

一 選擇題 (40%) 請勿在本試題紙上作答，否則不予計分

1. The term "push" and "pop" is related to the
 - a. array
 - b. lists
 - c. stacks
 - d. all of above
2. A data structure where elements can be added or removed at either end but not in the middle
 - a. Linked lists
 - b. Stacks
 - c. Queues
 - d. Deque
3. When inorder traversing a tree resulted E A C K F H D B G; the preorder traversal would return
 - a. FAEKCDBHG
 - b. FAEKCDHGB
 - c. EAFKHDCBG
 - d. FEAKDCHBG
4. Two main measures for the efficiency of an algorithm are
 - a. Processor and memory
 - b. Complexity and capacity
 - c. Time and space
 - d. Data and space
5. The time factor when determining the efficiency of algorithm is measured by
 - a. Counting microseconds
 - b. Counting the number of key operations
 - c. Counting the number of statements
 - d. Counting the kilobytes of algorithm
6. The space factor when determining the efficiency of algorithm is measured by
 - a. Counting the maximum memory needed by the algorithm
 - b. Counting the minimum memory needed by the algorithm
 - c. Counting the average memory needed by the algorithm
 - d. Counting the maximum disk space needed by the algorithm
7. Which of the following case does not exist in complexity theory
 - a. Best case
 - b. Worst case
 - c. Average case
 - d. Null case
8. The Worst case occur in linear search algorithm when
 - a. Item is somewhere in the middle of the array
 - b. Item is not in the array at all
 - c. Item is the last element in the array
 - d. Item is the last element in the array or is not there at all

(背面仍有題目,請繼續作答)

9. Which of the following algorithm does the following: A set of nodes assigned with values if fed to the algorithm. Initially 2 nodes are considered and their sum forms their parent node. When a new element is considered, it can be added to the tree. Its value and the previously calculated sum of the tree are used to form the new node which in turn becomes their parent.

- a. Kruskal's algorithm
- b. Dijkstra's algorithm
- c. Huffman's algorithm
- d. None of the above

10. The ability of an object variable to take different forms is called

- a. polymorphism
- b. multi-faceted
- c. multi-homing
- d. None of the above

二、For each of the terms in the left-hand column below, select the term in the right-hand column that best matches it. (30%)

- | | |
|-------------------------|--|
| 1. _____ inheritance | A. A method of analyzing algorithms that considers the entire sequence of operations of the program. It allows for the establishment of a worst-case bound for the performance of an algorithm irrespective of the inputs by looking at all of the operations. |
| 2. _____ design pattern | B. Enumerate all possible configurations of the inputs involved and pick the best of all the configurations |
| 3. _____ amortization | C. A method for solving complex problems by breaking them down into simpler sub-problems |
| 4. _____ brute force | D. A method of solving optimization problems; The basic idea of the method is a recursive procedure in which at each step the input size is reduced by a constant factor $0 < p < 1$. |

系所組別：會計學系乙組

考試科目：資料結構

考試日期：0225，節次：3

- | | |
|------------------------------|--|
| 5. _____ dynamic programming | E. The process of repeating items in a self-similar way |
| 6. _____ greedy method | F. A technique which allows the design of general classes that can be specialized to more particular classes, with the specialized classes reusing the code from the general class |
| 7. _____ prune and search | G. An algorithm that follows the problem solving heuristic of making the locally optimal choice at each stage with the hope of finding a global optimum |
| 8. _____ recursion | H. A search heuristic that mimics the process of natural evolution |
| 9. _____ divide and conquer | I. Provides a template for a solution that can be applied in many different situations |
| 10. _____ genetic algorithm | J. Works by recursively breaking down a problem into two or more sub-problems of the same (or related) type, until these become simple enough to be solved directly |

三、問答題

1. What are three main steps repeatedly executed by a CPU in a machine cycle? (9%)
2. Is it possible to insert different type of elements in a stack? How? (4%)
3. An AVL tree satisfies the height-balance property. What is this property? (4%)
4. A heap T storing n entities has height $h = \text{floor}(\log n)$, where floor represents the floor function, e.g., $\text{floor}(3.4) = 3$. Please prove this property. (8%)
5. Please write the code that computes Fibonacci numbers using binary recursion. (5%)