國立臺北科技大學105學年度碩士班招生考試

系所組別：2150 電機工程系碩士班戊組

第二節　計算機概論　試題

注意事項：

1. 本試題共 13 題，共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. (6%) The following 4-bit binary numbers have a sign in the leftmost position and, if negative, are in two's complement form. Perform the indicated arithmetic operations and verify the answers. Indicate if there is overflow.
   (a) (3%) 1110 + 1010　(b) (3%) 0010 – 1011

2. (9%) Give a brief definition of each of the following:
   (a) (3%) register　(b) (3%) cache memory　(c) (3%) virtual memory

3. (6%) What are the differences between time-sharing and multitasking?

4. (8%) Briefly describe the necessary conditions for deadlock to be occurred.

5. (6%) What are the differences between TCP and UDP transportation protocols? In what way could TCP be considered a better protocol for implementing the transport layer than UDP? In what way could UDP be considered better than TCP?

6. (10%) Consider sorting the following array of integers in ascending order.
   [5, 3, 1, 9, 8, 2, 4, 7]
   (a) (3%) Write the contents of the array after the third iteration of bubble sort.
   (b) (3%) Write the contents of the array after the third iteration of insertion sort.
   (c) (4%) Write the contents of the array after the first partitioning of quick sort has finished (before recursive calls). Assume that the first element is chosen as the pivot.

7. (8%) Give a tight upper bound for each following function using Big-O notation.

(a) (2%) $f(n) = \sum_{i=1}^{n}\sum_{j=1}^{n} n^2$ (b) (2%) $f(n) = 2^{100}+100!$

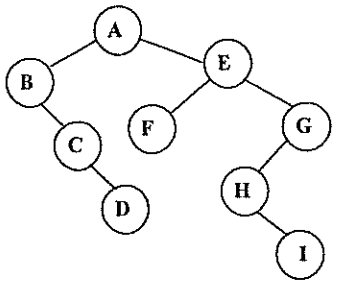
(c) (2%) $f(n) = \sum_{i=1}^{n}\sum_{j=1}^{n} j$ (d) (2%) $f(n) = \sum_{i=1}^{n}\sum_{j=i}^{n} 2$

8. (6%) Explain the difference between call-by-value and call-by-reference and give an example of each with C code.

9. (6%) Let A be a 2-dimensional array $A[m][n]$ and each element occupies one address. If the location of $A[5][20]$ is 1070 and $A[20][5]$ is 1805, then what is the location of $A[2][2]$.

10. (12%) Write the sequence in which the nodes of the following tree would be visited using the following traversal orders.

(a) (3%) in-order (b) (3%) pre-order (c) (3%) post-order (d) (3%) level-order



11. (6%) Draw the final max heap tree that results from inserting 3, 5, 6, 7, 9, 8, 2 in that order into an initially empty heap tree.

12. (9%) In terms of the following relations, what is the appearance of the relation RESULT after executing each of these instructions?

R relation

A	B	C
a1	b1	3
a2	b2	4
a3	b2	4
a4	b1	5

S relation

X	Y
4	y1
5	y2
5	y3
6	y4

(a) (2%) RESULT ← SELECT from S where X=5

(b) (3%) RESULT ← PROJECT B, C from R

(c) (4%) RESULT ← JOIN R and S where R.C = S.X

13. (8%) Briefly describe P, NP, NP-hard, and NP-complete problems.