國立成功大學

114學年度碩士班招生考試試題

編　號：87

系　所：工程科學系

科　目：資料結構

日　期：0211

節　次：第 1 節

注　意：1.不可使用計算機
2.請於答案卷(卡)作答，於試題上作答，不予計分。

1. Given the following two traversals of a binary tree. (20%)

   - Preorder traversal: F, B, A, D, C, E, G, I, H
   - Inorder traversal: A, B, C, D, E, F, G, H, I

Answer the following questions:

(1) Reconstruct the binary tree based on the given preorder and inorder traversals and draw the structure of the tree. (10%)

(2) Calculate the sum of the depths of all nodes in the reconstructed tree. Assume the root has a depth of 0. (10%)

2. Consider the following recursive function, where the input is an integer n

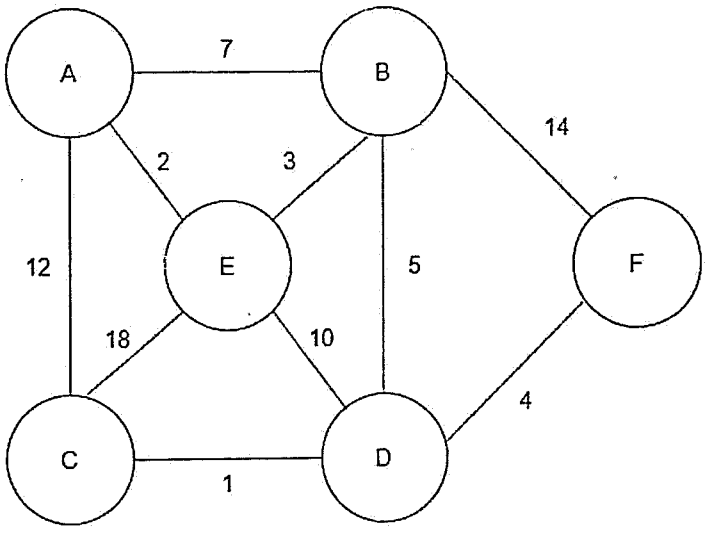
```
def mystery(n):
    if n <= 1:
        return 1
    else:
        return mystery(n / 2) + mystery(n / 2)
```

Analyze the **time complexity** of this function and express the result using big-O notation. (20%)

3. Consider the following graph. (20%)

   (1) Starting from node E, please use depth-first search, prioritizing smaller weights first, to calculate the sum of the weights. (10%)

   (2) Starting from node E, please use breadth-first search, prioritizing smaller weights first, to calculate the sum of the weights. (10%)



4. What type of sorting algorithm is being executed in the process of changing the contents of the following array? (20%)

   [5, 4, 3, 2, 1]>>[1, 4, 3, 2, 5]>>[4, 1, 3, 2, 5]>>[4, 2, 3, 1, 5]>>[1, 2, 3, 4, 5]
   >>[3, 2, 1, 4, 5]>>[1, 2, 3, 4, 5]>>[2, 1, 3, 4, 5]>>[1, 2, 3, 4, 5]

5. Consider the following graph. (20%)

(1) Using Prim's algorithm, start from node A and determine the weight of the third edge added during the construction of the minimum spanning tree. (10%)

(2) Using Kruskal's algorithm, determine the weight of the fourth edge added during the construction of the minimum spanning tree. (10%)