

國立中央大學 112 學年度碩士班考試入學試題

所別： 資訊管理暨大數據分析類

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科目： 資料結構

【題型說明：皆依題意為問答題或程式設計題】

1. (a) Please build the MAX-Heap tree with the following elements:
24, 58, 89, 36, 48, 77, 10, 94, 99. At least show the initial tree and final tree. (8%)
(b) What is the time complexity of Max-Heap in best, worst, and average cases? (6%)
(c) After performing the heap sort (Max Heap) once, what happens in the Max-Heap tree?
Please draw the final Max Heap tree. (3%)
2. Give the data as follows: 88, 67, 34, 98, 17, 26, 35, 4, 23, 30
(a) Describe the procedure of merge sort on the above data in ascending order. (6%)
(b) What is the time complexity of merge sort in best, worst, and average cases? (6%)
(c) Define what a stable method is? (3%) How about the stability of merge sort? (1%)
3. Please write pseudocodes for a recursive and a non-recursive functions that print the Fibonacci sequence, where the last Fibonacci number is less than 1000.
(a) Recursive function (8%)
(b) Non-recursive function (8%)
4. Please answer the following questions:
(a) Describe the definition of a 'complete graph'. (4%)
(b) If the complete graph has x vertices, how many edges does it have? (5%)
5. Please describe the following algorithms with examples.
(a) Breath First Search (4%)
(b) Depth First Search (4%)
6. When using MD5 as the hash function for handling large amounts of data, what might be the potential vulnerability for its outputs? Please briefly explain (4%).

注意:背面有試題

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7. (a) Please use the data {75, 40, 61, 23, 54, 12, 98, 86} to describe the sorting process of Quick Sort (in ascending order) with procedure details (8%).
- (b) Please also use above data to implement a Quick Sort function with C code (ANSI C) and illustrate the key steps in your code with comments (10%).
8. Please use a table to show the comparison of time complexity values between Insertion Sort and Quick Sort (big O notation) in best cases (4%), average cases (4%), and worst cases (4%).

注意：背面有試題