**Assignment 3**

**CIS355** – Spring Term 2018

**Point Value**: 100 points

**Assignment Due Date**: **In class Tuesday, March 1, 2018**

**Submission Instruction**

Please write your answers to those questions on a Microsoft Word document. The name of the file should be HW3\_YourLastname\_YourFirstname.docx. Please submit the file .docx on Schoology by 11:59pm and a hard copy of the file to the instructor in class on the due date.

**Short answers**

1. **Please answer the following questions given the following scenario.**

**Assume that the three processes arrived in order:**

**Processes CPU Burst Time**

P1 17

P2 6

P3 8

1. Please draw the Gantt chart if FCFS scheduling is used. **(5 points)**
   1. ****
2. Please calculate the average waiting time and average completion time under FCFS. You MUST show the calculation procedure. **(5 points)**
   1. Average Waiting time: (0+17+23)/3 = 13.333
   2. Average Completion Time: (17+23+31)/3 = 23.667
3. Please draw the Gantt chart if Round Robin is used. **(5 points)**
   1. ****
4. Please calculate the average waiting time and completion time under RR with q = 3. You MUST show the calculation procedure**. (5 points)**
   1. Average Waiting time: ((30-17)+(15-6)+(23-8)) = (13+9+15)/3 = 12.333
   2. Average Completion Time: (30+15+23)/3 = 22.667
5. Between the two CPU scheduling strategies, which one is better? Why? **(5 points)**
   1. It depends. With Round Robin, there is less starvation unless there are a lot of processes. Then again, First come first serve completes faster and each process gets full system attention, unless there are long running processes. But in this instance Round Robin is was better as it had more efficient waiting times and completion times.
6. **Please answer the following questions given the following scenario.**

Assume that the three processes arrived in order at time 0:

**Processes CPU Burst Time**

P1 10

P2 5

P3 7

P4 3

1. If Shortest-Job-First is used, please draw the Gantt chart. **(5 points)**
   1. ****
2. Please calculate the average waiting time and average completion time under SJF**. (5 points)**
   1. Average waiting time: (0+3+8+15)/4 = 6.5
   2. Average Completion time: (3+8+15+25)/4 = 12.75
3. **Please answer the following questions given the following scenario.**

Assume that the three processes arrived at different time:

**Processes Arrival Time CPU Burst Time**

P1 0 16

P2 2 8

P3 3 7

P4 4 4

1. If the Shortest-Remaining-Time-First scheduling is used, please draw the Gantt chart. **(10 points)**
   1. ****
2. Please calculate the average waiting time and the average turnaround time **(10 points)**
   1. Average waiting time: ((35-16)+(21-8)+(14-7)+(8-4) = (19+13+7+4)/4 = 10.75
   2. Average Completion time: (35+21+14+8)/4 = 19.5
3. Please describe what is Multi-level Feedback Queue scheduling? **(10 points)?** 
   1. The algorithm allows a process to move between queues. It is complex, as each queue has its own scheduling algorithm. Foreground is Round Robin (priorities increase exponentially) and Background is First Come First Serve. It adjusts each jobs priority depending on: job starts in highest priority queue, if timeout expires drop one level, if timeout doesn't expire push level.
4. Please describe what is lottery scheduling? **(10 points)**
   1. Processes are each assigned some number of lottery tickets, and the scheduler draws a random ticket to select the next process after each time slot. CPU time is proportional to number of tickets given to each job. Each job gets one ticket.
5. Please explain which one of the following CPU scheduling strategies have the optimal/best average response time? **(5 points)**
   1. **FCFS**
   2. **RR**
   3. **SRJF**
      1. Shortest Job First has the optimal/best average response time because it will always give the minimum average waiting time as it pre-emptive.
   4. **Priority**
   5. **Lottery**

1. **Please explain the following terminologies:**
   1. **CPU Utilization (2 points)**
      1. Show the computers usage of processing resources, its the sum of work handled by the Central Processing Unit It can be used to gauge system performance.
   2. **Turnaround time (2 points)** 
      1. The amount of time a process takes from submission to completion.
   3. **Waiting time (2 points)**
      1. the amount of time a process has been waiting in the ready queue.
   4. **Response time (2 points)**
      1. amount of time from when a request was submitted until the first response is produced
   5. **Throughput (2 points)**
      1. The total amount of work completed per time unit
2. **Assuming zero-cost context-switching time, is RR always better than FCFS? Please explain your answer? (10 points)**
   1. It depends because with Round Robin starvation is an issue but with zero-cost context-switch it significantly decreases starvation. As with FCFS zero-cost context-switch wouldn’t make a difference in the completion time. Thus Round Robin in majority of cases depending on the situation would be better as it is more efficient with less waiting and completion time and less starvation.