操作系统作业 4

1. Consider the deadlock situation that can occur in the diningphilosophers problem when the philosophers obtain the chopsticks one at a time. Discuss how the four necessary conditions for deadlock hold in this setting. Describe a deadlock-free solution, and discuss which necessary conditions are eliminated in your solution.

答：若所有五个哲学家同时饥饿并拿起左边的筷子，所有筷子的信号量现在均为 0，但当每个哲学家试图拿起右边的筷子时，他会被永远推迟，这样就、就形成了死锁。满足死锁的四个条件：

①互斥：一支筷子在同一时间不能被两个哲学家同时使用；

②持有和等待：每个哲学家此时已经拥有一支筷子（其左边的筷子），并等待获取其右边的哲学家所拥有的筷子；

③没有抢占：筷子在被所拥有的哲学家使用完毕之前，不能被其他哲学家强行夺走；

④循环等待：形成一种头尾相接的循环等待筷子（即资源）关系；

解决方案：使用非对称解决方案，即单号的哲学家先拿起左边的筷子，接着右边的筷子；而双号的哲学家先拿起右边的筷子，接着左边的筷子，消除了持有和等待条件和循环等待条件。

2. Consider the exponential average formula used to predict the length of the next CPU burst. What are the implications of assigning the following values to the parameters used by the algorithm?
   a. $\alpha = 0$ and $\tau_0 = 100$ milliseconds
   b. $\alpha = 0.99$ and $\tau_0 = 10$ milliseconds

答：公式为：$\tau_{n+1} = \alpha t_n + (1-\alpha)\tau_n$；

a. 当 $\alpha = 0$，$\tau_{n+1} = \tau_n$，最近历史没有影响（当前情形为瞬态）；

b. 当 $\alpha = 0.99$，$\tau_{n+1} = 0.99t_n + 0.01\tau_n$，几乎只有最近 CPU 执行才重要，过去历史几乎没有什么影响。

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

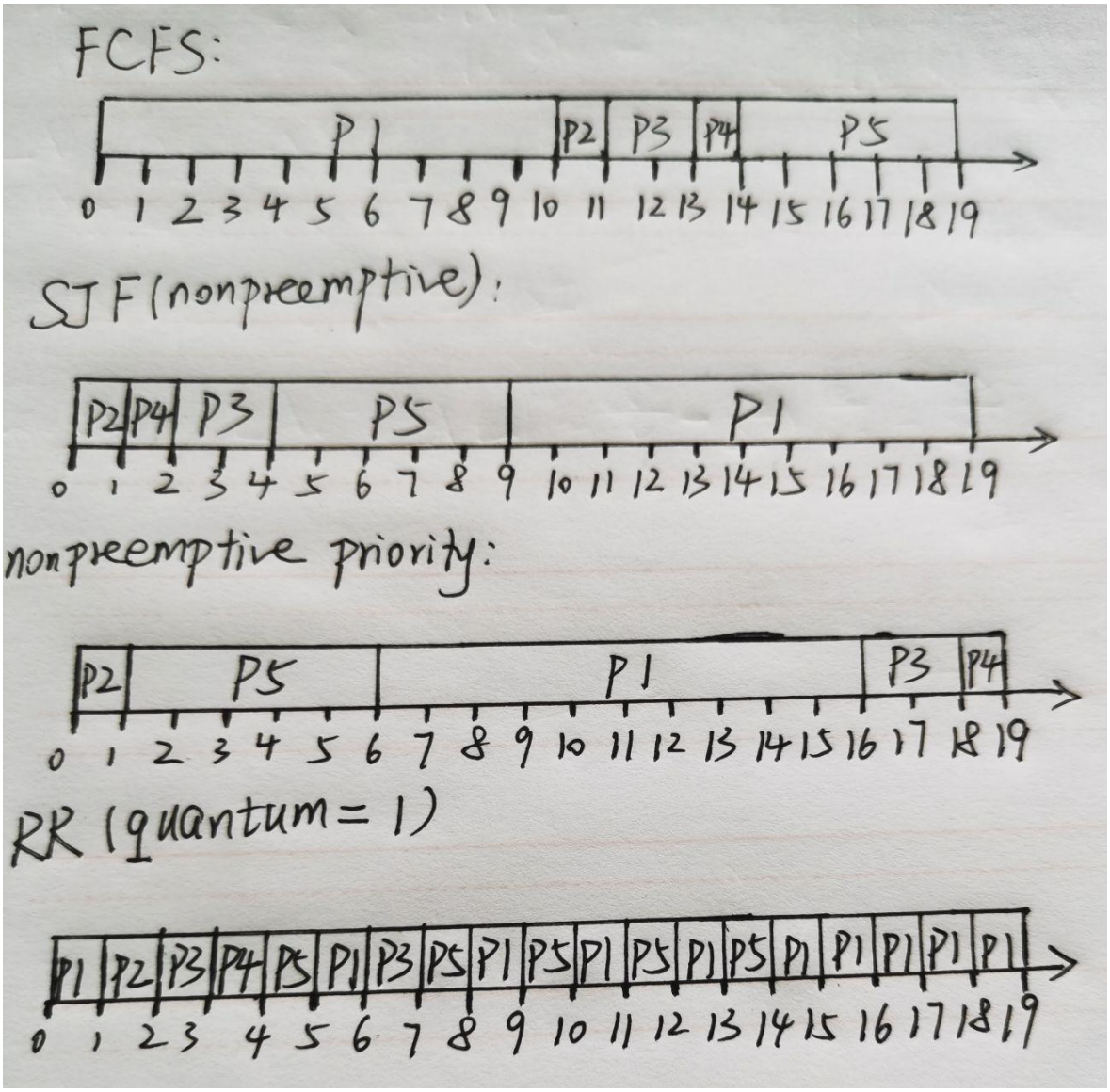
Process	Burst Time	Priority
P_1	10	3
P_2	1	1
P_3	2	3
P_4	1	4
P_5	5	2

