操作系统原理 October 8, 2011

Homework 4

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习题一

1. 8:00, JOB1 到达, 开始运行
   8:20, JOB2 到达, 等待运行
   8:25, JOB3 到达, 等待运行
   8:30, JOB4 到达, 等待运行
   8:35, JOB5 到达, 等待运行
   8:40, JOB6 到达, 等待运行
   9:00, JOB1 运行结束. 因为 JOB5 作业时间最短, 开始运行
   9:05, JOB5 运行结束, JOB6 运行
   9:15, JOB6 运行结束, JOB3 运行
   9:35, JOB3 运行结束, JOB4 运行
   10:00, JOB4 运行结束, JOB2 运行
   10:35, JOB2 运行结束.

2. 如表所示

作业	提交时间	开始时刻	完成时刻	周转时间 (min)
JOB1	8:00	8:00	9:00	60
JOB2	8:20	10:00	10:35	135
JOB3	8:25	9:15	9:35	70
JOB4	8:30	9:35	10:00	90
JOB5	8:35	9:00	9:05	30
JOB6	8:40	9:05	9:15	35

   平均周转时间: $\frac{60+135+70+90+30+35}{6} = 70\text{min}$

习题三

1. 如表所示

时间 (min)	操作
0	E 运行
10	E 结束, D 运行
18	D 结束, C 运行
24	C 结束, B 运行
28	B 结束, A 运行
30	A 结束

   平均周转时间: $\frac{30+28+24+18+10}{5} = 22\text{min}$

2. 如表所示

时间 (min)	操作
0	A 运行
2	A 结束, B 运行
4	C 运行
6	D 运行
8	E 运行
10	B 运行
12	B 结束, C 运行
14	D 运行
16	E 运行
18	C 运行
20	C 结束, D 运行
22	E 运行
24	D 运行
26	D 结束, E 运行
30	E 结束

平均周转时间: $\frac{2+12+20+26+30}{5} = 18\text{min}$

3. 如表所示

时间 (min)	操作
0	C 运行
6	C 结束, D 运行
14	D 结束, B 运行
18	B 结束, E 运行
28	E 结束, A 运行
30	A 结束

平均周转时间: $\frac{30+18+6+14+28}{5} = 19.2\text{min}$

4. 如表所示

时间 (min)	操作
0	A 运行
2	A 结束, B 运行
6	B 结束, C 运行
12	C 结束, D 运行
20	D 结束, E 运行
30	E 结束

平均周转时间: $\frac{2+6+12+20+30}{5} = 18\text{min}$

5.1

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

I/O-bound programs consume a relatively small part of computing resources but a large amount of I/O operations, by which way they occupy much time as well. CPU resources are designed to perform computing, so principles for CPU scheduling is to maximize CPU usage. I/O-bound programs usually do not use up all their CPU quantum, thus make it possible to share CPU quantums with CPU-bound programs to improve the overall performance.

5.4

Consider the following set of processes, with the length of CPU burst 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, P_5 all at time 0.

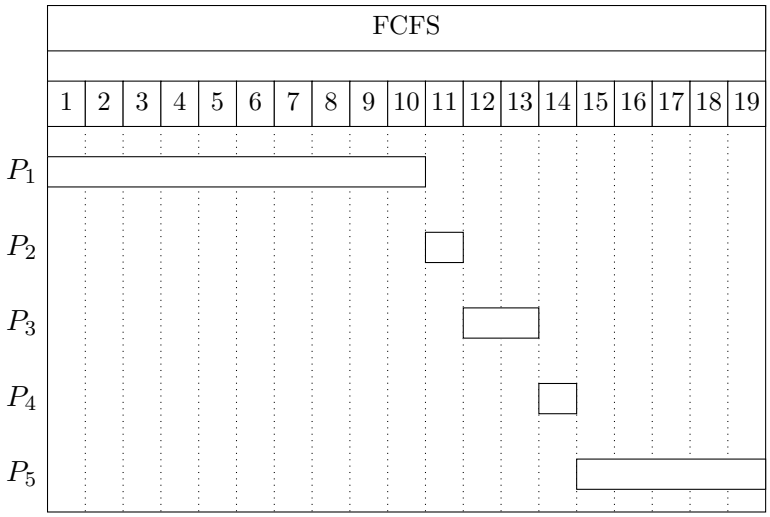
a. Draw four Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: FCFS, SJF, nonpreemptive priority(a smaller priority number implies a higher priority), and RR(quantum= 1).

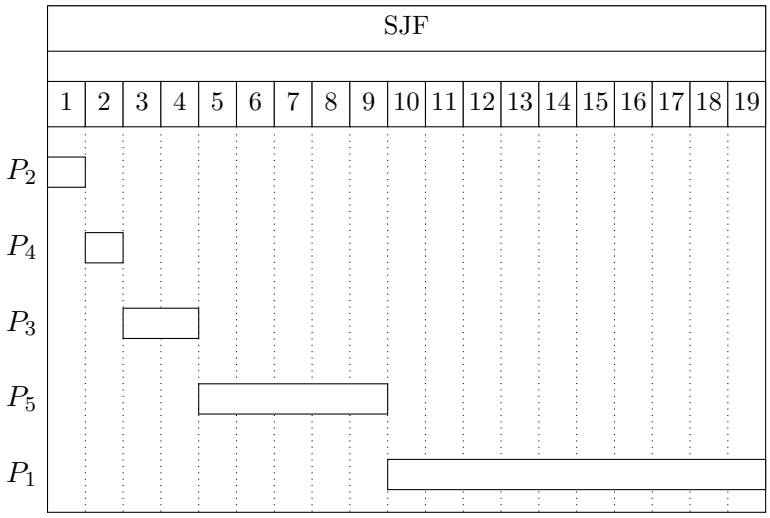
b. What is the turnaround time of each process for each of the scheduling algorithms in part a?

