Operating Systems (COMP2006)

CURTIN UNIVERSITY
Computing Discipline
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Worksheet 4

1. Describe the differences among short-term, medium-term, and long-term scheduling.

2. Why is it important for the scheduler to distinguish I/O-bound program from CPU-bound program?

3. Discuss how optimizing response time may reduce the CPU utilization.

4. Explain why shortest job first and priority-based scheduling algorithms could result in starvation.

5. Consider a variant of the RR scheduling algorithm where the entries in the ready queue are pointers to the PCBs.

   a) What would be the effect of putting two pointers to the same process in the ready queue?
   b) What would be the major advantages and disadvantages of this scheme?
   c) How would you modify the basic RR algorithm to achieve the same effect without the duplicate pointers?

6. Consider a system running ten I/O-bound tasks and one CPU-bound task. Assume that the I/O-bound tasks issue an I/O operation once for every millisecond of CPU computing and that each I/O operation takes10 milliseconds to complete. Also assume that the context switching overhead is 0.1 millisecond and that all processes are long-running tasks. What is the CPU utilization for a round-robin scheduler when:

   - The time quantum is 1 millisecond
   - The time quantum is 10 milliseconds

7. Consider the following set of processes, with the length of CPU burst time given in milliseconds:

Process	Burst time	Priority
P_1	10	3
P_2	1	1
P_3	2	3
P_4	1	4

P_5	5	2

The processes are assumed to have arrived in the order P_1, P_2, P_3, P_4, and P_5, all at time 0.

a. Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, a nonpreemptive priority (a smaller priority number implies a higher priority), and RR (quantum = 1) scheduling
b. What is the turnaround time of each process for each of the scheduling algorithms in part a?
c. What is the waiting time of each process for each of the algorithms in **part a**?
d. Which of the schedules in part a result in the minimal average waiting time (over all processes)?

8. Suppose that the following processes arrive for execution at the times indicated. Each process will run the listed amount of time. In answering the questions, use nonpreemptive scheduling and base all decisions on the information you have at the time the decision must be made.

Process	Arrival time	Burst time
P_1	0.0	8
P_2	0.4	4
P_3	1.0	1

a. What is the average turnaround time for these processes with the FCFS scheduling algorithm?

b. What is the average turnaround time for these processes with SJF scheduling algorithm?

c. The SJF algorithm is supposed to improve performance, but notice that we chose to run process P_1 at time 0 because we did not know that two shorter processes would arrive soon. Compute what the average turnaround time will be if the CPU is left idle for the first 1 unit and then SJF scheduling is used. Remember that processes P_1 and P_2 are waiting during this idle time, so their waiting time may increase. This algorithm could be known as future-knowledge scheduling.