The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all at time 0.

a. Draw four Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: FCFS, SJF (nonpreemptive), 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 these scheduling algorithms?
d. Which of the algorithms results in the minimum average waiting time (over all processes)?

答：

a.



b.

	P1	P2	P3	P4	P5
FCFS	10	11	13	14	19
SJF	19	1	4	2	9
Non-preemptive priority	16	1	18	19	6

RR	19	2	7	4	14

c.

	P1	P2	P3	P4	P5	average
FCFS	0	10	11	13	14	9.6
SJF	9	0	2	1	4	3.2
Non-preemptive priority	6	0	16	18	1	8.2
RR	9	1	5	3	9	5.4

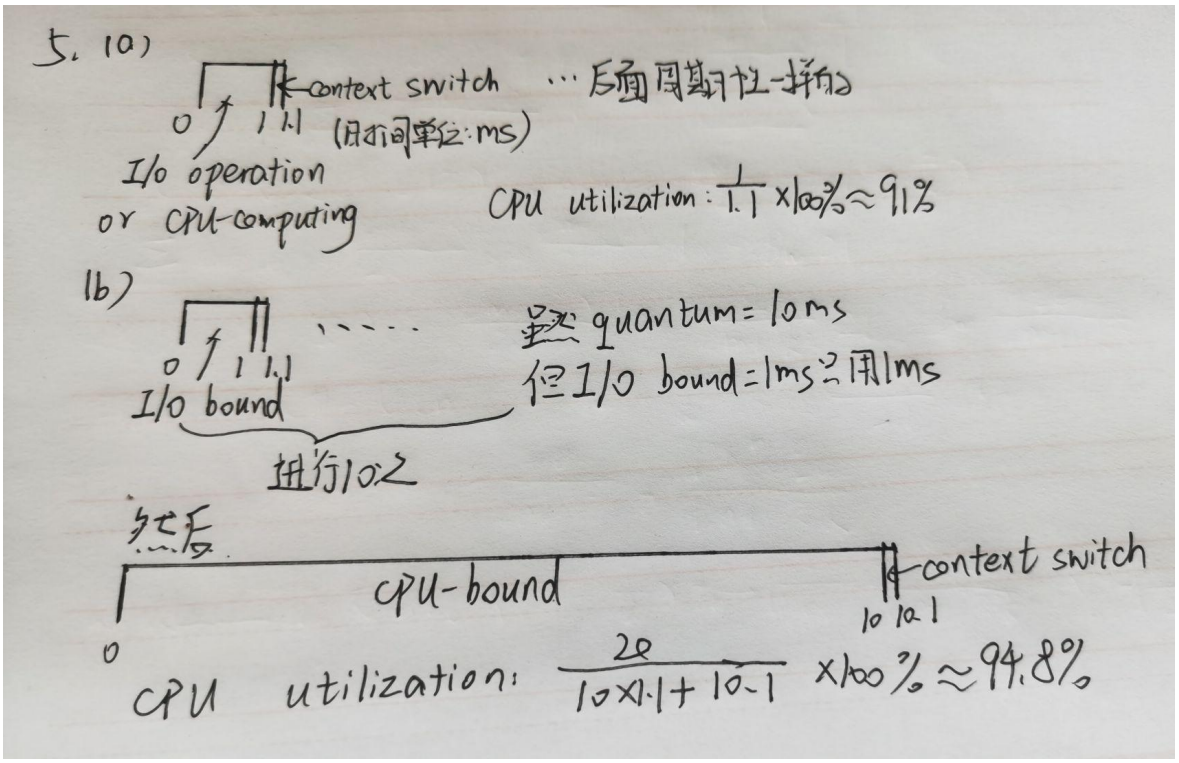
d. 由 c 中的表可看出 SJF 的平均等待时间最小。

4. Which of the following scheduling algorithms could result in starvation?
   a. First-come, first-served
   b. Shortest job first
   c. Round robin
   d. Priority

