

《操作系统》期中考试试题

考 试 注 意 事 项	一、学生参加考试须带学生证或学院证明，未带者不准进入考场。学生必须按照监考教师指定座位就坐。									
	二、书本、参考资料、书包等物品一律放到考场指定位置。									
	三、学生不得另行携带、使用稿纸，要遵守《北京邮电大学考场规则》，有考场违纪或作弊行为者，按相应规定严肃处理。									
	四、学生必须将答题内容做在试题答卷上，做在试题及草稿纸上一律无效									
	课程	操作系统			考试时间		2021 年 11 月 12 日			
题号	一	二	三	四	五	六	七	八	总分	
满分	10	20	20	30	20					
得分										
阅卷教师										

一、Select the best answer for each blank (1 point * 10)

- Contents of interrupt vector are _____.
A. begin address of sub-programs
B. begin addresses of interrupt handling programs
C. the address of begin addresses of interrupt handling programs
D. begin address of handling programs
- Deadlock avoidance is implemented by _____.
A. providing sufficient resources
B. controlling proper sequence of processes progress
C. destroying one of the 4 necessary and sufficient conditions
D. preventing system enter into unsafe state
- In multiprogramming system, in order to guarantee the integrality of shared variable, processes should enter their critical section mutual _____.
Critical section refers to _____.
A. a buffer
B. a data segment
C. synchronous mechanism
D. a code segment

- If the time quantum for Round-Robin scheduling is set to be very large (approaching infinity), then it becomes equivalent to _____.
A. FCFS
B. SJF
C. priority scheduling
D. multilevel queue scheduling
- In the following, _____ is not one of the conditions which should be satisfied for a good solution to critical section problem.
A. mutual exclusion
B. progress
C. bounded waiting
D. fairness
- In a(n) _____ temporary queue, the sender must always block until the recipient receives the message.
A. zero capacity
B. variable capacity
C. bounded capacity
D. unbounded capacity
- _____ requires that the operating system be given in advance additional information concerning which resources a process will request and use during its lifetime. With this additional knowledge, it can decide for each request whether or not the process should wait.
A. Deadlock avoidance
B. Deadlock prevention
C. Deadlock detection
D. Recovery from Deadlock
- () Which of the following migrations is impossible for process-scheduling ?
A. running → ready
B. running → waiting
C. waiting → running
D. running → terminate
- The definition of _____ is the number of processes that are completed per time unit.
A. CPU utilization
B. response time
C. turnaround time
D. throughput
- Both Linux and Solaris 10 use the _____ method for the correspondence between user threads and kernel threads.
A. One-to-One
B. Many-to-One
C. One-to-Many
D. Many-to-Many

二、Essay question (20 points)

- (5 points) Please explain the principles of the multiple feedback queue

scheduling algorithm.

- (5 points) Some atomic machine instructions support mutual exclusion effectively. Define a procedure to make exclusion with instruction compare_and_swap for two boolean variables.
- (5 points) Describe the priority inversion problem in the realtime system with an example.
- (5 points) Explain the implementation of conditional variables with "signal and continue" (Per Brinch Hansen).

三、(20 points) Here is a table of processes and their associated arrival and running times.

process	Arrival time	CPU burst time
P1	0	2
P2	1	6
P3	3	5
P4	5	4
P5	6	3

Show the scheduling order for these processes under 3 policies: First Come First Serve (FCFS), Shortest-Remaining-Time-First (SRTF), Round-Robin (RR) with timeslice quantum = 2, by filling in the Gantt chart with ID of the process currently running in each time quantum.

Assume that context switch overhead is 0 and that new RR processes are added to the head of the queue and new FCFS processes are added to the tail of the queue.

- Draw a Gantt chart illustrating the execution of these processes with different scheduling algorithms.
- Calculate the average waiting time and the average turnaround time for different scheduling algorithms.

四、(30 points) Bridge Crossing Problem. An old bridge which crosses a river from east to west. Since it is a narrow bridge, cars can only go in one direction at a time and no more than 4 cars are allowed on the bridge.

- Cars arriving at the bridge while the bridge is empty will immediately cross the bridge.
- Cars arriving at the bridge while there are cars on the bridge traveling in the

different direction will wait until the bridge becomes empty.

- Cars arriving at the bridge while there are less than 4 cars already on the bridge in the same direction will immediately cross the bridge.

(1) Write a program to coordinate the westward and eastward cars to pass through the bridge.

(2) Explain whether deadlock or starvation can occur in your design of the synchronization for the problem.

五、(20 points) (1) 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	2	2	0	0	4	2	1	1	2	0
P1	2	0	0	0	2	5	5	0				
P2	1	0	3	3	5	6	5	5				
P3	2	3	4	3	4	3	4	5				
P4	0	4	3	2	0	5	4	2				

Calculate matrix NEED. Is the system in safe state? Why?

(2) If a request from process P2 arrives for resources (1, 0, 0, 0), can the requested be granted immediately? If yes, then show the sequence of successful process executions in tabular form; if no, then you do not need to show any further details.