國立臺灣科技大學 107 學年度碩士班招生試題

系所組別：電子工程系碩士班甲組

科　　目：計算機概論

(總分為 100 分)

1. (10%) Convert the following numbers:
   (a) Convert 104_{10} to base 3. (5%)
   (b) Convert 0.454 to binary with 3 digits to the right of the binary point. (5%)

2. (10%) Please explain the following terms:
   (a) Superscalar. (5%)
   (b) Superpipelining. (5%)

3. (10%) Please explain why the miss rate of instruction cache is always lower than that of data cache.

4. (10%) Recently, the CPU architecture has been switched from uniprocessors to multicores. What is the major reason for this big change?

5. (10%) Please describe the operation of a ripple-carry adder. Why are ripple-carry adders not used in most computers today?

6. (9%) Please explain the following terms in details:
   (a) Sequential search. (3%)
   (b) Linked list. (3%)
   (c) Breadth-first search. (3%)

7. (20%) Please write a pseudo-code to reverse a string, e.g. Input: ABCDE; Output: EDCBA
   (a) Method 1: One-dimension array. (10%)
   (b) Method 2: Recursion. (10%)

8. (12%) Fill in the following table.

	Bubble sort	Merge sort	Insertion sort
Average time complexity	$O(n^2)$		
Memory	O(1)		

In this table, n is the number of records to be sorted, while memory denotes the amount of auxiliary storage needed beyond that used by the list itself.

9. (9%) Show the computational complexity and the necessary condition of a binary search tree. Plot a balanced and fully connected binary tree with elements 1, 2, 3, 4, 5, 6, 7 as an example.