**1. Answer the following questions in detail.**

1. **Explain in detail, with examples, the concept of Multithreading**

Multithreading, According to GeeksForGeeks, is a java feature that allows concurrent execution of two or more parts of a program for maximum utilization of CPU. Each part of this program is called thread and in a multithread application multiple threads are running simultaneously.

An example of it is a web system which receive access from many clients, using multithread the system can process the access from many clients simultaneously creating a thread for each client request and proccessing them concurrently, if the server were single thread, it would process one request at time creating a delay making the next client waits for the previous request to be completed.

**B. Discuss the type of problems, with examples, where multithreading fails to improve performance**

A type of problem that multithread brings is the race condition, as explained in class, it can occur when two or more threads access a common resource simultaneously and one of the threads modifies the data, because of that the result of a proccess or an operation can vary depending on the time of execution of the thread.

An example of race condition is two threads incrementing the same number, when the first thread checks that number it is 0 and then increments to 1, but when the second thread checked that number it was 0 as well, so the second thread will increment to 1 instead of 2 leading to an error.

A way to avoid this error is using a variable to control if this data is being used or not and making the thread wait for the execution of the other thread to access the data.

**C. Discuss the difference between threads that extend the Thread class and threads that implement the Runnable interface**

In Java we have two ways to use threads in our systems, one is extending the Thread class and the other is implementing the Runnable interface. According to GeeksForGeeks, if we extend the Thread class, our class cannot extend any other class because Java doesn’t support multiple inheritance. But, if we implement the Runnable interface, our class can still extend other base classes.

This decision is very important when we are creating our threads, we have to think if this class will need to extend some other class to choose the correct way to implement a thread function

References:

*GeeksforGeeks (2016). Multithreading in Java - GeeksforGeeks. [online] GeeksforGeeks. Available at: https://www.geeksforgeeks.org/multithreading-in-java/.*

**2. Exercise C**

**Explain in writing the efficiency of your program by comparing it with a single threaded program. Use appropriate references where necessary**

For this exercise using multithreading was more efficient than using a single thread process, because all my data was processed at the same time, reducing the execution time.