北京邮电大学 2022-2023 学年第一学期《操作系统》期中试题

2022. 10. 27

一. ESSAY QUESTIONS (24 points)

1. Define the states of a process and draw the complete state transition diagram for an operating system.
2. Explain the priority inversion in real time system and give a solution to this problem.
3. A deadlocked state is an unsafe state, and an unsafe state may lead to a deadlock state. Explain the reason why an unsafe state usually will not lead to a deadlock.
4. Explain the (Hoare) Signal and Wait semantics for the monitor implementations.

二. (26 points)Consider the following set of processes, with the length of the CPU burst given in milliseconds:

Process	Priority	Burst Time
P1	3	10
P2	1	2
P3	3	1
P4	4	3
P5	2	5

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

(1) Draw Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: FCFS, preemptive priority (a smaller priority number implies a higher priority).
(2) What is the turnaround time of each process for each of the scheduling algorithms in part (1)?
(3) What is the waiting time of each process for each of the scheduling algorithms in part (1)?

三、(30 points)In a kindergarten, the teacher distributed the fruits to children. All fruit would be placed on a large plate. The boys liked eating apples and the girls liked oranges. At the beginning, the plate was empty, which can contain 5 apples or oranges altogether. The teacher would put either an apple or two oranges into the plate each time. When she put an apple in the plate, a boy would get and eat it; and when she put two oranges in, a girl would get the two oranges and eat them.

(1) Please design appropriate semaphore-based processes to describe the behaviors of the teacher and boys and girls .
(3) Make modifications for the processes if a girl will get three oranges **instead of** two each time.
(2) Can deadlock occur in your processes? Describe a scenario of deadlock if it can occur, or explain why deadlock cannot happen.

四、(20 points) Consider the following snapshot of a system, answer the following questions according to the Banker's algorithm.

	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	0	1	2	0	0	1	2	2	2	0	0
P1	1	0	0	0	1	7	5	0				
P2	1	3	5	4	2	3	5	6				
P3	0	6	3	2	0	6	5	2				
P4	0	0	1	4	0	6	5	6				

(1) Calculate matrix NEED.
(2) Is the system in safe state? Why?