操作系统期末考试样卷

一、单项选择题（30pts total, 2pts each）

1. (　　) The operating system is *not* responsible for the following activities in connection with process management? _____ .
   A. Suspending and resuming processes
   B. Providing mechanism for process synchronization
   C. Handling deadlock
   D. Keeping track of free memory

2. (　　) Which of the following process schedule algorithm can lead to starvation? _____ .
   A. FCFS　　B. Round Robin　　C. SJF　　D. Guaranteed Scheduling

3. (　　) _____ register contains the size of a process.
   A. Base　　B. Limit　　C. Index　　D. Stack pointer

4. (　　) Deadlock can arise if four conditions hold simultaneously. Which of the following is not one of these four conditions? _____.
   A. mutual exclusion　　B. busy waiting　　C. hold and wait
   D. no preemption　　E. circular wait

5. (　　) Let graph represent “resource allocation graph”. Which statement is wrong? _____.
   A. If graph contains cycle, and there is only one instance per resource type, then there is deadlock.
   B. If graph contains cycle, and there can be several instances per resource type, then there may or may not have deadlock
   C. If graph contains no cycle, then no deadlock
   D. If no deadlock, then graph contains no cycle

6. (　　) The ability of a computer system to switch execution among several jobs that are in memory at the same time is called _____.
   A. time slicing　　C. multiprocessing
   B. multiprogramming　　D. multitasking

7. (　　) In the readers-writers problem, processes *p* and *q* are allowed to simultaneously access the shared resource if and only if _____.
   A. *p* and *q* are both reading.　　C. Either *p* or *q* or both is reading
   B. *p* and *q* are both writing　　D. Either *p* or *q* or both is writing

8. (　　) Suppose that a machine has 48-bit virtual address and 32-bit physical

address. If pages are 4KB, how many entries are in the page table if it has only a single level?

A. 2^{27} B. 2^{16} C. 2^{24} D. 2^{36}

9. "Computing the track, sector, and head for a disk read" is done in which layers?

A. Interrupt handlers C. Device-independent OS software

B. Device drivers D. User-level I/O software

10. ( ) If there are no name collisions in a file system, the easiest method is to use_____.

A. single-level directory system C. single-level or two-level directory system

B. two-level directory system D. hierarchical directory system

11. ( ) A computer has four page frames. The time of loading, time of last access, and the R and M bits for each page are as shown below (the times are in clock ticks):

Page	Loaded	Last ref.	R	M
0	126	280	1	0
1	230	265	0	1
2	140	270	0	0
3	110	285	1	1

Which page will NRU, LRU and second chance replace respectively?

A. 2, 2,1 B. 2,3,1 C. 2,1,2 D. 3,1,2

12. ( ) A computer has six tape drives, with *n* processes competing for them. Each process may need two drives. For which values of n is the system deadlock free?

A. 8 B. 7 C. 6 D. 5

13. ( ) The beginning of a free space bitmap looks like this after the disk partition is first formatted: 1000 0000 0000 (the first block is used by the root directory). The system always searches for free blocks starting at the lowest-numbered block, so after writing file A, which uses six blocks, the bitmap looks like this: 1111 1110 0000 0000. Show the bitmap after the following additional action: file B is written, using five blocks.

A. 1000 0001 1111 0000 C. 1111 1111 1111 1100

B. 1111 1111 1111 0000 D. 1111 1110 0000 1100

14. ( ) In which of the four I/O software layers is "Writing commands to the device registers" is done? _____

A. Interrupt handlers C. Device-independent OS software

B. Device drivers D. User

15. ( ) How much cylinder skew is needed for a 7200-rpm disk with a track-to-track seek time of 1msec? Assuming that the disk has 200 sectors of 512 bytes each on each track. _____

A. 12 B. 24 C. 48 D. 40

二、简答题(15pts total, 5pts each)

1. (5pts) List at least three key differences between user-level threads and kernel-level threads.
2. (5pts) In a virtual memory system, does a TLB miss imply a disk operation will follow? Why or why not?
3. (5pts) How many disk operations are needed to open the file /usr/student/lab/test.doc? Why? (Assume that nothing else along the path is in memory. Also assume that all directories fit in one disk block.)

三、综合题(55pts total)

1. (10pts) A tunnel, which is very narrow, allows only one passenger to pass once. Please using semaphores to implement the following situations:

（1） (4pts) Passengers go through the tunnel one by one alternately(交替地) from two directions.

（2） (6pts) The passengers at one direction must pass the tunnel continuously. Another direction's visitors can start to go through tunnel when no passengers want to pass the tunnel from the opposite direction.

2. (8pts) Five batch jobs A through E, arrive at a computer center at almost the same time. They have estimated running times of 10, 6, 2, 4, and 8 minutes. Their (externally determined) priorities are 3, 5, 2, 1, and 4, respectively, with 5 being the highest priority. For each of the following scheduling algorithms, determine the mean process turnaround time. Ignore process switching overhead.

Job	Arrival time	Execution time	Priority
A	0	10	3
B	0	6	5
C	0	2	2
D	0	4	1
E	0	8	4

(1) Round robin

(2) Priority scheduling

(3) First-come, first-served (run order 10, 6, 2, 4, 8).

(4) Shortest job first

3. (10pts) A system has five processes and four allocatable resources. The current allocation and additional needs are as follows:

Process	Allocation				Need				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P1	0	0	3	2	0	0	1	2	1	6	2	2
P2	1	0	0	0	1	7	5	0				
P3	1	3	5	4	2	3	5	6				
P4	0	3	3	2	0	6	5	2				
P5	0	0	1	4	0	6	5	6				

Please answer the following questions:

(1) Is this state safe? Why?

(2) The request (1,2,2,2) of P3 can be granted or not? Why?

4. (10 pts) Given a **36-bit** processor with **4 active processes** being executed concurrently. Please answer the following questions. Show all the addresses of your answer in **hex number**. If a translation cannot be found, enter page fault.

(1) Assume an inverted page table (IPT) is used by the OS. The IPT is shown below (Only Valid, PID and VPN are shown). Each page size is 4MB. What "virtual address" of which "process" maps to the physical address "0x363055B"?

(2) Now we switch to use an **index-based linear page table**, how much memory (in KB) is required for **just process A**? Assume each page table entry (PTE) contains a valid and dirty bit.

V	PID	VPN
1	9	0x0DF0
1	A	0x3630
1	C	0x1B70
1	C	0x37C1
0	F	0x1F04
1	A	0x3640
1	9	0x1FFF
1	A	0x23A4
1	9	0x3004
1	A	0x0D7C
1	C	0x0DF0
0	B	0x1F04
1	A	0x0DF0
1	9	0x020D
1	A	0x31A2
1	C	0x07C1

5. (8 pts) A UNIX file system has 1-KB blocks and 32bit disk addresses. What is the maximum file size if i-nodes contain 10 direct entries, and one single, double, and triple indirect entry each?

6. (9pts) Suppose that a disk drive has 300 cylinders, numbered 0 to 299. The drive is currently serving a request at cylinder 143. The queue of pending requests, in FIFO order, is

   86, 147, 291, 18, 95, 151, 12, 175, 30

   Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests, for each of the following disk-scheduling algorithms?

   (1) First-Come First-Served (FCFS)
   (2) Shortest Seek First (SSF)
   (3) Elevator Algorithm (Assume that initially the arm is moving towards cylinder 0)