Operating Systems, Second Term Exam, Chapter 5 to 8, Dec. 21, 2006

Part I (10%).

True or False. If your answer is false, please write down your explanation(s).

1. (F) Two phase locking protocol prevents deadlock. not prevent deadlock.
2. (T) "Aging" can be used to prevent low priority processes from starvation when a priority scheduling is chosen.
3. (F) Suppose that there was a network breakdown. The system recovery process found that there was no commit log record in an atomic transaction number 1111. The recovery process would redo the transaction. undo
4. (F) Deadlock prevention techniques are implemented in most of the operating systems. 會造成效率降低，所以大部分採取忽略死結，由設計者決定
5. (T) Memory compaction could be invoked when there is an external fragmentation in a segment-only memory management system..

Part I.

1. (5%)Write the full name of each terminology. Note that no explanation is needed.
   (1) FCFS, (2)SJF (in scheduling) (3) RR (in scheduling) (4)MMU (5)TLB translation look-aside buffer
2. (15%)Explain the following terminology briefly.
   (1) load sharing, (2)busy waiting (3) checkpoint (4) timestamp (5)semaphore
3. (5%)Show an example of "priority inversion" in priority scheduling. How to solve it? Log. am memory management.
4. (5%)Show an example program segment of "race condition".
5. (5%)You are given the following program segment as an implementation of synchronization mechanism. What is its problem?

```
do {
    flag[i] = TRUE;
    while (flag[j]) ;
        critical section
  flag[i] = false;
  remainder section }
  while (1);
```

transaction key = TRUE & boolean & P W Undo

6. (5%)Define the semantic and operation of the atomic instruction SWAP. Use SWAP instruction to implement a critical section.
7. (10%)Suppose that a programming language supports a "monitor" class, and there are two operations "enter" and "exit" supported. Use the monitor to write a critical section.
8. (10%) Show an example how a virtual address is translated into physical address in the operations of two-level hierarchical paging scheme.

P1	P2	頁偏移
10	10	12

9. (15%)Given a snapshot of an operating system: 分頁

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	Allocation	*Max*	*Available*
	A B C D	A B C D	A B C D
P0	0 0 1 2	0 0 1 2	1 5 2 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	

2 8 8 6

2 14 11 8

Need P0 . P2 . P3 . P4 . P1

0 0 0 0

0 4 5 0

1 0 0 2

0 0 2 0

0 6 4 2

(1) What is the content of the matrix *Need*?

(2) Is the system in a safe state?

(3) If a request from process P1 arrives for (0,4,2,0), can the request be granted immediately?

10. (15%)Suppose that the snapshot of process arrivals of a computer system are defined as follows:

Process	Arrival Time	Burst Time	Priority
P1	0.0	8	below normal
P2	2.0	6	normal
P3	4.0	4	highest
P4	5.0	4	highest

Assume the scheduling policy is priority-based with no preemption. If two processes are of the same priority, RR is used. The time slice for each RR process is 2ms, and context switch time is ignorable.

(1) What is P1's waiting time?

(2) What is P1's turn around time?

(3) What is the throughput of the system?

(4) What is the CPU utilization? 使用率

(5) What is the average waiting time of the snapshot?