國 立 臺 北 科 技 大 學

100 學年度研究所碩士在職專班入學考試

電資碩士專班
甲組：計算機概論試題

填准考證號碼

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注意事項：

1. 本試題共【12】題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在試卷答案欄內，否則不予計分。

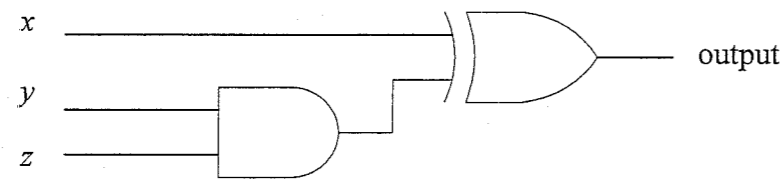1. Consider the circuit below:

Fig. 1

   (a) What is the logical expression of the circuit? (2%)
   (b) Show the truth table of the circuit. (4%)

2. Answer the following questions regarding data representation.
   (a) What is the hexadecimal equivalent of the unsigned binary number **1101011010111010**? (3%)
   (b) What is the 8-bit equivalent two's complement representation of **-13**? (3%)
   (c) Consider a floating point binary notation with 8 bits. From left to right, it consists of 1 bit for the sign (0= "+"), 3 bits for the exponent represented in excess four notation, and the remaining bits for the decimal part of the mantissa. Decode the bit pattern **01101011** using this floating point format? (4%)

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3. Consider a RISC CPU that has a five-stage pipeline: Instruction fetch, Decode, Execute, Memory access, and Write back. Each instruction can pass through a single pipeline stage in one clock cycle. Calculate the number of clock cycles required to completely process a sequence of 5 instructions for this CPU. Please show details of your calculation. (5%)

4. What are the differences between a network bridge and a router? (6%)

5. What are the differences between deadlock and starvation? (6%)

6. Consider an algorithm that requires $O(n^2)$ memory to process inputs where **n** is the size of the inputs to the algorithm. Suppose that the algorithm requires 5 Megabytes of memory to process 1000 inputs (i.e., **n** = 1000). If the algorithm is executed on a computer with 2 Gigabytes of memory, how large can **n** be? Justify your answer. (5%)

7. Given the following binary tree:
   (a) Traverse the tree in *pre-order* and list the traversal sequence in terms of node number. (3%)
   (b) Redraw the tree if a node 7 is inserted into the tree. (3%)
   (c) Suppose that the following recursive program **print_tree()** takes a binary tree and traverses and lists the node numbers of the tree in *in-order*. Modify the **print_tree()** program so that it will recursively traverse a binary tree and list the node numbers in *post-order*. (4%)
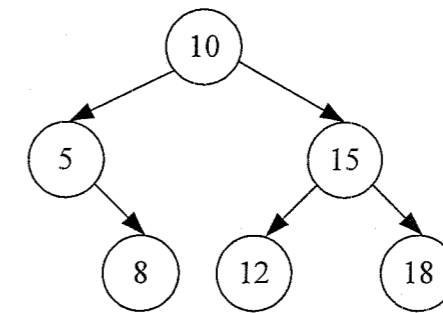

Fig. 2

```
void print_tree(binary_tree *t){
    if (! is_empty(t))          // check if the tree is null
    {
        print_tree(t->left);    // traverse left subtree
        printf("%d\n", t->value); // print out the node number
        print_tree(t->right);   // traverse right subtree
    }
}
```

Fig. 3

注意：背面尚有試題

8. Consider the data structures: arrays, linked lists, stacks, and queues.

   (a) Briefly describe the differences between the arrays and linked lists. (6%)

   (b) Briefly describe the differences between the stacks and queues. (6%)

9. Explain the following terms precisely and concisely.

   (a) IPv4 (4%)

   (b) HTTP (4%)

   (c) Denial of Service (4%)

   (d) Cloud Computing (4%)

10. Briefly describe each stage within the development phase of the software life cycle. (8%)

11. Describe the following object-oriented programming concepts.

   (a) Encapsulation (4%)

   (b) Polymorphism (4%)

12. Answer the following questions regarding database.

   (a) Summarize the distinction between a flat file and a database. (4%)

   (b) What is SQL (Structured Query Language)? (4%)