國立彰化師範大學九十六學年度碩士班招生考試試題

系所：數學系　　組別：丙組　　科目：計算機概論(含資料結構)

★★請在答案紙上作答★★

1. **Stack is an important data structure in computer science, and it includes some operations on it. Answer the following questions:**
   (1) **Firstly define a data structure "stack" using an array, and describe the related four operations that consist of Pop, Push, Is_empty, and Is_full. (10%)**
   (2) **Firstly define a data structure "stack" using a linked list, and describe the related two operations that consist of Pop and Push. (10%)**

2. **Sequentially given the following items 17、29、15、53、34、60、7、13、45、30.**
   (1) **Please construct the corresponding "binary search tree". (10%)**
   (2) **Please construct the corresponding "max-heap tree". (10%)**

3. **As we all know, "Quick_sort" is a very famous sorting algorithm.**
   (1) **Please briefly describe the Quick_sort algorithm. (4%)**
   (2) **Please derive the time best-case time complexity = $O(n \log_2 n)$, where n is the number of a unsorted list. (3%)**
   (3) **Please derive the time worst-case time complexity = $O(n^2)$, where n is the number of a unsorted list. (3%)**

4. **Given a sorted list, Please briefly describe three searching algorithms as follows:**
   (1) **Binary searching (4%)**
   (2) **Fibonacci searching (3%)**
   (3) **Interpolation searching (3%)**

5. **Given an undirected and connected graph $G = (V, E)$ with weight edges, a spanning tree of G is a tree such that it covers all vertices of G with $|V|-1$ edges. The minimum spanning tree (MST) problem is to find a spanning tree (V, T) of G such that T has the minimum weight among all spanning trees of G. Please describe the Prime algorithm to solve the MST problem (7%). Moreover, please explain "why the cycle judgment is not required when adding an edge in the Prime algorithm" (3%)**

6. **Now, you want to create a website on a computer. The web site will provide texts, graphics, and database query for Internet users. What tools do you require to develop your web site? (Hint: you may list some useful tools that include "Programming tools", "Server tools", and "Database tools", respectively.) (10%)**

7. **According to the following items, please compare the properties or differences between them.**
   (1) **CISC and RISC machines. (4%)**
   (2) **MIPS and MHz. (3%)**
   (3) **ASCII and Big-5. (3%)**

8. Please list the output of the following C program. (10%)

```
#include <stdio.h>
main()
{
  int i, j;
  int a=0,b=0,c=0;
     for (i=1; i<=5; i++) {
        for (j=i; j>=1; j--){
           a=a+i;
           b=b+j;
           c=c+1;
         }
      }
     printf("a=%d \n", a);
     printf("b=%d \n", b);
     printf("c=%d \n", c);
}
```