

## **CS 3220-AM,BM: Operating Systems**

### **Assignment 1**

Date Assigned: Oct 27<sup>th</sup>, 2021

Date Due: Nov 2<sup>nd</sup>, 2021

(Total Score: 52 points)

(Questions: 2)

#### **Instructions:**

Labels of all figures and tables are mentioned below the figures and tables respectively. Show all your working where required. Provide all numerical results with two digits of precision only.

**Q 1.** Multiple jobs can run in parallel and finish faster than if they had run sequentially. Suppose that 2 jobs, each of which needs 5 minutes of CPU time, start simultaneously. How long will the last one take to complete if they run sequentially? How long if they run in parallel? Assume 30% I/O wait. **(20 points)**

**Q 2.** For this question, consider each part as in continuation with the previous one. Suppose that a computer has 64 GB of Memory, with the Operating System taking up 1 GB, and each User Process taking up 512 MB.

- a) How many User Processes can simultaneously run in the computer? **(4 points)**
- b) If the I/O wait for each User Process is 35%, calculate CPU Utilization and CPU Waste. **(8 points)**
- c) If 32 GB of Memory is now added to the computer, how many User Processes can now simultaneously run? **(4 points)**
- d) Calculate the new CPU Utilization and CPU Waste. **(8 points)**
- e) How many User Processes are simultaneously running in the computer defined in Part (c), if at an instant of time CPU Waste is 20%? **(4 points)**
- f) What would be the maximum I/O wait that can be tolerated for each User Process, in the computer defined in Part (c), if at an instant of time, 50 User Processes are simultaneously running, and the goal is 40% CPU Utilization? **(4 points)**