

所 別：工程技術研究所
學程別：資訊工程學程

組別：

科目：計算機概論

1. (10%) Draw the max heap (i.e. the maximum at the top) that results when the following operations are performed on an initially empty heap: insert(1), insert(5), insert(2), insert(6), insert(8), remove, insert(7), insert(3).
2. (10%) Draw the top-down 2-3-4 tree built when the keys HARD QUESTION are inserted (in that order) into an initially empty tree.
3. (10%) Suppose that the dimensions of the matrices A, B, C, and D are 50×10 , 10×40 , 40×30 , and 30×5 , respectively. We want to know how best to compute $A \times B \times C \times D$. Show the table and the order of multiplication.
4. (10%) (a) What are NP-complete problems?
(b) How can you prove that a problem is NP-complete?

5. (10%)

int recursive(int n)

```
{  
    if (n <= 1) return 1;  
    return recursive(n-1) + recursive(n-1);  
}
```

Write down the recurrence equation for the time complexity of function recursive and solve it.

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6. 解釋名詞 [20pts]

- (a) Die (in VLSI)
- (b) Caller Save
- (c) Computer Family
- (d) Data Hazard

7. A computer instruction set has 8 instructions. 5 of them are given below:
add, sub, or, load, jump

The other three are left for you to determine. What will you choose? Justify your answer. [15pts]

8. Will you use software or hardware approach to handle the following misses? Justify your answer. [15pts]

- (a) TLB miss.
- (b) Cache miss
- (c) Page fault.