KINGDOM OF SAUDI ARABIA
Ministry of Higher Education
Taibah University
College of Computer Science and Engineering (Girls Section)

المملكة العربية السعودية
وزارة التعليم العالي
جَامِعَة طيبة
كلية علوم و هندسة الحاسب الآلي

CS323 – Operating Systems

Semester I, Fall 2021

Assignment (Group Project) (10 marks)

Stage 1: Form a group.

Form a group of **at most <u>three</u>** students. Register your group on Blackboard. The registration link will be availavle from Monday, Oct 25th to Friday, Oct 29th. Note that only one student is required to register the group members.

Stage 2: Complete the Homework

Questions are divided into two parts. Part I must be completed entirely, while in Part II, you choose <u>one</u> of the two programming questions.

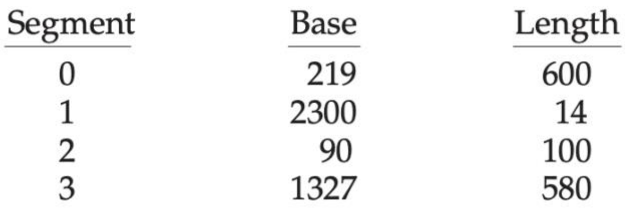
Part I:

Asnswer the following three questions.

1. Compare between the structures and performance (pros and cons) of any two different operating systems. **(2 marks)** [CLO-1.1]
   Note that this question requires some research over the internet. Please provide all sources you have used to complete this question.

2. Briefly explain why switching processes is more costly than switching threads. **(1 mark)** [CLO-1.2]

3. Consider the following segment table: **(1mark)** [CLO-2.1]



Segment	Base	Length
0	219	600
1	2300	14
2	90	100
3	1327	580

What are the physical addresses for the following logical addresses?

a) Segment 0: 430
b) Segment 1: 10
c) Segment 2: 500
d) Segment 3: 400

Part II: [CLO-4.1]

You must choose ONLY one of the following two options. Note that you are required to submit the code in a text file and a screenshot of the program output. (4mark)

Option 1.

The Fibonacci sequence is the series of numbers 0, 1, 1, 2, 3, 5, 8, ...

Formally, it can be expressed as:

fib0 =0
fib1 =1
fibn = fibn−1 + fibn−2

Write a multithreaded program that generates the Fibonacci sequence. This program should work as follows: On the command line, the user will enter the number of Fibonacci numbers that the program is to generate. The program will then create a separate thread that will generate the Fibonacci numbers, placing the sequence in data that can be shared by the threads (an array is probably the most convenient data structure). When the thread finishes execution, the parent thread will output the sequence generated by the child thread. Because the parent thread cannot begin outputting the Fibonacci sequence until the child thread finishes, the parent thread will have to wait for the child thread to finish. Use the techniques described in Section 4.4 to meet this requirement.

Option 2.

The Collatz conjecture concerns what happens when we take any positive integer n and apply the following algorithm:

n = n/2, if n is even
n = 3×n+1, if n is odd

The conjecture states that when this algorithm is continually applied, all positive integers will eventually reach 1. For example, if n = 35, the sequence is
35, 106, 53, 160, 80, 40, 20, 10, 5, 16, 8, 4, 2, 1
Write a C program using the fork() system call that generates this sequence in the child process. The starting number will be provided from the command line. For example, if 8 is passed as a parameter on the command line, the child process will output 8, 4, 2, 1. Because the parent and child processes have their own copies of the data, it will be necessary for the child to output the sequence. Have the parent invoke the wait() call to wait for the child process to complete before exiting the program. Perform necessary error checking to ensure that a positive integer is passed on the command line.

Submission Datelines.

1. **Stage 1 (**Registration of group members) by end of **week 9** (Friday October 29th, 2021)
2. **Stage 2 (**The complete Homework) by end of **week 12** (Friday November 19th, 2021).

No late submission will be accepted

Assesment.

PartI → (4 marks)
PartII → (4 marks)
Peer assessment → (2 marks)

Good luck