國立交通大學 98 學年度碩士班考試入學試題

科目：作業系統(1005)　　考試日期:98年3月15日 第 3 節

系所班別：資訊系所跨組聯招　　組別：資訊聯招　　第 1 頁,共 7 頁

【不可使用計算機】＊作答前請先核對試題、答案卷(試卷)與准考證之所組別與考科是否相符！！

請使用答案卡作答

一、單一選擇題，共十二題，每一題答對給五分，未答得零分，答錯倒扣兩分。
（單一選擇題總分若為負分，仍將與複選題分數加總。）

1. Which one of the following is an *incorrect* transition of process states?
   (a) running→waiting
   (b) waiting→running
   (c) ready→running
   (d) waiting→ready
   (e) running→terminated

2. Which one of the following process-scheduling algorithms is prone to poor I/O utilization?
   (a) First-Come First-Serve
   (b) Shortest-Job First
   (c) Round-Robin
   (d) Multilevel Feedback Queue
   (e) none of the above

3. Suppose that an I/O-bound process enters a time-sharing system. The system is scheduled by multilevel-feedback-queue algorithm. After a long period of time, the process will:
   (a) have a small time quantum and a low priority.
   (b) have a large time quantum and a high priority.
   (c) have a small time quantum and a high priority.
   (d) have a large time quantum and a low priority.
   (e) have an invariant time quantum and an invariant priority.

4. Which of the following statement is true?
   (a) Spinlocks are not appropriate for multi-core systems.
   (b) Critical sections cannot be preserved by disabling kernel preemption.
   (c) More than one process can be active within a monitor.
   (d) Wait and signal of a counting semaphore cannot be implemented with multiple binary semaphores.
   (e) All of the above are incorrect.

5. Consider a system with five processes P0~P4 and four resource type A, B, C and D. Suppose at time T0, the resource allocation state is:

	Allocation				MAX				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P_0	2	1	1	0	3	1	3	3	1	1	2	0
P_1	0	1	1	2	3	2	1	2				
P_2	1	0	0	3	1	0	4	3				
P_3	0	1	2	0	2	1	2	0				
P_4	1	0	0	2	1	1	0	2				

Which one is correct?

(a) <P4, P3, P2, P0, P1> is a safe sequence.

(b) <P4, P3, P1, P0, P2> is a safe sequence.

(c) <P2, P1, P0, P3, P4> is a safe sequence.

(d) <P3, P4, P2, P1, P0> is a safe sequence.

(e) There is no safe sequence.

6. Following the above question, which description is correct?

(a) If a request from process P0 arrives for (1,0,2,0), the request can be granted immediately.

(b) If a request from process P1 arrives for (0,1,0,0), the request can be granted immediately.

(c) If the available resources at T0 become (1, 1, 1, 0), there is a safe sequence.

(d) If the available resources at T0 become (1, 1, 0, 2), there is a safe sequence.

(e) None of the above is correct.

7. Which of the following statement on the Unix mmap() system call is incorrect ?

(a) mmap() can support memory-mapped I/O.

(b) mmap() can map physical RAM to virtual memory.

(c) mmap() can be used for Interprocess communication.

(d) mmap() can implement demand paging.

(e) none of the above

8. On the operating-system examples of virtual memory implementation, Windows-NT maintains two parameters: working-set-maximum and working-set-minimum for each process and Solaris-2 kernel maintains the list of free pages with the size parameter of lotsfree, desfree, and minfree (lotsfree > desfree > minfree). Please answer which of the following is correct?

(a) For Windows-NT, if a page fault occurs for a process that is below its working-set maximum, the process must select a page for replacement.

(b) If the free memory falls below the designated threshold in the Windows-NT, the virtual

memory manger will add more pages to the processes with pages fewer than working-set maximum.

(c) When the number of free pages falls below lotsfree in Solaris 2, the pageout process starts up.

(d) The pageout process of Solairs 2 is similar to the second-chance algorithm and scans all pages in memory periodically at the same scan rate.

(e) none of the above.

9. In a paging system with three-level page tables, suppose that the hit ratio is 90% and it takes 20 nanoseconds to search the TLB (translation look-aside buffer) and 200 nanoseconds to access memory. What is the effective memory-access time?
   (a) 240 ns
   (b) 260 ns
   (c) 280 ns
   (d) 300 ns
   (e) none of the above

10. An IDE hard disk spins at 7200 RPM, 1000 cylinders, 10 tracks per cylinder, 100 sectors per track, and 512 bytes per sector. The disk is formatted by a file system which the logical block size is 1024 bytes. If we ignore the space to keep directory and indexes, how many 1-byte files that the disk can store?
   (a) 512000000 1-byte files
   (b) 1000000 1-byte files
   (c) 500000 1-byte files
   (d) 100000 1-byte files
   (e) 50000 1-byte files

11. The raw disk speed of the above hard drive is about:
   (a) 120 MBytes/sec
   (b) 60 MBytes/sec
   (c) 12 MBytes/sec
   (d) 6 MByte/sec.
   (e) 600 KBytes/sec

12. Which of the following statement is correct?
    (a) The throughput of interrupt I/O is higher than that of polling I/O.
    (b) For the interrupt which is masked, the interrupt still notifies the CPU but the CPU does not process the request.
    (c) The overall system performance can be always improved by enabling DMA (direct-memory-access).
    (d) The DMA mechanism is usually suitable for a character device.
    (e) Software interrupt also goes through the interrupt controller to notify the CPU.

