淡江大學八十七學年度碩士班入學考試試題

系別：資訊管理學系　　科目：資料結構

1. Explain the following terms. (10%)
   (a) Complete binary tree
   (b) Rehashing
   (c) Weakly connected graph

2. Consider the problem of the Towers of Hanoi,
   (a) give the description of this problem.
   (b) write a program to solve it (please describe your idea first).
   (c) analyze your program, what's the total number of moves required for n disks? (15%)

3. Euclid's algorithm is famous for computing the greatest common divisor. Please give the running time analysis for this algorithm. (10%)

4. Consider binary search trees,
   (a) describe the rules of deleting a node from a binary search tree.
   (b) use pseudo code to write a subroutine, *FindKth(T,k)*, to find the *k*th smallest key in the binary search tree *T*.
   (c) there are several methods to keep binary search trees balance. Please describe at least one of those methods and present your description as clear as possible. (20%)

5. Consider the mergesort algorithm,
   (a) describe the basic idea of mergesort detailedly (give examples when necessary).
   (b) determine the running time of mergesort for random input and sorted input.
   (c) mergesrot can be implemented for linked lists and contiguous arrays, discuss their efficiency in memory space and running time, respectively. (20%)

6. Regarding the variable-length coding problem,
   (a) describe the Huffman's coding algorithm detailedly (give examples when necessary).
   (b) prove (or disprove) that Huffman's coding algorithm generates an optimal prefix code.
   (c) use pseudo code to write a program to implement file compression using Huffman's algorithm (assume only the alphabet 'A' to 'Z' and white space are allowed in the file). (25%)