**CS550 “Advanced Operating Systems”**

**Homework 1**

***Submission:***

***This is an INDIVIDUAL written assignment.***

***Due by 11:59pm of 9/24/2020***

***Total points 100 - Late penalty: 10% penalty for each day late***

***Please upload your assignment on Blackboard with the following name: CS550\_SectionNumber\_LastName\_FirstName\_HW1.***

***Please do NOT email your assignment to the instructor and/or TA!***

1. **(0 points)** Answer the questions given in Lecture 3, slide 19.
2. **(10 points)** In this problem you are to compare reading a file using a single-threaded file server and a multithreaded server. It takes 15 msec to get a request for work, dispatch it, and do the rest of the necessary processing, assuming that the data needed are in a cache in main memory. If a disk operation is needed, as is the case one-third of the time, an additional 75 msec is required, during which time the thread sleeps.
   1. How many requests/sec can the server handle if it is single threaded?
   2. If it is multithreaded?
3. **(10 points)** Would it make sense to limit the number of threads in a server process?
4. **(10 points)** Consider a process P that requires access to file F which is locally available on the machine where P is currently running. When P moves to another machine, it still requires access to F. If the file-to-machine binding is fixed, how could the systemwide reference to F be implemented?
5. **(10 points)** List all the components of a program state that are shared across threads in a multithreaded process.
6. **(10 points)** Explain the tradeoffs between using multiple processes and using multiple threads.
7. **(10 points)** Does a multi-threading solution always improve performance? Please explain your answer and give reasons.
8. **(10 points)** Explain the tradeoffs between preemptive scheduling and non-preemptive scheduling.
9. **(10 points)** What are two differences between user-level threads and kernel-level threads? Under what circumstances is one type better than the other?
10. **(10 points)** What is the difference between a process and a thread. Which one consumes more resources?
11. **(10 points)** The X protocol suffers from scalability problems. How can these problems  
    be tackled?
12. **(0 points)** Read textbook Chapter 1, 2, and 3.

**Note: We encourage collaboration between you and your classmates. Discuss various approaches and techniques to better understand the questions. However, we do NOT allow copying solutions or code. This is considered as cheating and falls under IIT code of honor. Penalties will be enforced. Please make sure you write your own solutions.**

**GOOD LUCK!**