

國立高雄大學 101 學年度研究所碩士班招生考試試題

科目：計算機結構與作業系統 系所組別：資訊工程學系
考試時間：100 分鐘 本科原始成績：100 分

是否使用計算機：否

I. [20%] 單選題 (每題 2 分，共 10 題)

1. Which condition can be used to detect an MEM hazard?
 - (A) if (MEM/WB.RegWrite and MEM/WB.RegisterRd \neq 0
and EX/MEM.RegWrite and EX/MEM.RegisterRd \neq 0
and EX/MEM.RegisterRd = ID/EX.RegisterRs
and MEM/WB.RegisterRd = ID/EX.RegisterRs)
 - (B) if (EX/MEM.RegWrite and (EX/MEM.RegisterRd \neq 0)
and not (MEM/WB.RegWrite and (MEM/WB.RegisterRd \neq 0)
and (EX/MEM.RegisterRd = ID/EX.RegisterRs))
and (MEM/WB.RegisterRd = ID/EX.RegisterRs))
 - (C) if (MEM/WB.RegWrite and (MEM/WB.RegisterRd \neq 0)
and not (EX/MEM.RegWrite and (EX/MEM.RegisterRd \neq 0)
and (EX/MEM.RegisterRd = ID/EX.RegisterRs))
and (MEM/WB.RegisterRd = ID/EX.RegisterRs))
 - (D) if (MEM/WB.RegWrite and (MEM/WB.RegisterRd \neq 0)
and not (EX/MEM.RegWrite and (EX/MEM.RegisterRd \neq 0)
and (MEM/WB.RegisterRd = ID/EX.RegisterRs))
and (EX/MEM.RegisterRd = ID/EX.RegisterRs))
2. An MIPS processor will execute the instruction “j Label” whose 26-bit Label value is 0x3000002. The current value of register PC is “0x30000120”. When the instruction is executed completely, what is the content of register PC?
 - (A) 0x03000002
 - (B) 0x3C000008
 - (C) 0x33000002
 - (D) 0x30000124
3. Given a floating point number 0.4375_{10} , what is the representation in the IEEE 754 single precision?
 - (A) 0 01111110 110000000000000000000000
 - (B) 0 11111110 110000000000000000000000
 - (C) 0 01111101 111000000000000000000000
 - (D) 0 01111101 110000000000000000000000

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4. Which means the situation in which a planned instruction cannot execute in the proper clock cycle because data that is needed to execute the instruction is not yet available?
(A) Control hazard
(B) Data hazard
(C) Structural hazard
(D) Stall
5. Which of the following is not true?
(A) RAID 1 has the highest redundancy overhead.
(B) RAID 3, 4, and 5 have the same throughput for large writes.
(C) RAID 3 has the worst throughput for small writes.
(D) The forwarding unit is used to detect the true data dependency for ID pipeline stage and selects the forwarded results for the execution unit.
6. Which presents the guest with a system that is similar but not identical to the guest's preferred system so the guest usually need be modified to run on it? (A) Para-virtualization (B) Simulation (C) Java virtual machine (D) .NET framework
7. Which scheduling algorithm is most appropriate for a time-shared system? (A) FCFS (B) SJF (C) SRTF (D) RR
8. On UNIX, which system call is used to replace the process's memory space with a new program? (A) create() (B) fork() (C) exec() (D) open()
9. Which structure of the page table has most difficulty implementing shared memory? (A) Hierarchical paging (B) Hashed page tables (C) Inverted page tables (D) Segmented page tables
10. Which is the number of entries in the TLB multiplied by the page size? (A) TLB cache (B) TLB reach (C) Hit ratio (D) Page resolution

II. [20%] 填充題：填入適當的英文全名術語或計算結果 (每題 2 分，共 10 題)

1. 1 is a scheme in which writes always update both the cache and the next lower level of the memory hierarchy, ensuring that data is always consistent between two.
2. 2 is a cache that keeps track of recently used address mappings to try to avoid an access to the page table.
3. 3 is a buffer that holds results in a dynamically scheduled processor until it is safe to store the results to memory or a register.
4. 4 is a principle stating that if a data location is referenced, then it will tend to be referenced again soon.
5. 5 is a cache miss that occurs in a set-associative or direct-mapped cache when multiple blocks compete for the same set and that are eliminated in fully associative cache of the same size.

