

國立臺灣科技大學
九十三學年度碩士班考試試題

系所組別：電機工程系丙一組

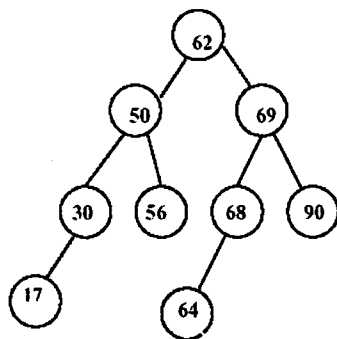
科 目：資料結構

總分 100 分

1. (12%) Explain the following terms
 - (a) Abstract Data Type
 - (b) Hashing
 - (c) Topological Sort
 - (d) Stack

2. (10%) Show that given a sequence of n numbers, the smallest $\left\lfloor \frac{n}{\log n} \right\rfloor$ numbers can be found in $O(n)$ comparisons.

3. (10%) Answer the following questions:
 - (a) Write down a recursive C function called *StringLength(char *str)* returning the length of a '\0'-terminated string specified by a *char ** pointer;
 - (b) Insert the value 66 into the AVL tree shown below. Show any intermediate step and circle your final answer.



4. (6%) Below are three binary tree traversal algorithms named mars(), jupiter() and mercury(). These traversal algorithms have more common names. What are they?

(a)

```

void mars() {
    if (left != null) left.mars();
    if (right != null) right.mars();
    print(this);
}
  
```

(b)

```

void jupiter(){
    if(left != null) left.jupiter();
    print(this);
    if(right != null) right.jupiter();
}
  
```

(c)

```

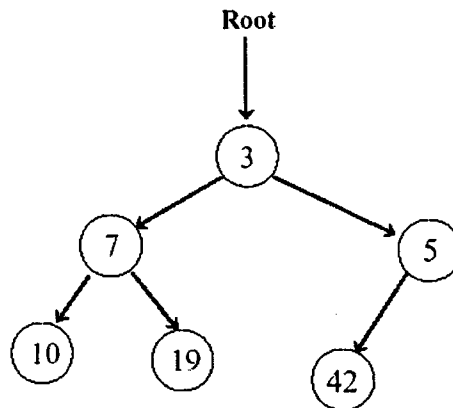
void mercury() {
    print(this);
    if(left != null) left.mercury();
    if(right != null) right.mercury();
}
  
```



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5. (12%) Write a function which finds the integer value of the maximum integer in an unordered tree (i.e., it is NOT a binary search tree), such as the one shown (note that your function must work on ANY such tree). You may assume that all integers in the tree are non-negative.



6. (15%) Use **Huffman** algorithm to encode the following message such that it contains the minimum number of bits and the shortest code length. The message is AABCDBCACCFEDEFAC.
7. (15%) Give a **Max Heap** by inserting the following sequence of numbers: 78, 48, 9, 11, 71, 51, 63, 18, 25, and 33.
8. (20%) Use **Kruskal's** algorithm to find a minimum cost spanning tree for the undirected connected graph with the cost beside each link shown below. Please mark the sequence to each link when it is added.

