LAB 06

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

SOLUTION:

- **CODE:**

```
#include <stdio.h>

#define N 4

int completedPhilo = 0;
int i;

struct Fork {
    int taken;
} ForkAvailable[N];

struct Philosopher {
    int left;
    int right;
} PhilosopherStatus[N];

void goForDinner(int philID) {
    // Case 1: Philosopher has already completed dinner
    if (PhilosopherStatus[philID].left == 10 && PhilosopherStatus[philID].right == 10) {
        printf("Philosopher %d already completed his dinner\n", philID + 1);
    }
    // Case 2: Philosopher has both forks and completes dinner
    else if (PhilosopherStatus[philID].left == 1 && PhilosopherStatus[philID].right == 1) {
        printf("Philosopher %d completed his dinner\n", philID + 1);
        PhilosopherStatus[philID].left = PhilosopherStatus[philID].right = 10;

        int otherFork = philID - 1;
        if (otherFork == -1)
            otherFork = (N - 1);

        ForkAvailable[philID].taken = ForkAvailable[otherFork].taken = 0;
        printf("Philosopher %d released fork %d and fork %d\n", philID + 1, philID + 1,
otherFork + 1);
```

```
    completedPhilo++;
}
// Case 3: Has left fork, trying for right fork
else if (PhilosopherStatus[philID].left == 1 && PhilosopherStatus[philID].right == 0) {
    if (philID == (N - 1)) {
        if (ForkAvailable[philID].taken == 0) {
            ForkAvailable[philID].taken = PhilosopherStatus[philID].right = 1;
            printf("Fork %d taken by philosopher %d\n", philID + 1, philID + 1);
        } else {
            printf("Philosopher %d is waiting for fork %d\n", philID + 1, philID + 1);
        }
    } else {
        int dupPhilID = philID;
        philID -= 1;
        if (philID == -1)
            philID = (N - 1);

        if (ForkAvailable[philID].taken == 0) {
            ForkAvailable[philID].taken = PhilosopherStatus[dupPhilID].right = 1;
            printf("Fork %d taken by philosopher %d\n", philID + 1, dupPhilID + 1);
        } else {
            printf("Philosopher %d is waiting for fork %d\n", dupPhilID + 1, philID + 1);
        }
    }
}
// Case 4: Has not taken any fork yet
else if (PhilosopherStatus[philID].left == 0) {
    if (philID == (N - 1)) {
        if (ForkAvailable[philID - 1].taken == 0) {
            ForkAvailable[philID - 1].taken = PhilosopherStatus[philID].left = 1;
            printf("Fork %d taken by philosopher %d\n", philID, philID + 1);
        } else {
            printf("Philosopher %d is waiting for fork %d\n", philID + 1, philID);
        }
    } else {
        if (ForkAvailable[philID].taken == 0) {
            ForkAvailable[philID].taken = PhilosopherStatus[philID].left = 1;
            printf("Fork %d taken by philosopher %d\n", philID + 1, philID + 1);
        } else {
            printf("Philosopher %d is waiting for fork %d\n", philID + 1, philID + 1);
        }
    }
```

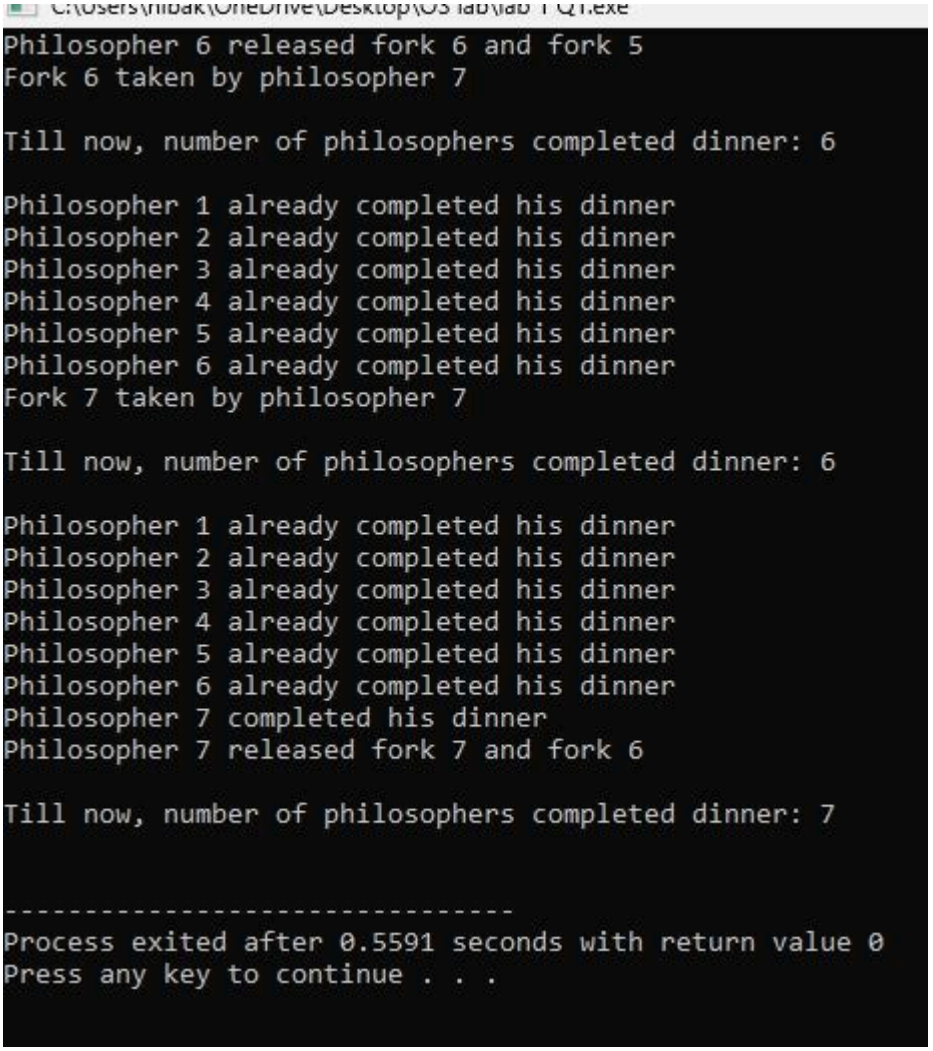
```
    }
}

int main() {
    // Initialization
    for (i = 0; i < N; i++) {
        ForkAvailable[i].taken = 0;
        PhilosopherStatus[i].left = 0;
        PhilosopherStatus[i].right = 0;
    }

    // Simulation loop
    while (completedPhilo < N) {
        for (i = 0; i < N; i++) {
            goForDinner(i);
        }
        printf("\nTill now, number of philosophers completed dinner: %d\n\n", completedPhilo);
    }

    return 0;
```

