

國立臺北科技大學

九十四學年度資訊工程系碩士班入學考試

作業系統試題

填准考證號碼

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注意事項：

1. 本試題共 5 題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

1. True/False Questions (use T for true and F for false): (2% each)

- (a) Context-switch time is pure overhead, because the system does no useful work while switching. Its speed varies from machine to machine, depending on the memory speed, the number of registers that must be copied, and the existence of special instructions.
- (b) Let $r_i(x)$ and $w_i(x)$ be the read operation and write operation on object x for transaction i , respectively. Then, the schedule $r_1(x), r_3(y), w_1(x), w_2(y), r_4(y), w_3(x), r_3(x), w_4(y)$ is conflict serializable.
- (c) An operating system implementing the Pthread API can provide deferred cancellation which allows a target thread to terminate itself safely at cancellation points.
- (d) A soft real-time system allows a critical real-time task to get priority over other tasks and retain that priority until the task completes. This makes soft real-time systems useful for multimedia applications.
- (e) For a resource-allocation system with multiple instances of each resource type, both resource-allocation graph algorithm and banker's algorithm can be used to avoid the deadlock for the system.
- (f) Direct files (or hashing files) are often used where data are processed exhaustively.
- (g) SCAN policy for disk scheduling is biased in favor of the area most recently traversed.
- (h) Rivest-Shamir-Adleman (RSA) is a public-key algorithm for encryption.
- (i) Performance is one potential disadvantage of micokernels that is often cited.

- (j) The interfault time for a particular process always increases as the number of page frames allocated to a process increases.

2. Fill-in-the-blank Questions: (3% each)

- (a) Consider the following set of processes, with the length of CPU burst time and arrival time given in milliseconds:

<u>Process</u>	<u>Arrival time</u>	<u>Burst time</u>
P ₁	0	8
P ₂	1	4
P ₃	2	6
P ₄	4	10

- If the FCFS, preemptive SJF, and RR (quantum = 4 milliseconds) scheduling algorithms are used for the set of processes, the relationship among the average waiting time of these three algorithms is ().
- (b) Consider a page-reference string 1, 2, 3, 4, 1, 2, 5, 1, 2, 3, 4, 5 for a demand-paging system with three frames where all frames are initially empty. Among the FIFO, OPT, and LRU replacement algorithms, the () replacement algorithm would produce the maximum number of page faults.
- (c) Among different mapping models between user and kernel threads, the () model allows for greater concurrency while the many-to-one model has greater efficiency and allows the developers to create as many user threads as they wish.
- (d) To eliminate deadlocks using resource preemptions, we successively preempt some resources from processes and give these resources to other processes until the deadlock cycle is broken. If preemption is required to deal with deadlocks, then three issues: selecting a victim, rollback, and () need to be addressed.
- (e) Consider the following algorithm implementing a two-process solution to the critical-section problem. The algorithm is applicable to two processes i and j . For convenience, let $i=0$ and $j=1$. These two processes share a common variable $turn$ initialized to 0. By analyzing the algorithm, we can find that the solution does NOT satisfy the () requirement for the critical-section problem.

```
while(true){
    while (turn <> i);
        <critical section>
    turn = j;
        <remainder section>
};
```

注意：背面尚有試題

- (f) () is a technique used when memory is divided into variable-size partitions. From time to time, the operating system shifts the partitions so that they are contiguous and so that all of the free memory is together in one block.
- (g) () is the interval of time between the submission of a process and its completion.
- (h) () is a thread scheduling policy in which a set of related threads is scheduled to run on a set of processors at the same time, on a one-to-one basis.
- (i) The time required for a disk to rotate a requested data item from its current position to a position adjacent to the read-write head is called ().
- (j) Assume $W(t, \Delta)$ is a working set at virtual time t for Δ virtual time units, then the relationship between $W(t, \Delta+1)$ and $W(t, \Delta)$ is ().
3. How does the modified bit improve performance in the Not-Used-Recently (NUR) replacement strategy? (15%)
4. Consider a system with three *smoker* processes and one *agent* process. Each smoker continuously rolls a cigarette and then smokes it. But to roll and smoke a cigarette, the smoker needs three ingredients: tobacco, paper, and matches. One of the smoker processes has paper, another has tobacco, and the third has matches. The agent has an infinite supply of all three materials. The agent places two of the ingredients on the table. The smoker who has the remaining ingredient then makes and smokes a cigarette, signaling the agent on completion. The agent then puts out another two of the three ingredients, and the cycle repeats. Devise a semaphore solution to synchronize the agent and the smokers. (15%)
5. Consider a file currently consisting of 200 blocks. Assume that the file control block (and the index block, in the case of indexed allocation) is already in memory. Calculate how many disk I/O operations are required for contiguous, linked, and indexed (single-level) allocation strategies. Assume that each disk I/O operation accesses only one block. In the contiguous allocation case, there is no room to grow in the beginning, but there is room to grow in the end. Moreover, the block information to be added is already stored in memory.
- (a) The block is added at the beginning. (4%)
- (b) The block is added in the middle. (4%)
- (c) The block is added at the end. (4%)
- (d) The block is removed from the beginning. (4%)
- (e) The block is removed from the middle. (4%)