CMP 426/697 Fall 2019 Homework 4 **(Due Date: Friday October 25, 2019)**

- For question 1, CMP 426 students should do parts (a) - (f) and may do part (g) for extra credit.
- For question 1, CMP 697 students should do parts (a) - (g).
- For question 2, CMP 426 students and CMP 697 students should answer all parts.

You can type up the answers and submit on Blackboard as a word or pdf file or hand-write them and submit on Blackboard a clear image of them (.jpg or .pdf).

(Question 1). For each part, you will be given a scheduler and a list of processes, with their arrival time and burst time. You should:

   i) draw a Gantt Chart showing the order in which the jobs will be run by the CPU and for how long (7 points each)

   ii) compute the average turnaround time (7 points each)

   iii) compute the average response time (7 points each)

   iv) compute the average waiting time (7 points each)

a) Scheduler: First-in-first-out (FIFO)

Process	Arrival Time	Burst Time
P1	0 ms	8 ms
P2	4 ms	4 ms
P3	10 ms	1 ms

b) Scheduler: First-in-first-out (FIFO)

Process	Arrival Time	Burst Time
P1	0 ms	20 ms
P2	10 ms	50 ms
P3	30 ms	10 ms

c) Scheduler: Non preemptive Shortest Job First(SJF)

Process	Arrival Time	Burst Time
P1	0 ms	20 ms
P2	0 ms	30 ms
P3	10 ms	10 ms
P4	30 ms	40 ms

d) Preemptive Shortest Job First(Shortest-remaining-time-first)

Process	Arrival Time	Burst Time
P1	0 ms	20 ms
P2	0 ms	30 ms
P3	10 ms	10 ms
P4	30 ms	40 ms

e) Priority Scheduling (smaller number implies higher priority)

Process	Priority	Burst Time	Arrival Time
P1	40	20	0
P2	30	25	25
P3	30	25	30
P4	35	15	60
P5	5	10	100
P6	10	10	105

f) Round Robin with uses a 10 ms time slice

Process	Arrival Time	Burst Time
P1	0 ms	30 ms
P2	10 ms	40 ms
P3	20 ms	10 ms

g) (for CMP 697, but CMP 426 students may do for extra credit) Scheduler: Multi-Level Feedback Queue (MLFQ) which uses 10ms time slices and 3 queues. Jobs are boosted back to highest priority every 30ms.

Process	Arrival Time	Burst Time
P1	0 ms	50 ms
P2	10 ms	10 ms
P3	20 ms	50 ms

(Question 2). Consider the following set of processes. With the length of the CPU Burst given in milliseconds:

Process	Burst Time	Priority	Arrival Time
P1	2	2	0
P2	1	1	0
P3	8	4	0
P4	4	2	0
P5	5	3	0

The processes are assumed to have arrived in the order P1, P2, P3, P4 P5, all at time 0.

i)   draw a Gantt Charts that illustrates the execution of these processes using the following scheduling algorithms: FCFS, SJF and nonpreemptive priority(a larger number implies a higher priority) and RR (quantum = 2). (5 points each)

ii)   Compute the average turnaround time for each scheduling algorithm from part i) (5 points each)

iii)   Compute the average response time for each scheduling algorithm from part i) (5 points each)

iv)   Compute the average waiting time for each scheduling algorithm from part i) (5 points each)

v)   Which algorithms results in the minimum average waiting time? (5 points)

vi)   Which algorithms results in the minimum average response time? (5 points)

vii)   Which algorithms results in the minimum average turnaround time? (5 points)