CSE 430 Homework 4

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Question 6.16

Consider the following set of processes, with the length of the CPU burst...The processes are assumed to have arrived in the order P_1, P_2, P_3, P_4, P_5, all at time 0.

(a) Draw 4 Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: FCFS, SJF, nonpreemptive priority (a larger priority number implies a higher priority), and RR (quantum = 2).
FCFS:

P_1	P_2	P_3	P_4	P_5

0   2   3 11 15 20

SJF:

P_2	P_1	P_4	P_5	P_3

0   1   3   7 12 20

Nonpreemptive:

P_3	P_5	P_1	P_4	P_2

0   8 13 15 19 20

RR:

P_1	P_2	P_3	P_4	P_5	P_3	P_4	P_5	P_3	P_5	P_3

0   2   3   5   7   9   11 13 15 17 18 20

(b) What is the turnaround time of each process for each of the scheduling algorithms in part a?

Process	FCFS	SJF	Nonpreemptive	RR
P1	2	3	15	2
P2	3	1	20	3
P3	11	20	8	20
P4	15	7	19	13
P5	20	12	13	18
Average	10.2	8.6	15	10.3

(c) What is the waiting time of each process for each of these scheduling algorithms?

Process	FCFS	SJF	Nonpreemptive	RR
P1	0	1	13	0
P2	2	0	19	2
P3	3	12	0	12
P4	11	3	15	9
P5	15	7	8	13
Average	6.2	4.6	11	7.2

(d) Which of the algorithms results in the minimum average waiting time (over all processes)? As seen in the tables above, the minimum average waiting time is the shortest-job-first (SJF) algorithm.

Question 6.19

Which of the following scheduling algorithms could result in starvation?

(a) First-come, first-served No, it is not possible.

(b) Shortest job first Yes, it is possible.

(c) Round robin No, it is not possible.

(d) Priority Yes, it is possible.

Question 6.20

Consider a variant of the RR scheduling algorithm in which 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? The process would run twice as many times.

(b) What would be two major advantages and two disadvantages of this scheme?

- Advantages
    (i) The user can prioritize more important processes.
    (ii) Starvation is prevented for processes of less priority.
    (iii) The scheduling algorithm does not have to be changed.
- Disadvantages
    (i) Context switching has a larger effect.
    (ii) Removing processes from running queue is harder (need to search through whole list).

(c) How would you modify the basic RR algorithm to achieve the same effect without the duplicate pointers? Achieving the same effect without duplicate pointers can happen if we allow the quantum time of each process to be changed on a per-process basis.

Question 6.24

Explain the differences in how much the following scheduling algorithms discriminate in favor of short processes:

(a) FCFS If long processes come before short processes, then the short processes will have to wait longer before they can run.

(b) RR Since each process has equal priority, the shorter processes will finish first.

(c) Multilevel feedback queues If a process take too much CPU time, it is moved to a lower-priority queue. Therefore, shorter processes are favored.