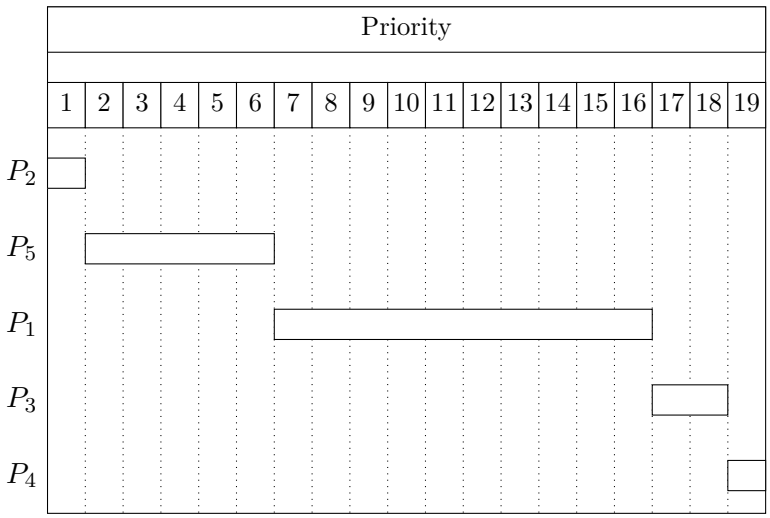
c. What is the waiting time of each process for each of the scheduling algorithms in part a?

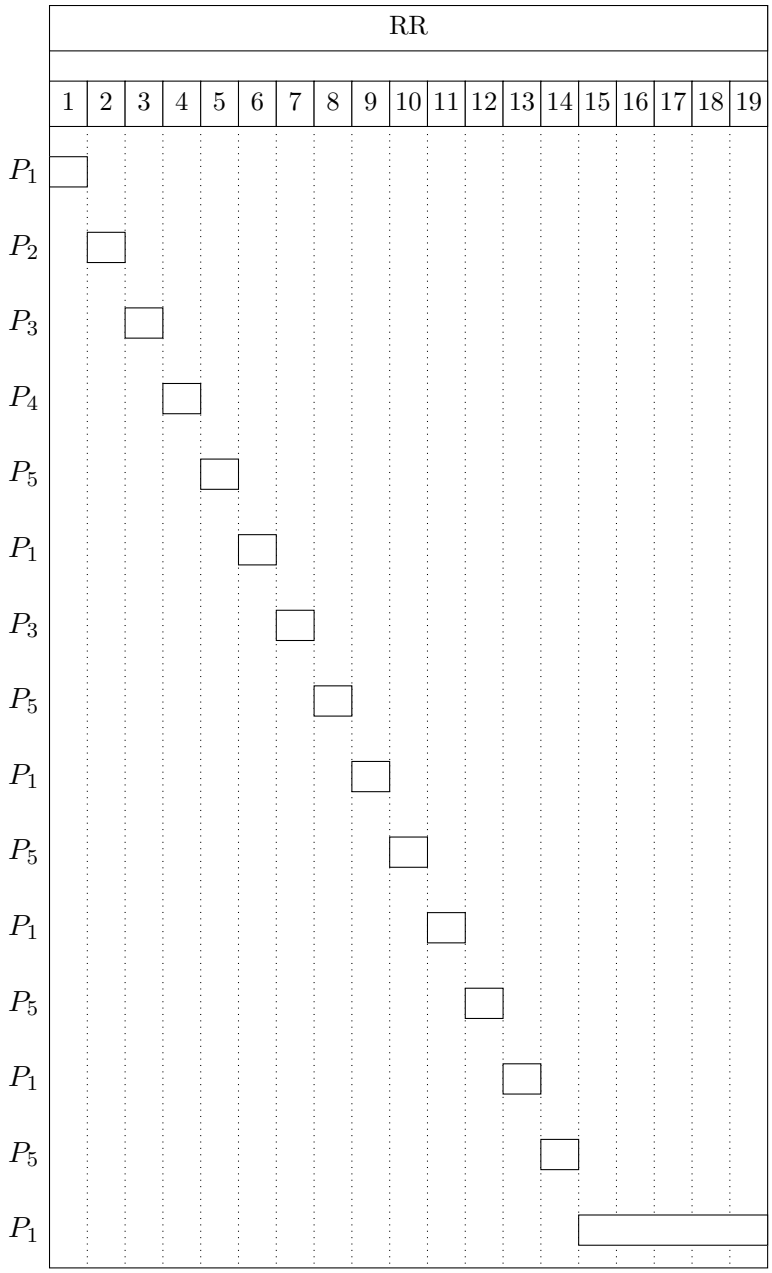
d. Which of the algorithms in part a results in the minimum average waiting time (over all processes)?

a.


FCFS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
P_1
P_2
P_3
P_4
P_5


SJF
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
P_2
P_4
P_3
P_5
P_1


Priority
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
P_2
P_5
P_1
P_3
P_4



b. See Table 1.

c. See Table 2.

d. Shortest job first.

Table 1: Turnaround time

Turnaround time	FCFS	SJF	Priority	RR
P_1	10	19	16	19
P_2	11	1	1	2
P_3	13	4	18	7
P_4	14	2	19	4
P_5	19	9	6	14

Table 2: Waiting time

Waiting time	FCFS	SJF	Priority	RR
P_1	0	9	6	9
P_2	10	0	0	1
P_3	11	2	16	5
P_4	13	1	18	3
P_5	14	4	1	9

5.5

Which of the following scheduling algorithms could result in starvation?

a. First-come, first served

b. Shortest job first

c. Round robin

d. Priority

b. Shortest Job First and d. Priority.