;

    int fork_right = RIGHT;

    MPI_Status status;

    while (1) {

        // Thinking phase

        printf("Philosopher %d is thinking.\n", philosopher_id);

        // Simulate thinking

        sleep(1);

        // Hungry phase
```

```
        state = HUNGRY;

        printf("Philosopher %d is hungry and trying to pick up
forks.\n", philosopher_id);

        // Pick up the left fork

        MPI_Send(NULL, 0, MPI_INT, fork_left, 0, MPI_COMM_WORLD);

        MPI_Recv(NULL, 0, MPI_INT, fork_left, 0, MPI_COMM_WORLD,
&status);

        // Pick up the right fork

        MPI_Send(NULL, 0, MPI_INT, fork_right, 0, MPI_COMM_WORLD);

        MPI_Recv(NULL, 0, MPI_INT, fork_right, 0, MPI_COMM_WORLD,
&status);

        // Eating phase

        state = EATING;

        printf("Philosopher %d is eating.\n", philosopher_id);

        // Simulate eating

        sleep(1);

        // Put down the left fork

        MPI_Send(NULL, 0, MPI_INT, fork_left, 0, MPI_COMM_WORLD);

        // Put down the right fork

        MPI_Send(NULL, 0, MPI_INT, fork_right, 0, MPI_COMM_WORLD);

        // Transition back to thinking

        state = THINKING;
```

```
        }

    }
```

Output :-


PROBLEMS
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
powershell
PS E:\STUDY\Notes> Philosopher 0 is thinking.
>> Philosopher 1 is thinking.
>> Philosopher 2 is thinking.
>> Philosopher 3 is thinking.
>> Philosopher 4 is thinking.
>> Philosopher 0 is hungry and trying to pick up forks.
>> Philosopher 1 is hungry and trying to pick up forks.
>> Philosopher 2 is hungry and trying to pick up forks.
>> Philosopher 3 is hungry and trying to pick up forks.
>> Philosopher 4 is hungry and trying to pick up forks.
>> Philosopher 0 is eating.
>> Philosopher 2 is eating.
>> Philosopher 4 is eating.
>> Philosopher 4 is eating.
>> Philosopher 0 is thinking.
>> Philosopher 2 is thinking.
>> Philosopher 4 is thinking.
>> Philosopher 1 is eating.
>> Philosopher 3 is eating.
>> Philosopher 1 is thinking.
>> Philosopher 3 is thinking.