# Department of Computer Science and Engineering
# National Sun Yat-sen University
# Data Structures Quiz, Chapter 5, Dec. 1, 2014

1. (a) Explain the complete binary tree. And give an example to illustrate your answer. Note that you will get no score if you do not give both explanation and example. (15%)

   (b) Extend the array representation of a complete binary tree to the case of complete trees whose degree is *d*, *d*> 1. Develop the formulas for the parent and children of the node stored in position *i* of the array. Here, the root of the tree is stored in position 1 of the array. (15%)

2. The inorder sequence of a binary tree is BDAFEHGC, and its level-order sequence is ABCDEFGH. Please draw the tree. (20%)

3. Write a recursive C++ function to count the number of leaf nodes in a binary tree. (50%)

```
class TreeNode {
   int data;
   TreeNode *leftChild, *rightChild;;
};
int count( TreeNode *root)
// Return the number of leaf nodes in the binary tree
//       pointed by “root”.
// Return 0 if the binary tree is empty.
{
```

| |
|---|
| Please write the body of count ( ). |

```
} // end of count ( )
```

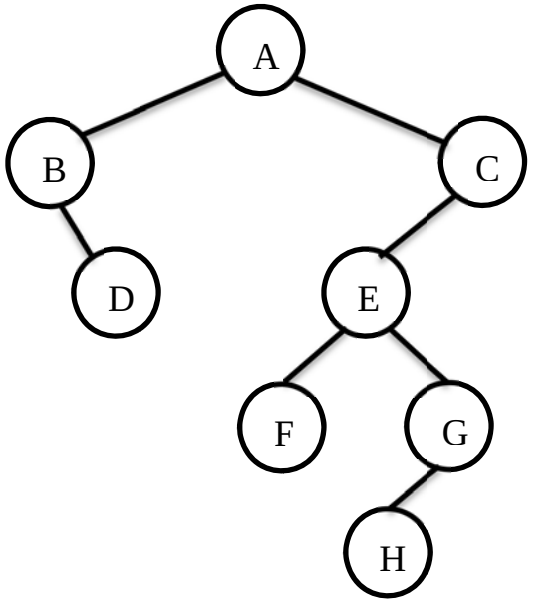
Answer:

1. (a) 如果 binary tree 有 L 個 level，則前 L-1 個 level 的所有 node 均存在。最下面(第 L 個 level)靠左側亦是連續存在 node，僅有可能其右側欠缺 node。

(b) parent of i: $\left\lfloor \frac{i+d(-2)}{d} \right\rfloor$

children of i: di-d+2, di-d+3, di-d+4, …, di, di+1

2.




3.

```
int count( TreeNode *root)
{
    if(root == NULL)
        returen 0;
    if(root->leftChild == NULL && root->rightChild == NULL)
        return1;
    else
        return count(root->leftChild) + count(root->rightChild)
}
```