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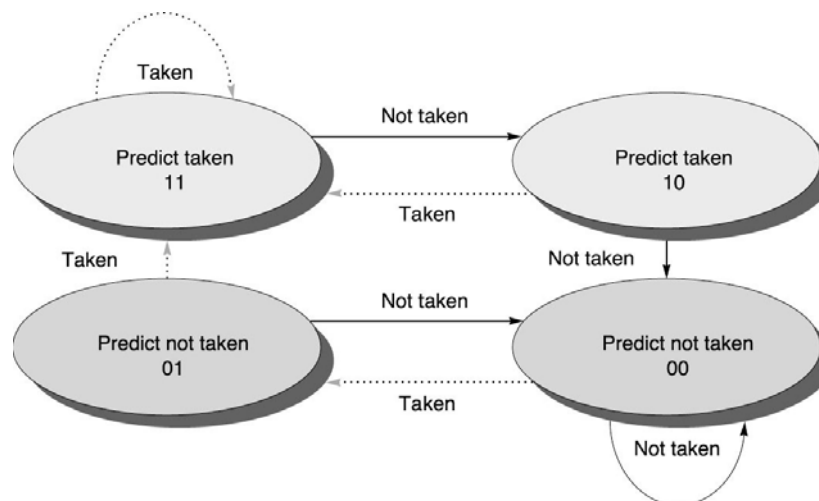
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6. 6 is the requirement for solution to critical-section problem means if a process is executing in its critical section, then no other processes can be executing in their critical sections.
7. A 7 device is a special-purpose storage system that is accessed by clients remotely via a remote-procedure-call interface over a data network.
8. 8 is a variation on linked disk-space allocation used by the MS-DOS operating systems and supported by many computer systems.
9. Given the reference string of page accesses: 1 2 3 4 2 3 4 1 2 1 1 3 1 4 and a system with three page frames, 9 page faults would occur for the LRU replacement algorithm.
10. Consider a disk queue with requests for I/O to blocks on cylinders 98, 183, 37, 122, 14, 124, 65, 67 in the order. If the disk head is initially at cylinder 53, a total head movement of 10 cylinders is required for the SSTF disk scheduling algorithm.

III. [60%] 問答題 (每題 10 分，共 6 題)

1. Explain the following terms: (a) Interleaved memory organization (b) Harvard architecture (c) Fully associative cache (d) Overflow (e) Superscalar
2. A computer uses a direct-mapped cache with 64KB of data and 4-word block size (1 word has 4 bytes). Assume that the address is 32 bits. What is the size of the tag field? What is the total size of the cache (including valid bits)?
3. Given the following repeating patten (e.g., in a loop) of branch outcomes : T, T, NT, NT, NT. What is the accuracy ratio of the two-bit predictor if this pattern is repeated forever? The states of the predictor are shown in the following figure and the predictor starts off in the bottom right state in the figure.



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4. (A). What are the general design goals of operating systems?
(B). What are the specific design goals of operating systems for each of the following equipments? (a) Mainframe (b) Desktop PC (c) Smart phones
5. A solid-state drive (SSD) is a new kind of storage device that provides access in the same manner of a traditional block I/O hard-disk drive (HDD).
(A). Show the physical differences between SSD and HDD.
(B). Show the differences of mechanisms and polices in the design of file systems between SSD and HDD.
6. Consider the following code:

```
#define BUFSIZE 256

char    buf0[BUFSIZE];

char    *mystrdup(int choice, char *str)
{
    char    buf1[BUFSIZE];
    char    *buf2, *ptr;

    buf2 = (char *) malloc(BUFSIZE);
    if(choice == 0) ptr = buf0;
    else if(choice == 1) ptr = buf1;
    else ptr = buf2;

    strcpy(ptr, str);

    return ptr;
}
```

- (A). Show the structure of a process in memory and indicate the sections containing the following buffers: buf0, buf1 and buf2.
- (B). What are the security concerns with the code? How to improve its security?