CENG328 – OPERATING SYSTEMS

Homework 4

Question 1: *The Dining Philosophers Problem* [1]

The Dining Philosophers problem involves a group of philosophers sitting at a round dining table with a bowl of spaghetti in front of each philosopher. The philosophers spend their time alternating between thinking and eating. However, there are only a limited number of forks available for the philosophers to eat with, and each philosopher requires two forks to eat.

The problem arises when all philosophers become hungry at the same time and attempt to pick up the forks next to them simultaneously. This can lead to a deadlock situation where none of the philosophers can make progress, as each philosopher is waiting for the fork held by their neighbor.

Implement a solution to the Dining Philosophers problem using a programming language of **your choice**. Your solution should meet the following requirements:

- Implement a program that simulates the behavior of the dining philosophers.
- Ensure that the solution prevents deadlock and starvation.
- Use appropriate synchronization mechanisms such as mutexes, semaphores, or monitors to coordinate access to the forks.

Test your solution with different numbers of philosophers to verify its correctness and scalability.

Question 2: *The Sleeping-Barber Problem* [2]

A barbershop consists of a **waiting room** with *n* **chairs** and the **barber** room containing the barber chair. If there are no **customers** to be served, the barber goes to sleep. If a customer enters the barbershop and all chairs are occupied, then the customer leaves the shop. If the barber is busy but chairs are available, then the customer sits in one of the free chairs. If the barber is asleep, the customer wakes up the barber.

Implement a program using a programming language of **your choice** to synchronize the barber and the customers.

Please upload your code as compressed file (“yourID_hw4.zip” or “yourID_hw4.tar”).

References:

[1] https://en.wikipedia.org/wiki/Dining_philosophers_problem

[2] https://en.wikipedia.org/wiki/Sleeping_barber_problem