

長庚大學 100 學年度第一學期電機所博士班演算法資格考

1. 請於答案卷第一頁依序寫下學號、姓名。
 2. 請詳細閱讀下列試題，並請標明題號依試題順序將答案書寫於答案卷上。
 3. 任何形式的作弊，本資格考以 Fail 論。
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1. Please describe what is bellman ford algorithm for the single source shortest path problem? If the input graph G contains a negative cycle, is bellman ford method still working? Please explain it in detail. (17 points)
2. Supposed that a binary counter is initialized as 0. We increase the counter n times. How many bits are altered through the process with Big-Oh notation? (For example: 1011=> 1100 3bits, 1111=>10000 5 bits) (17 points)
3. We know that a binary search tree keeps the good relationship for the order of the nodes. Please describe a sorting algorithm using a binary search tree. And show us the best/worst time complexity of your method. Is it stable? (17 points)
4. If the code words for the Huffman code are 0, 1, 2, and 3. Does there still exist any greedy algorithm similar to Huffman code? Please explain your answer. (If you can proof, that will be better). (16 points)
5. Please use the dynamic programming approach to design an algorithm to find the maximum sum in any contiguous sublist of a given list of n real values. For example, consider the list [6, 2, -14, 9, -2, 8, 4, -5]. It consists of a contiguous sublist [9, -2, 8, 4] which has the maximum sum 19. Please describe your algorithm, and show the time complexity using order notation. (16 points)
6. We have a graph G and two vertex x, y in the G . G admits a path p from x to y passing each node of G exactly once. If p existed, we call p as Hamiltonian Path. Hamiltonian Path problem was known to be NP-complete problem. With the configuration, longest path problem is to find out a longest simple path in G from x to y . Please proof that longest path problem is also a NP-complete problem. (17 points)