

國立中央大學94學年度碩士班考試入學試題卷 共 2 頁 第 1 頁
所別：資訊工程學系碩士班 科目：作業系統與計算機組織

注意： 作答時，請在答案紙上左邊標明題號，按橫列依小題逐一作答：

1. (10%) True or False. (If the statement is false, explain the answer shortly)
 - (a) If we write a 32-bit (4-byte) data word, 0x12345678, to the address 0x2000 in a big-endian system, then the byte stored in 0x2000 is 0x78.
 - (b) A write-through cache will have the same miss rate as a write-back cache.
 - (c) The case of "TLB miss, Page Table miss, Cache hit" is possible.
 - (d) In memory hierarchy design, increasing the block size will help to decrease the miss penalty.
 - (e) Conflict misses will not happen in fully associate caches.
2. (8%) Please compare "write-through" and "write-back" in cache system.
3. (10%) Use Booth's algorithm to compute 5×-3 (4-bit number) = -15 (8-bit number). Complete the following table.

| Iteration | Step | Product |
|-----------|----------------|---------|
| 0 | Initial step | |
| 1 | (No) operation | |
| | Shift | |
| 2 | (No) operation | |
| | Shift | |
| 3 | (No) operation | |
| | Shift | |
| 4 | (No) operation | |
| | Shift | |

4.
 - (1) (8%) If the execution time of each instruction is t . How long does it take to execute n instructions in an ideal 6-stage pipeline machine (assuming pipeline hazard and overhead are ignored)?
 - (2) (8%) In which condition the execution sequence of instructions may be out of order in a pipeline system?
5. (6%) Please describe the criteria which will affect the encoding and length of instruction set and the design considerations of a RISC processor.

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6.(6%) Consider a demand-paged computer system where the degree of multiprogramming is currently fixed at four. The system was recently measured to determine utilization of CPU and the paging disk. The results are one of the following alternatives. Can you increase the degree of multiprogramming to increase the CPU utilization?

- (a) CPU utilization 12 percent; disk utilization 2 percent
- (b) CPU utilization 86 percent; disk utilization 4 percent
- (c) CPU utilization 10 percent; disk utilization 95 percent

7.(12%) Given memory partitions of 50K, 500K, 200K, 300K, and 600K (in order), how would each of the First-fit, Best-fit, and Worst-fit algorithms place processes of 212K, 417K, 112K, and 444K (in order)?

8.(12%) Please briefly explain the following terminologies

- (a) trap
- (b) interrupt
- (c) thread

9.(10%) Please insert the correct statement in the following dining-philosophers program.

```
monitor diningPhilosophers {
    int[] state = new int[5];
    static final int THINKING = 0;
    static final int HUNGRY = 1;
    static final int EATING = 2;
    condition[] self = new condition[5];
    public diningPhilosophers {
        for (int i = 0; i < 5; i++)
            state[i] = THINKING;
    }
    public entry pickUp(int i) { /* see next slides */ }
    public entry putDown(int i) { /* see next slides */ }
    private test(int i) { /* see next slides */ }
}

public entry pickUp(int i) {
    state[i] = HUNGRY;
```

```
test(i);
if (state[i] != EATING)
    self[i].wait;
}

public entry putDown(int i) {
    state[i] = THINKING;
    // test left and right neighbors
    test((i + 1) % 5);
}

private test(int i) {
    if ((state[(i + 4) % 5] != EATING) &&
        (state[i] == HUNGRY) &&
        (state[(i + 1) % 5] != EATING)) {
        state[i] = EATING;
    }
}
(9-a 3%)
(9-b 3%)
```

To prevent the resumed thread and signaling thread will be active simultaneously, (9-c 2%) Hoare (the inventor of Monitor) and (9-d 2%) Concurrent Pascal designer, each selects which approach:

- 1. Signal-and-Wait
- 2. Signal-and-Continue.

10.(10%) Suppose that a disk drive has 6000 cylinders numbered from 0 to 5999. The drive is currently serving a request at cylinder 153 and previous request was at cylinder 140. The queue of pending requests, in FIFO order, is

90, 1450, 950, 1774, 938, 1509, 1022, 1750, 146

Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests, for each of the following disk scheduling algorithms?

- a. FCFS
- b. SSTF
- c. SCAN
- d. LOOK
- e. C-SCAN