國立交通大學 108 學年度碩士班考試入學招生試題

科目：資料結構與網際網路概論(5072)　　考試日期：108 年 2 月 14 日 第 3 節

系所班別：資訊管理研究所碩士班　　組別：資管碩甲組　　第 1 頁，共 2 頁

【不可使用計算機】＊作答前請先核對試題、答案卷(試卷)與准考證之所組別與考科是否相符！！

1. (6%) Please explain why the Base64 encoding and decoding is very important for an e-mail application.

2. (5%) In the service bands of WLANs, regulators mandate the use of spread spectrum transmission. Please explain why.

3. (5%) Which of the following signals has a wider bandwidth, a sine wave with a frequency of 100 Hz, a sine wave with a frequency of 1000 Hz, a composite wave with 100-1000 Hz, or a composite wave with 10k-11k Hz? What are these bandwidths?

4. (5%) Suppose an IPv6 address is shortened as 2002:0:20:2::200, please recover the full address.

5. (5%) Please explain why the traffic pattern analysis of communication between two end users may reveal sensitive information.

6. (7%) Please explain why the XML (Extensible Markup Language) is widely used in many areas and what the advantages of XML are.

7. (6%) In the maze problem (老鼠走迷宮), we want to find a feasible path from the entrance to the exit. Compare the advantages and disadvantages of breadth-first search and depth-first search for solving the maze problem.

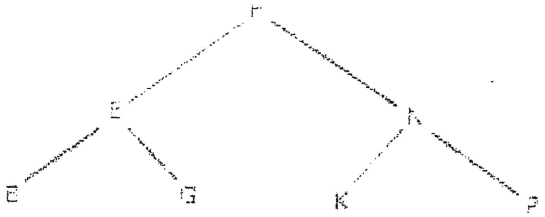
8. (3%, 3%, 5%) Let $A_{6\times3}, B_{3\times10}, C_{10\times5}$ be three matrices of integers. Find the numbers of scalar multiplications of the following two expressions of matrix multiplications:
   (a) $(A \times B) \times C$.
   (b) $A \times (B \times C)$.
   (c) Given a chain of n matrices, how many different ways of matrix-chain multiplication are there?

9. (9%) Match the three data structures {queue, priority queue, stack} with the three search strategies {depth-first search, breadth-first search, best-first search}. Explain your answer.

10. (4%, 4%) Given an input sequence of 9 integers 2, 7, 4, 6, 9, 3, 8, 1, 5.
    (a) Insert the integers as in the sequence into an empty min-heap. Show the derived min-heap.
    (b) Show the min-heap after the deletion of 2 from the min-heap of (a). Describe detail operations of the deletion.

11. (5%) How to use pointers to implement the dynamic structure of a list with three entries? Illustrate the implementation.

12. (5%) Insert the entry M into the list B, E, G, H, K, N, P stored as a binary tree.



13. (5%) Briefly summarize what "Digital signature" is. (4%) How to use public and private keys in the technique of "Digital signature"?

14. (4%) Please explain the hidden terminal problem? (4%) Draw a figure that shows two scenarios of the hidden terminal problem, and indicate them in this figure.

15. (6%) The table below represents a tree stored in a machine's memory. Each node of the tree consists of three cells. The first cell contains the data (a letter), the second contains a pointer to the node's left child, and the third contains a pointer to the node's right child. A value of 0 represents a NIL pointer. If the value of the root pointer is 55, draw a picture of the tree.

Address	Contents
40	G
41	0
42.	0
43	X
44	0
45	0
46	J
47	49
48	0
49	M
50	0
51	0
52	F
53	43
54	40
55	W
56	46
57	52