國立交通大學 97 學年度碩士班考試入學試題

科目：資料結構與網際網路概論(5112)　　考試日期:97 年 3 月 9 日 第 3 節

系所班別：資訊管理研究所　　組別：資管所甲組　　第 1 頁,共 2 頁

＊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. Please explain the following terminology. (12%)
   (a) Cyclic Redundancy Check (CRC)
   (b) Choke Packet
   (c) Security Policy and Procedure
   (d)Frequency Hopping Spread Spectrum (FHSS)

2. (a) What is WiMax? What is Wi-Fi? Compare their difference. (8%)
   (b) Explain the hidden station problem and the exposed station problem of WiMax. (10%)

3. Assume the inorder and the postorder traversal sequences of a tree are "g d h b e i a f j c" and "g h d i e b j f c a", respectively. Please draw this binary tree. (6%)

4. (a) Please define the complexity classes: P, NP, NP-Complete. (6%)
   (b) Show that P=NP if we can reduce an NP-complete problem to a P problem. (7%)

5. Write down the postfix expression for A/B-C+D*E-A*C. (6%)

6. (a) Let $A_{4\times5}$, $B_{5\times3}$, $C_{3\times6}$, $D_{6\times4}$ be four matrices of integers. Calculate the numbers of scalar multiplications required by $(((A\times B)\times C)\times D))$ and $((A\times B)\times(C\times D))$, respectively. (3%)
   (b) Let $A_1, A_2, \ldots, A_m$ be m matrices of integers with dimensions $n_1\times n_2, n_2\times n_3, \ldots, n_m\times n_{m+1}$. We want to optimally parenthesize the matrix product $A_1\times A_2\times\ldots\times A_m$ such that the number of scalar multiplications is minimum. Denote the optimal number of scalar multiplications by $T(1,m)$. Give a recurrence formula of $T(1,m)$. (6%)

7. (a) Show that any tree with $n > 1$ nodes has an even number of odd-degree nodes. (2%)
   (b) State the if-and-only-if condition for an undirected graph to permit the existence of Eulerian cycles. (3%)
   (c) Given a tree T that has n_1 odd-degree nodes and n_2 even-degree nodes, determine the minimum number of edges to be added into T such that Eulerian cycles exist in the resulting graph. (3%)
   (d) Assume a cost $c(i, j)$ is assigned to each pair of nodes v_i and v_j. Repeat question (c), but now we want to minimize the total cost of newly added edges. Design an algorithm to achieve the least-cost insertion. (3%)

8. A program is a list of instructions for the computer to follow to process data. Programming, also known as software development, is a six-step procedure for creating that list of instructions. What are the procedures? (6%)

9. A particular microprocessor has a 12-bit address bus. (8%)
   (a) How many memory locations can it address?
   (b) Write down the lowest address.
   (c) Write down the highest address.
   (d) How many hex digits are needed to specify an address?

10. According to Degrees of Separation, how many intermediary persons between the first sender and the target person by passing a message along a chain of acquaintances? Please explain it. (3%)

11. (8%) The Fibonacci series

    0,1,1,2,3,5,8,13,21,34,55, ...

    begins with the terms 0 and 1 and has the property that each succeeding term is the sum of the two preceding terms.
    (1) Write a non-recursive function in C language Non_Fibonacci(n) which calculates the nth Fibonacci number.
    (2) Write a recursive function in C language Re_Fibonacci(n) that calculate the nth Fibonacci numbers.

    註：If you don't know C language, please specify the programming language you know and write down the codes.

題目結束