CS 161 Culminating Project (Technical Option)

1. **CPU Scheduling Algorithm Simulation**
    - Simulate three (3) CPU scheduling algorithms using purely a Unix shellscript. Select from any group of three algorithms provided below.
        - FCFC, Non-Preemptive SJF, Round Robin
        - Non-Preemptive Priority, Preemptive SJF, Preemptive Priority
    - Input of process name, arrival time, CPU burst, and priority should come from a comma-delimited file. An example of the contents of this file is provided below.

```
Proc1,0,25,5
P2,1,3,1
Process 3,0,5,2
```

    - In the example above, process P2 arrived at 1 ms, has a CPU burst of 3 ms, and a process priority of 1.
    - The user is asked for the name of the process information input file. The user is also required to input the time quantum if Round Robin is selected for simulation.
    - A Gantt Chart of the simulation is displayed at the end of the simulation
    - Individual waiting and turnaround times, as well as averages for the two metrics should also be shown.

2. **Disk Scheduling Algorithm Simulation**
    - Simulate three (3) disk scheduling algorithms using purely a Unix shellscript. Select from any group of three algorithms provided below.
        - FCFS, SSTF, and C-SCAN
        - SCAN, LOOK, C-LOOK
    - The program asks the user for the name of the input file that will contain the details of the simulation. The format of the input file is as follows.

        Algorithm abbreviation:cylinder1,cynlinder2,…,cylinder

        Algorithm abbreviation is specified by the 4-character keywords FCFS, SSTF, SCAN, CSCN, LOOK, or CLUK. Cylinder1 up to cyclinderN specifies the series of cylinder/track numbers, as needed by the CPU. The number of cylinders per specified algorithm may vary. The ':' symbol separates the algorithm from the cylinder/track sequence, while the ',' symbol separates the individual cylinder/track numbers. A sample input file is presented below.

```
CSCN:20,2,50,5,62,15,8,33
SSTF:65,8,10,40
FCFS:11,28,5,6,39,1
SSTF:52,2,39,9,12
```

    - The output of the program is a visual representation of the simulation of each algorithm) similar to the diagram below.
    - The output should also include the following statistics for each algorithm.
        - Average seek time
        - Average response time (wait time before request is serviced)

3. **Disk Block Size Experiment and Analysis**
    - Determine the performance impact of changing the block size used to store files in secondary memory.
    - Perform the experiment with various block size values (probably ten or more) enough to establish or deduce data patterns.
    - Experiment using three groups of file sizes: small (KB), medium (MB), and large (>0.5GB).
    - Take note of read and write performance speeds.
    - Perform an extensive analysis of the performance as you vary the block sizes. The analysis part must include *but should not be limited* to your answers to the research questions found below.
    - Visualization of analysis and results are always helpful. Statistical or quantitative analysis definitely contributes to increasing the chances of a higher grade for the project.
    - Research questions:
        - What pattern emerges as the block size is increased?
        - Is there an optimal block size for all types of files regardless of size?
        - If there is no optimal block size applicable to all file sizes, what is optimal for small files? For medium-sized files? For large files?
        - Is the search of optimal block size (or sizes) dependent on the type of storage used (e.g. hard disk vs. SSD)?
        - Assuming the same hardware is utilized, is the operating system a factor on read/write performance speeds for the different block and file sizes used?

Additional Notes:

- The group may choose from any of the three options presented above. Additionally, for options 1 and 2, the group must choose which group of three algorithms will be simulated.
- Group size: maximum of three (3) members
- Project output
    - Options 1 or 2: Source code to be submitted via Moodle assignment (Turnitin-enabled)
    - Option 3: A4 paper size (soft copy via Moodle)
- The group is *required* to submit the *printed and signed* Certificate of Authorship (Group)
- Project Deadline: Friday, 18 May 2018