國立彰化師範大學 105 學年度碩士班招生考試試題

系所：　**數學系**　　　　組別：　**丙組**　　　　　　科目：　**資料結構**

1. What does the following program print? (10%)

```c
#include <stdio.h>
#include <stdlib.h>

int main()
{
    int i, a[10]={1,4,7,0,3,6,9,2,5,8};
    for (i=0; i<10; i++){
        a[a[i]]++;
    }
    for (i=0; i<10; i++)
        printf("%3d", a[i]);
    return 0;
}
```

2. What does the following program print? (10%)

```c
#include <stdio.h>
#include <stdlib.h>
int main()
{
    int i, j, a[10];
    for (i=0; i<10; i++)
        a[i]=-1;
    for (i=0; i<10; i++){
        j=(i*i)%10;
        do {
            if (a[j]==-1){
                a[j]=i;
                break;
            } else {
                j=(j+1)%10;
            }
        } while (1);
    }
    for (i=0; i<10; i++)
        printf("%3d", a[i]);
    return 0;
}
```

3. What does the following program print? (10%)

```c
#include <stdio.h>
#include <stdlib.h>
int f(int);
int main()
{
    printf("%d", f(f(5)));
    return 0;
}

int f(int x){
    if (x==0)
        return 0;
    else
        return x+f(--x);
}
```

4. What does the following program print? (10%)

```c
#include <stdio.h>
#include <stdlib.h>
#include <ctype.h>
int main()
{
   char s[]="Hello World";
   int i=0;
   do {
      if (isupper(s[i]))
         printf("%c", s[i]);
      else
         printf("*");
      i++;
   } while (i<strlen(s));
   return 0;
}
```
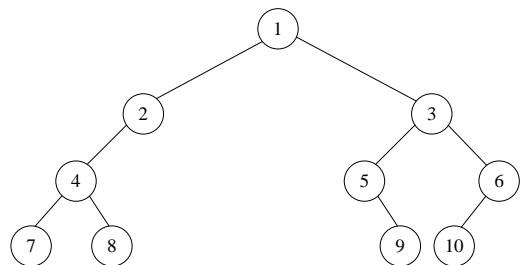
5. What does the following program print? (10%)

```c
#include <stdio.h>
#include <stdlib.h>
void swap(int *, int*);
int main()
{
   int a=10, b=20;
   printf("%d %d ", ++a, b--);
   swap(&a, &b);
   printf("%d %d ", a++, --b);
   return 0;
}
void swap(int *x, int *y){
   int temp;
   temp=*x;
   *x=*y;
   *y=temp;
}
```
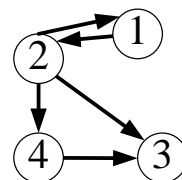
6. Write the traversal result of the following binary tree:

   (a)   inorder; (3%)

   (b)   postorder; (3%)

   (c)   breadth-first search; (3%)

   (d)   depth-first search. (3%)

7. Given the following weight graph, please write its

   (a) adjacency matrix; (5%)

   (b) adjacency lists; (5%)

   (c) adjacency multilists. (5%)

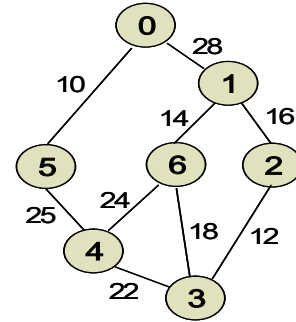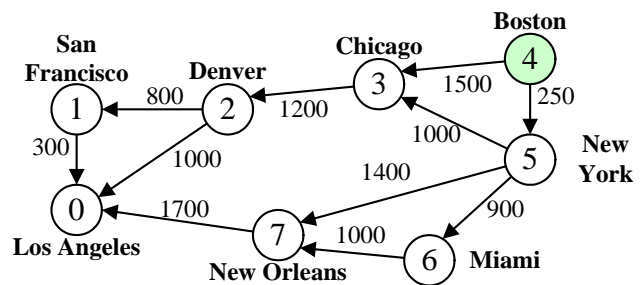**8.** Find the minimum-cost spanning tree of the following graph by using Prim's algorithm (5%)

(Note: You have to draw the immediate steps or briefly explain your answers. Answers without explanation get only 2 points).

9. Please find the **shortest paths** from vertex "Boston" to all other vertices of the following graph by Dijkastra's algorithm.(8%)

(Note: You have to draw the immediate steps or briefly explain your answers. Answers without explanation get only 4 points).

10. Please write the **recursive algorithm (or persudo code)** to read in an integer n input by a user and then print all possible permutations of the n integers. (10%)