

Part I (10%).

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

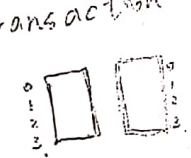
1. ( F ) Two phase locking protocol prevents deadlock. *not prevent deadlock*
2. ( T ) "Aging" can be used to prevent low priority processes from starvation when a priority scheduling is chosen.
3. ( F ) Suppose that there was a network breakdown. The system recovery process found that there was no commit 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. *会造成速率降低, 所以大部分采取忽略死结, 由设计者决定*
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*
2. (15%) Explain the following terminology briefly. *shrinking look-aside*  
(1) load sharing, (2) busy waiting (3) checkpoint (4) timestamp (5) semaphore *buffer*
3. (5%) Show an example of "priority inversion" in priority scheduling. How to solve it? *load sharing Log. an 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*
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.
9. (15%) Given a snapshot of an operating system: *分页*

P1	P2	页偏移
10	10	12

	<u>Allocation</u>	<u>Max</u>	<u>Available</u>
	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	2 8 8 6
P2	1 3 5 4	2 3 5 6	2 14 11 8
P3	0 6 3 2	0 6 5 2	
P4	0 0 1 4	0 6 5 6	

Need  
P<sub>0</sub> . P<sub>2</sub> . P<sub>3</sub> . P<sub>4</sub> . P<sub>1</sub>  
0 0 0 0  
10 4 5 0  
1 0 0 2  
0 0 2 0  
0 6 4 2  
15 7 0  
10 1 2  
13 7 6  
11 8 6

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

9.5  
12 4 38  
10 38  
16 70  
38  
4

0-181  
22 40  
22  
180  
176  
40  
4

5  
4 17  
20  
2