OUTPUT:


C:\Users\Hiba\OneDrive\Desktop\OS lab\lab 7 Q1.exe
Philosopher 6 released fork 6 and fork 5
Fork 6 taken by philosopher 7
Till now, number of philosophers completed dinner: 6
Philosopher 1 already completed his dinner
Philosopher 2 already completed his dinner
Philosopher 3 already completed his dinner
Philosopher 4 already completed his dinner
Philosopher 5 already completed his dinner
Philosopher 6 already completed his dinner
Fork 7 taken by philosopher 7
Till now, number of philosophers completed dinner: 6
Philosopher 1 already completed his dinner
Philosopher 2 already completed his dinner
Philosopher 3 already completed his dinner
Philosopher 4 already completed his dinner
Philosopher 5 already completed his dinner
Philosopher 6 already completed his dinner
Philosopher 7 completed his dinner
Philosopher 7 released fork 7 and fork 6
Till now, number of philosophers completed dinner: 7

Process exited after 0.5591 seconds with return value 0
Press any key to continue . . .

```
Philosopher 4 already completed his dinner
Philosopher 5 completed his dinner
Philosopher 5 released fork 5 and fork 4
Fork 5 taken by philosopher 6

Till now, number of philosophers completed dinner: 5

Philosopher 1 already completed his dinner
Philosopher 2 already completed his dinner
Philosopher 3 already completed his dinner
Philosopher 4 already completed his dinner
Philosopher 5 already completed his dinner
Fork 6 taken by philosopher 6

Till now, number of philosophers completed dinner: 5

Philosopher 1 already completed his dinner
Philosopher 2 already completed his dinner
Philosopher 3 already completed his dinner
Philosopher 4 already completed his dinner
Philosopher 5 already completed his dinner
Philosopher 6 completed his dinner
Philosopher 6 released fork 6 and fork 5

Till now, number of philosophers completed dinner: 6


--------------------------------
Process exited after 0.6122 seconds with return value 0
Press any key to continue . . .
```

```
Philosopher 1 already completed his dinner
Philosopher 2 already completed his dinner
Philosopher 3 already completed his dinner
Philosopher 4 completed his dinner
Philosopher 4 released fork 4 and fork 3
Fork 4 taken by philosopher 5

Till now, number of philosophers completed dinner: 4

Philosopher 1 already completed his dinner
Philosopher 2 already completed his dinner
Philosopher 3 already completed his dinner
Philosopher 4 already completed his dinner
Fork 5 taken by philosopher 5

Till now, number of philosophers completed dinner: 4

Philosopher 1 already completed his dinner
Philosopher 2 already completed his dinner
Philosopher 3 already completed his dinner
Philosopher 4 already completed his dinner
Philosopher 5 completed his dinner
Philosopher 5 released fork 5 and fork 4

Till now, number of philosophers completed dinner: 5


--------------------------------
Process exited after 0.6883 seconds with return value 0
Press any key to continue . . .
```

```
Till now, number of philosophers completed dinner: 2

Philosopher 1 already completed his dinner
Philosopher 2 already completed his dinner
Philosopher 3 completed his dinner
Philosopher 3 released fork 3 and fork 2
Fork 3 taken by philosopher 4

Till now, number of philosophers completed dinner: 3

Philosopher 1 already completed his dinner
Philosopher 2 already completed his dinner
Philosopher 3 already completed his dinner
Fork 4 taken by philosopher 4

Till now, number of philosophers completed dinner: 3

Philosopher 1 already completed his dinner
Philosopher 2 already completed his dinner
Philosopher 3 already completed his dinner
Philosopher 4 completed his dinner
Philosopher 4 released fork 4 and fork 3

Till now, number of philosophers completed dinner: 4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Process exited after 0.5355 seconds with return value 0
Press any key to continue . . .
```