計算機概論（研究所入學考）[以中文作答]

1. Implement the combination logic $F(A,B,C,D)=\Sigma(0,1,2,3,10,12)+d(4,8)$
   (a) by using 3 level NAND gate (using minimal number of gates) (5%)
   (b)by using a decoder(5%);
   (c) Explain why we can use 3 level NAND gates to implement all combination logic(5%)
2. Convert the decimal number 35 to (a) a binary number, (b) an octal number(10%)
3. Design a 5-1-4-3-6 counter by using a synchronous up counter with load, reset, and count control and NOR gates. (DO NOT use Flip-Flop to implement the counter directly, suppose you have an up counter ready for use)(10%) Explain your design.
4. Explain why a JAVA program can be compiled and put in a WWW server and it can be run on any computer in the Internet?(10%)
5. In a window object oriented programming languages such as Visual C++, they always provide a set of built in classes with a set of pure virtual member functions. Can you explain (1) what is a pure virtual function.?(5%) (2) Why they want to have pure virtual member functions? (5%)
6. Write a function which accepts a string array *char *str[]* and number of elements in the array *int n* sort the string array according to the length of strings (from minimal length to maximal length). (10%) (DO NOT use recursive function call)
7. Explain why we need a function prototype before a real function call.(5%)

```
int   sum(int [],int);
.....
x=sum(a,5);
```

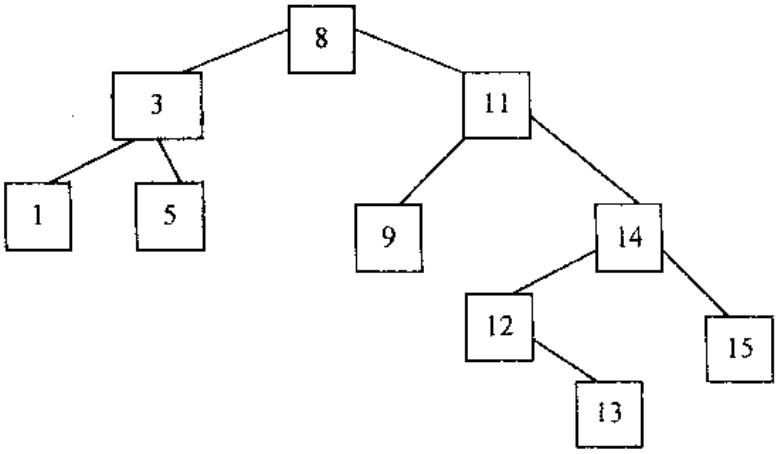
8. Converting the following recursive program scheme into an iterative version that does not use a stack. f(n) is a function that return TRUE or FALSE based on the value of n, and g(n) is a function that returns a value of the same type as n (without modifying n), (7%)

```
int  rec (int n)
{ if (f(n) = = FALSE) {
        /* any group of C statements that      */
        /* do not change the value of n        */
        rec(g(n));    }}
```

Generalize your result to the case in which *rec* return a value. (8%)

```
int  rec (int n)
{   int s=0;
    if (f(n) = = FALSE) {
        /* any group of C statements that      */
        /* do not change the value of n        */
            s += rec(g(n));    }}
```

9.Draw the following binary search tree after deleting the node with key 11.(5%)



10. given the following binary tree node declarations

```
typedef struct tree_node *tree_ptr;
struct tree_node { element_type element;
                   tree_ptr left;
                   tree_ptr right;};
typedef tree_ptr TREE;
```

Complete the following program to compute the height of a tree using a postorder traversal. (where T is a pointer pointing to the root of the tree TREE)(10%)

```
int height(TREE T)
{
  if (T = = null)
      _____(a);
  else
      _____(b);
}
```