ENCS3390- Operating Systems

Problem Set #2

October 2021

1. Suppose that the following processes arrived in order. Each process will run for the amount of time listed, using nonpreemptive scheduling, answer the questions below:

Process	Burst Time
P1	4
P2	7
P3	12
P4	10

a. Using the FCFS scheduling algorithm, draw the Gantt chart for the schedule and calculate the average turnaround time and the average waiting time for these processes.
b. Using the SJF scheduling algorithm, draw the Gantt chart for the schedule and calculate the average turnaround time and the average waiting time for these processes.

2. Assume the processes shown in the table below arrived at time 0 in order. Moreover, the table below shows the CPU burst time in milliseconds and the priority of each process. Larger priority number implies higher priority. Answer the following questions:

Process	Burst Time	Priority
P1	8	2
P2	5	4
P3	10	3
P4	6	3
P5	1	1

a. Draw four Gantt charts that illustrate the execution of these processes using the following scheduling algorithms (FCFS, SJF, nonpremeptive priority, RR with time quantum = 4)
b. Calculate the turnaround time of each process for each of these four algorithms.
c. Calculate the waiting time of each process for each of these four algorithms.
d. Which of these four algorithms results in the minimum average time (over all processes)?

3. Given the processes shown in the following table along with their arrival time, CPU burst time, and priority. Smaller priority number implies higher priority. Answer the following questions:

Process	Arrival Time	Burst Time	Priority
P1	1	10	4
P2	2	8	2
P3	3	4	5
P4	4	9	1
P5	5	2	3

a. Draw two Gantt charts that illustrate the execution of these processes using preemptive SJF and preemptive priority scheduling.
b. Calculate the turnaround time of each process for each of these two algorithms
c. Calculate the waiting time of each process for each of these two algorithms
d. Calculate the average waiting time and the average turnaround time of all processes for each of these two algorithms.

4. What are the five scheduling criteria? Which ones need to be maximized, and which ones need to be minimized?
5. What is the difference between preemptive and nonpreemptive scheduling?
6. What is the difference between I/O-bound programs and CPU-bound programs?

7. What advantage is there in having different time-quantum sizes at different levels of a multilevel queueing system?
8. Which of the scheduling algorithms we studied could result in starvation? How the starvation problem is resolved?
9. Explain the differences in how much the following scheduling algorithms discriminate in favor of short processes:

a. FCFS b. RR c. multilevel feedback queues

10. Distinguish between PCS and SCS scheduling.
11. Distinguish between soft real time and hard real time systems.
12. How the relation between the CPU burst time and the time quantum for RR scheduling should be? Explain why.
13. How the relation between time quantum for RR scheduling algorithm, and the context switch time should be? Explain why.
14. What is the job of dispatcher, and what is the dispatch time/latency?