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## COMP303 Operating Systems

### Homework 3 Report

In this homework, we were supposed to implement a deadlock-free solution for sleeping barber problem. At the end of the program, we were asked to calculate the waiting time of each customer. For this reason, I used Pthreads and semaphores to synchronize the events. The basic algorithm for my implementation is as follows:

- At the beginning, the barber is sleeping since there are no customers at the saloon.
- Then, the customers are created and left for barber. According to their arrival time, they arrive at the barber and the first one wakes up the barber.
- When barber is cutting hair, other customers wait for barber to be available and if there are no space in the waiting room, they leave the saloon.

Arrival time and maximum duration for a haircut are calculated with the aid of a function named `rand_wait()` which generates a random value between 0 and a given integer .

The outputs of the code are given bellow:

**Input: barber 11,2,10000,20000,2**

**Output:**

Barber is sleeping

Customer 1 left for barber

Customer 2 left for barber

Customer 3 left for barber

Customer 4 left for barber

Customer 5 left for barber

Customer 4 arrived at barber

Customer 4 wakes up the barber

Customer 4 is waiting for haircut

Customer 4 is having haircut

Customer 4 is waiting for haircut

Customer 5 arrived at barber

Customer 5 wakes up the barber

Customer 5 is waiting for haircut

Customer 6 left for barber

Customer 4 is having haircut

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Waiting time for customer 1: 103000 ms.  
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Waiting time for customer 2: 103000 ms.  
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Waiting time for customer 3: 103000 ms.  
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Customer 8 is having haircut  
Customer 8 leaves since there are no seats  
Customer 9 is having haircut  
Customer 9 leaves since there are no seats  
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Waiting time for customer 4: 129000 ms.  
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Waiting time for customer 5: 129000 ms.  
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Waiting time for customer 6: 129000 ms.  
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Customer 11 is having haircut  
Customer 11 leaves since there are no seats  
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Waiting time for customer 7: 143000 ms.  
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Waiting time for customer 8: 143000 ms.  
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Waiting time for customer 9: 143000 ms.  
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Waiting time for customer 10: 143000 ms.  
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Waiting time for customer 11: 143000 ms.  
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Barber is sleeping

**Input:** barber 7,2,1000,20000,2

**Output:**

Barber is sleeping  
Customer 1 left for barber

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Customer 1 arrived at barber  
Customer 1 wakes up the barber  
Customer 1 is waiting for haircut  
Customer 1 is having haircut  
Customer 1 is waiting for haircut  
Customer 1 is having haircut  
Customer 1 leaves since there are no seats  
Customer 2 left for barber  
Customer 2 arrived at barber  
Customer 2 wakes up the barber  
Customer 2 is waiting for haircut  
Customer 2 is having haircut  
Customer 2 is waiting for haircut  
Customer 2 is having haircut  
Customer 2 leaves since there are no seats  
Customer 3 left for barber  
Customer 3 arrived at barber  
Customer 3 wakes up the barber  
Customer 3 is waiting for haircut  
Customer 3 is having haircut  
Customer 3 is waiting for haircut  
Customer 3 is having haircut  
Customer 3 leaves since there are no seats  
Customer 4 left for barber  
Customer 4 arrived at barber  
Customer 4 wakes up the barber  
Customer 4 is waiting for haircut  
Customer 4 is having haircut  
Customer 4 is waiting for haircut  
Customer 4 is having haircut  
Customer 4 leaves since there are no seats  
Customer 5 left for barber  
Customer 5 arrived at barber  
Customer 5 wakes up the barber  
Customer 5 is waiting for haircut  
Customer 5 is having haircut  
Customer 5 is waiting for haircut  
Customer 5 is having haircut  
Customer 5 leaves since there are no seats

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Waiting time for customer 1: 0 ms.

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Waiting time for customer 2: 0 ms.

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Waiting time for customer 3: 0 ms.

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Waiting time for customer 4: 0 ms.

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Waiting time for customer 5: 0 ms.

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Barber is sleeping