二、複選題，共八題，每題全對得 5 分，答錯一個選項得 2.5 分，答錯兩個以上選項、或未答得 0 分。

13. Which item(s) are shared by threads of a multi-threaded process?
    (a) local variables
    (b) global variables
    (c) program text/executable binaries
    (d) register values of the CPU
    (e) heap memory

14. Consider 4 CPU bursts with burst lengths P1=4, P2=10, P3=8, and P4=2, all arriving at the same time but with an order P1, P2, P3, and then P4. Which one of the following process-scheduling algorithm can have a total turnaround time no larger than 65?
    (a) First-Come First-Serve
    (b) Shortest-Job First
    (c) Round-Robin with time quantum=8
    (d) Round-Robin with time quantum=4
    (e) Round-Robin with an infinitely large time quantum.

15. Consider the following pseudo codes for reading and writing a shared buffer. With appropriate ***X1***, ***X2***, ***X3***, ***X4***, multiple threads are permitted to concurrently read the data, but only one can perform data writing.

```
int count=0;
semaphore sem_C, sem_D;
```

```
void main() {
   Initialization (sem_C=1, sem_D=1);
   Create 6 Thread_A;
   Create 25 Thread_B;
}

void * Thread_A {
      sleep(rand()%30);
      wait(sem_C);
      Data calculation and writing;
      signal(sem_C);
}
```

```
void * Thread_B {
      sleep(rand()%10);
      wait(sem_D);
      count++;
      if(count==1) X1;
      X2;
      Data reading;
      X3;
      count--;
      if(count==0) X4;
      signal(sem_D);
}
```

Which of the following are correct?

(a) "***X1***" and "***X4***" are "wait(sem_C)" and "signal(sem_C)" respectively

(b) "***X2***" and "***X3***" are "wait(sem_D)" and "signal(sem_D)" respectively

(c) Deadlock occurs if the count is initialized to 1.

(d) Race condition may occur if sem_C is initialized to 6.

(e) Race condition may occur if sem_D is initialized to 6.

16. Consider the following structure of two processes P_i, i = 0 or 1, where assignment and evaluation on shared flag[] are atomic operations.

```
void * Process(int i) {
 int j;
 do {
  if(i==0)
     j=1;
  else
     j=0;
  flag[i] = true;
  while(flag[j]) ;
  critical section;
  flag[i] = false;
  remainder section;
 } while(true); }
```

Which of the following about the critical section problem are correct?

(a) Process 0 and Process 1 always perform alternatively.

(b) Mutual exclusion requirement can be satisfied.

(c) Progress requirement can be satisfied.

(d) Bounded waiting requirement can be satisfied.

(e) Forever looping may occur.

17. Which of the following on virtual memory are not correct?

(a) We can limit the effects of thrashing by using a global replacement algorithm.

(b) Page fault rate will always decrease as the number of allocated frames increases for all kinds of page replacement algorithms.

(c) LRU page replacement is a stack algorithm.

(d) The vfork system call of UNIX will use copy-on-write to copy pages of the parent process

(e) Regardless how the file is opened, we can treat all the I/O as memory-mapped, allowing file access to take place in memory.

18. Consider a two-level page table scheme. A 32 bit logical address is divided into a 12 bits of outer page number and 12 bits of inner page number and 8 bits of page offset. If we trace a particular process and record the following address sequence with hexadecimal representation: 0x07EF9812, 0x07EF9823, 0x07EF98DE, 0x00000012, 0x00000045, 0x00000089, 0x01AABB99, 0x01AABB54, 0x01AABB77, 0x02989876, 0x000000078, 0x03DFDF89, 0x03DFDF77, 0x00000098, 0x048890FF, 0x048890EE, 0x02989874, 0x03DFDFDE, 0x00000099, 0x03DFDF78, 0x03DFDF24, 0x02989822, 0x02989845, 0x01AABB88, 0x01 AABB70, 0x02989899, 0x02989845, 0x00000011, 0x01AABB23, 0x07EF9888, 0x000000099, 0x01AABB34, 0x01AABB87. Which of the following are correct?

(a) The page faults number for the LRU replacement algorithms, with four frames is 8.

(b) The page faults number for the optimal replacement algorithms, with three frames is 8.

(c) If we set working-set window to Δ = 10 memory references, the working set size at the 10^{th} memory reference is 4.

(d) The page faults number for the FIFO replacement algorithms, with five frames is 10.

(e) If we set working-set window to Δ = 10 memory references, the working set size at the 20^{th} memory reference is 4.

19. Virtual memory may use disk space as a swap space which can be seen as an extension of main memory. Which of the following statement(s) is/are correct?
    (a) The size of the virtual memory increases if the swap space technology is employed.
    (b) The system performance decreases if the swap space technology is employed.
    (c) The swap space can hold the code segment and data segment of any process.
    (d) The swap space can hold any code segment and data segment of the OS kernel.
    (e) It is inefficient for both access performance and disk utilization to implement the swap space as a large file in a normal file system.

20. Which of the following statement(s) is/are correct for the buffer cache mechanism for a file system?
    (a) The read performance can be improved by enabling buffer cache.
    (b) User process sees fast writes if synchronous writes and buffer cache are both enabled.
    (c) The numbers of both read and write I/O requests to the disk drive can be reduced.
    (d) Buffer cache mechanism is usually implemented on the disk drive.
    (e) The performance of the file system can be always improved by increasing the size of buffer cache.