注意：背面有試題

1: (20%) Suppose we have two stacks and no other temporary variable.　Please "construct" a queue data structure using only the two stacks.

　　(A) describe your idea first for how your queue can operate (5 %)

　　(B) write a pseudo-program to demonstrate your described idea. (15 %)

2. (30 %) Assume that we have information on the employees of a firm as the following table.　For each employee, in addition to the employee's name, we have an occupational title, an ID number, and a location.　We would like to be able to access quickly the information for any of the categories.　For example, we might want to quickly retrieve the list of all employees who work in New York, or the list of all programmers.　What is the data structure meeting these requirements, as well as all of the following:
　　(1) allowing programmers to easily insert and retrieve any employee
　　(2) any employee data is not stored twice
　　(3) able to scale up to huge number of records
Please show your data structure in as example and explain how the *insert*, *delete*, and *search* operations should be done.
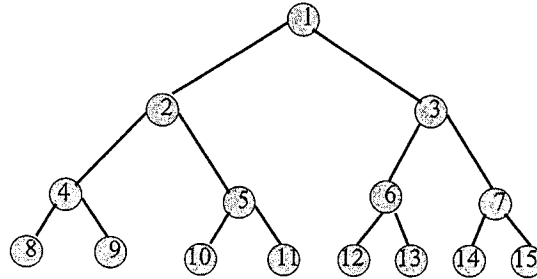
Node	ID Number	Name	Occupation	Location
A	10	Mary	Accountant	Taipei
B	20	Kathy	Consultant	Taichung
C	30	Maria	Programmer	Tainan

3. (25%) The first tree in this question is not a symmetric binary tree with structure.
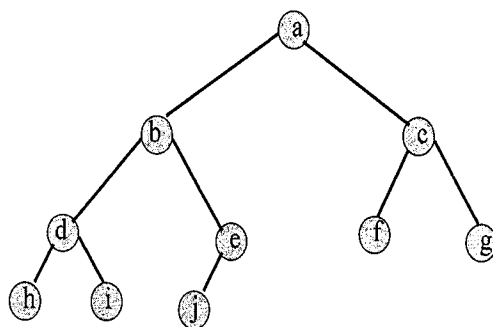
The second tree is a symmetric tree with structure. Make any additional assumptions if you need in answering 3.(A) and 3.(B) below.

(A) (20%) Write a recursive program to check whether a given binary tree is symmetric with its structure (you don't need to check the values in the nodes)?

(B) (5%) What is the complexity of your program, and why?

4. (25%) 4.(A), 4.(B), 4.(C) are questions about constructing binary trees from the traversal sequences:

(A) Given the following two traversal sequences, construct a binary tree follows these traversal sequences. (11%)

- in-order traversal sequence: *g d h b e i a f j c*
- pre-order traversal sequence: *a b d g h e i c f j*

(B) Can you construct the binary tree uniquely, given two traversal sequences, one in preorder and one in post-order? If not, provide a counter example. (7%)

(C) Can you construct the binary tree uniquely, given two traversal sequences, one in in-order and one in pre-order? If not, provide a counter example. (7%)