答：b,d

5. 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 takes 10 milliseconds to complete. Also assume that the context-switching overhead is 0.1millisecond and that all processes are long-running tasks. Describe is the CPU utilization for a round-robin scheduler when:
   a. The time quantum is 1 millisecond
   b. The time quantum is 10 milliseconds

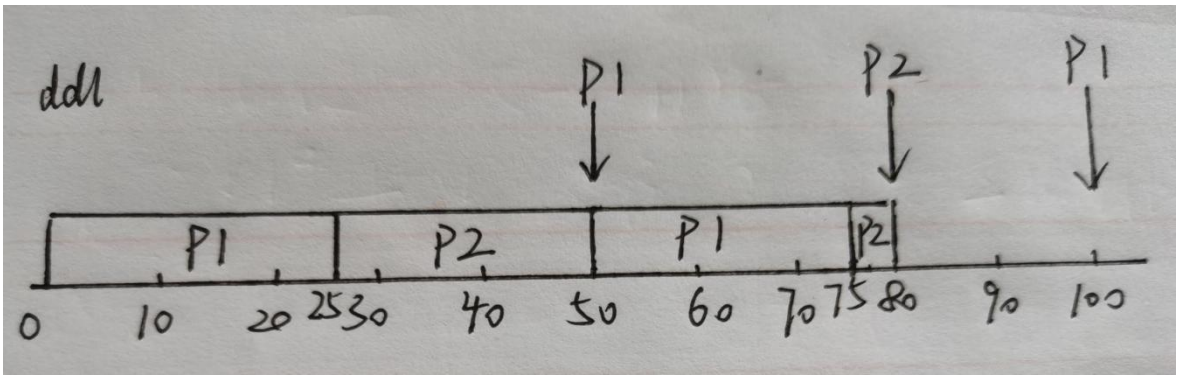
答：



6. Give an example to illustrate under what circumstances rate-monotonic scheduling is inferior to earliest-deadline-first scheduling in meeting the deadlines associated with processes?

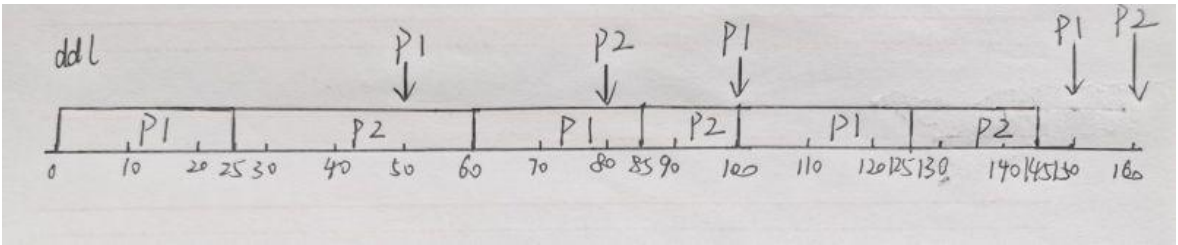
答：如：P1 = 50 , t1 = 25; P2 = 80 , t2 = 35;

单调速率调度：



P2在deadline之前并未完成！！！

最早截止日期优先调度：


ddl
P1
P2
P1
P1
P2
P1
P2
P1
P2
0 10 20 25 30 40 50 60 70 80 85 90 100 110 120 125 130 140 145 150 160