COSC4437A – Distributed Systems (Winter 2024 Term)

Assignment# 2

Deadline: March 20, 2024

- Compress all the program related files using Zip or other tools.
- Please submit a zip file on Moodle containing your assignment labeled with your full name. Follow this filename format: [StudentFullName]_A2.zip

Weight: 15%

Q1) Write a Python program to download multiple files concurrently using threads. **(15 marks)**

Q2) Write a Python program to implement a multi-threaded quicksort algorithm. **(15 marks)**

Q3) Write a Python program that initially generates 10 files, each containing 25 random words from the English dictionary. Then, use the 10 generated files and extend the program to simultaneously copy those 10 files using threads. Instead of using the built-in shutil.copy() function, implement the copy operation within each thread by opening the source file in binary read mode and the destination file in binary write mode. Print a message once each copy operation is complete. Ensure proper error handling for file operations and thread execution. Finally, provide a comparison of the running time between the concurrent threading approach and the serial programming approach **(30 marks)**

Q4) Implement a bank account system in Python that allows multiple clients (test with at least five) to perform transactions concurrently, ensuring thread safety and data consistency. Clients can perform transactions such as deposits, withdrawals, and transfers. Each client should interact with the bank accounts through remote procedure calls (RPC) over sockets. The server utilizes threading to handle multiple clients concurrently, with each client connection managed in a separate thread. This setup enables multiple clients to interact with the bank accounts simultaneously without blocking each other. Furthermore, ensure that the server handles errors appropriately, including invalid requests and insufficient funds for withdrawals. Finally, ensure that the bank accounts remain consistent after transfers. **(40 marks)**