

科目：計算機結構與作業系統

適用：資工系

考生注意：

1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

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1. (10 points)

If memory access time is 200ns and page fault rate is 0.0000025, what is the maximum page fault service time such that the effective memory access time does not exceed 220ns?

2. (10 points)

The disk space of a file can be allocated in a linked list.

What are the two problems with this approach? (space/time)

3. (30 points)

Please answer Yes or No for following statements. (3 points for each)

- A. Context-switch does affect the performance of cache.
- B. When an interrupts occurs, the state of the running process will not transit from RUN to READY immediately.
- C. If semaphores are employed in synchronization, busy-waiting can be eliminated altogether.
- D. Cache is useful simply because it is faster than memory.
- E. The LRU page replacement algorithm does not always performs well.
- F. The name of a file, in UNIX implementation, is stored in its inode.
- G. A spinlock is useful in an uni-processor system.
- H. In order to save power, some system will turn off the screen or slow down the CPU when the system is idle. Is this operation initiated by kernel?
- I. The instruction to read the clock is privileged.
- J. The instruction to issue a trap is privileged.

4. (20 points)

Explain the following terms.

- A. (4 pts) Yield
- B. (4 pts) Normalization or SPECratio
- C. (4 pts) Least/most significant bit
- D. (4 pts) Branch target address
- E. (4 pts) way-associative cache

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5. (15 points)

Assume that executing program A on single CPU needs 100 cycles, and parallelizing program A has fixed 10-cycle overheads. When parallelizing program A to be executed on 10 CPUs, what is the fraction of program A to be parallelizable (e.g. x% of A) so that we can get 5 times of speed up with 10 CPUs?

6. (5 points)

How to decide the cycle time of a CPU with pipelining?

7. (10 points)

Answer the following questions related to caches.

- A. (4 pts) Name one cache replacement policy that you learned and explain the policy.
- B. (2 pts) Is it necessary for a direct-mapped cache to utilize the cache replacement policy described above? Why?
- C. (4 pts) To reduce compulsory misses, what kind of method do you propose to utilize?

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