座位号 专业 学院 学号 姓名 密 封 线 （密封线内不答题）

诚信应考,考试作弊将带来严重后果！

华南理工大学期末考试

《操作系统》试卷 B

注意事项：1. 考前请将密封线内填写清楚；

2. 所有答案请答在答题纸上；

3. 考试形式：闭卷；

4. 本试卷共 三 大题，满分 100 分， 考试时间 120 分钟。

题 号	一	二	三			总分
得 分						
评卷人						

一、单项选择题（20pts total, 2pts each）

1. (　　) What is the main advantage of multiprogramming?
   A. Efficient use of the CPU　　C. Efficient use of disk
   B. Fast response　　D. Short Turnaround time

2. (　　) Mutex is used for mutual exclusion problem. For 2 parallel processes, the value of mutex cannot be_____.
   A. 1　　B. 0　　C. -1　　D. -2

3. (　　) It is provable that _____ scheduling algorithm is optimal if all the jobs are available simultaneously.
   A. First Come First Served (FCFS)　　C. Shortest Remaining Time Next (SRTN)
   B. Shortest Job First (SJF)　　D. Priority

4. (　　) Suppose that the operating system is running a non-preemptive scheduler and that process p is currently running. A context switch can occur _____.
   A. when p terminates or blocks　　B. when another process unblocks
   C. when another process enters　　D. when the time quantum is exhausted

5. (　　) Which of the following statements is true?
   A. The use of a TLB for a paging memory system eliminates the need for keeping a page table in memory.
   B. External fragmentation can be prevented by frequent use of compaction, but the cost would be too high for most systems.
   C. The first fit allocation algorithm often creates small holes that can't be used.
   D. More page frames always have fewer page faults

6. (　　) The file-reference count is used for _____.
   A. counting number of bytes read from the file
   B. counting number of open files

C. counting number of links pointing to a file
D. counting number of process accessing a file

7. As for Unix system, the attributes of file are stored in _____.
A. file B. directory C. i-node D. directory entry

8. ( ) "Device independence" means _____.
A. that devices are accessed dependent of their model and types of physical device.
B. systems that have one set of calls for writing on a file and the console (terminal) exhibit device independence.
C. that files and devices are accessed the same way, independent of their physical nature.
D. none of the above

9. ( ) How much cylinder skew is needed for a 10000-rpm disk with a track-to-track seek time of 800us? Assuming that the disk has 300 sectors of 512 bytes each on each track.
A. 24 B. 48 C. 20 D. 40

10. ( ) In a system, all resource requests must be made in numerical order. This is a method for preventing deadlock to attack the _____ condition.
A. mutual exclusion C. no preemption
B. hold and wait D. circular wait

二、简答题(20pts total, 5pts each)

1. (5 pts) What is the biggest advantage of implementing threads in user space? What is the biggest disadvantage?

2. (5pts) In a virtual memory system, does a TLB miss imply a disk operation will follow? Why or why not?

3. (5 pts) How does MS-DOS implement random access to files?

4. (5pts) A system has ***p*** processes each needing a maximum of ***m*** resources and a total of ***r*** resources available. What condition must hold to make the system deadlock free?

三、综合题(60pts total)

1. (10pts) Men and women share a bathroom. But when a women is in the bathroom, other women may enter, but no men, and vice versa. Please use semaphores to solve this problem.

2. (10 pts) Suppose two processes enter the ready queue with the following properties:
   (1) Process 1 has a total of 8 units of work to perform, but after every 2 units of work, it must perform 1 unit of I/O (so the minimum completion time of this process is 12 units). Assume that there is no work to be done following the last I/O operation.
   (2) Process 2 has a total of 20 units of work to perform. This process arrives just behind P1.

   Show the resulting schedule for the Shortest-Job-First (preemptive) and the Round-Robin algorithms. Assume a time slice of 4 units for RR. What is the completion time of each process under each algorithm?

3. (10pts) Consider the following system snapshot using the data structures in the Banker's algorithm, with resources R_0, R_1, and R_2, and processes P_0 to P_4:

Process	Max				Allocation				Available			
	R_0	R_1	R_2	R_3	R_0	R_1	R_2	R_3	R_0	R_1	R_2	R_3
P_0	7	0	2	1	4	0	0	1	3	2	2	1
P_1	1	6	5	0	1	1	0	0				
P_2	3	3	4	6	1	0	4	5				
P_3	1	5	6	2	0	4	2	1				
P_4	2	4	3	2	0	3	1	2				

Using Banker's algorithm answer the following questions.

(1) What are the contents of the **Need** matrix?

(2) Is the system in a safe state? Why?

(3) If a request from process P_2 arrives for additional resources of (0,2,0,0), can the Banker's algorithm grant the request immediately? Why? Show the new system state and other criteria.

4. (10 pts) Consider a demand paging system with three frames. And the given page reference sequence is A, D, B, E, A, E, F, G, A, G, E, F. How many page faults does each of the LRU, FIFO, and Optimal page replacement algorithms generate? (**Show your work step-by-step. A simple answer will receive no credit.**)

5. (10 pts) A certain file system uses 2-KB disk blocks. And the i-nodes contain 8 direct entries, one single and one double indirect entry each. The size of each entry is 4 B. Answer the following questions:
   (1) What is the maximum file size of this file system?
   (2) How much disk space a 128-MB file actually occupied? (including all the direct and indirect index blocks)

6. (10 pts) Disk requests come in to the disk driver for cylinders 10, 22, 20, 2, 40, 6, and 38, in that order. Assume that initially the disk read/write arm is at cylinder 20.
   (1) Using Shortest Seek First (SSF) algorithm, give the order in which the cylinders are serviced and the total cylinders the arm moves.
   (2) Using elevator algorithm, give the order in which the cylinders are serviced and the total cylinders the arm moves (initially moving upward).