

淡江大學九十學年度碩士班招生考試試題

系別：電機工程學系

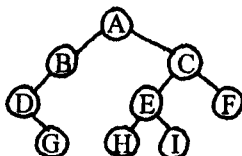
科目：計算機概論 (含計算機組織)

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計算機	字典
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本試題雙面印製

- (40 points) Explain the following terms as clearly as possible.
 - memory interleaving
 - page faults
 - instruction pipelining
 - delayed branches
 - isolated I/O
 - dataflow computers
 - wormhole routing
 - Amdahl's Law
 - minimum spanning trees
 - sequential circuits
- (12 points) The main memory of a computer is organized as 16 blocks, with a block size of 8 words. The cache has 4 block frames. In (1) through (3), show the mappings from the numbered blocks in main memory to the block frames in the cache. Draw all lines showing the mappings as clearly as possible.
 - Show the direct mapping and the address bits that identify the tag field, the block number, and the word number.
 - Show the fully associative mapping and the address bits that identify the tag field and the word number.
 - Show the two-way set-associative mapping and the address bits that identify the tag field, the set number, and the word number.
- (12 points) Consider the following two problems related to binary tree traversals.
 - For the following binary tree, give its traversals in (a) preorder, (b) inorder, and (c) postorder.



- Draw the binary tree which has the following two traversals.
(Assume each node of the tree contains single-character information only.)

Preorder: C B A F E D G

Inorder: A B C D E F G

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x	x

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4. (8 points) Consider the following two problems related to recursive and iterative definitions.
- (1) Write a recursive definition of $a + b$, where a and b are nonnegative integers, in terms of the successor function succ , defined as

```
succ(x)
int x;
{
    return (x++);
}
```

- (2) Consider the following recursive C function. Write an iterative function to accomplish the same purpose.

```
func(n)
int n;
{
    if (n == 0) return (0);
    return (n + func(n-1));
}
```

5. (10 points) What are the differences between a procedure (subroutine) and an interrupt service routine (ISR)? Also give the differences between how an ISR is invoked when the interrupt is caused by a software interrupt or hardware interrupt or exception.
6. (8 points) Answer the following two questions related to computer performance metrics.
- (1) Our favorite program runs in 10 seconds on computer A, which has a 100 MHz clock. We are trying to help a computer designer build a computer, B, that will run this program in 6 seconds. The designer has determined that a substantial increase in the clock rate is possible, but this increase will affect the rest of the CPU design, causing computer B to require 1.2 times as many clock cycles as computer A for this program. What clock rate should we tell the designer to target?
- (2) Suppose we have two implementations of the same instruction set architecture. Computer C has a clock cycle time of 10 ns (nanoseconds) and a CPI (clock cycles per instruction) of 2.0 for some program, and computer D has a clock cycle time of 20 ns and a CPI of 1.2 for the same program. Which computer is faster for this program, and by how much?

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7. (10 points) The Gray code is a binary code for integers. It differs from the ordinary binary representation in that there is just a single bit change between the representations of any two numbers. The eight elements of the 3-bit Gray code are as follows.

Binary Code	Gray Code
000	000
001	001
010	011
011	010
100	110
101	111
110	101
111	100

Design a circuit that converts from 3-bit binary code to 3-bit Gray code.