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 Priority:

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 Priority	RR
P_1	2	3	15	2
P_2	3	1	20	3
P_3	11	20	8	20
P_4	15	7	19	13
P_5	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 Priority	RR
P_1	0	1	13	0
P_2	2	0	19	2
P_3	3	12	0	12
P_4	11	3	15	9
P_5	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? That process will have a higher priority (i.e. run twice as often).

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

- Advantages
  (i) The user does not have to change the scheduling algorithm.
  (ii) For processes of lower priority, the algoritm prevents starvation.
- Disadvantages
  (i) The user must search through the entire list of processes in order to remove a process.
  (ii) There is more time taken in context switches.

(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. Therefore, FCFS discriminates against shorter processes.

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

(c) Multilevel feedback queues If a process take too much CPU time, it is moved to a lower-priority queue (i.e. longer processes). Therefore, multilevel feedback queues discriminate for shorter processes.