

國立嘉義大學 114 學年度

資訊工程學系碩士班招生考試試題

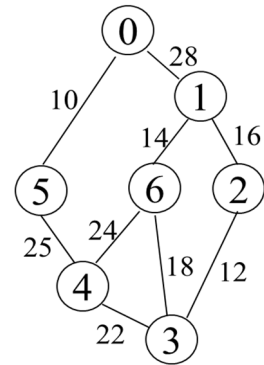
科目：資料結構（共 100 分）

1. How many children does a binary tree have? (10%)
2. Consider the following recursive function.

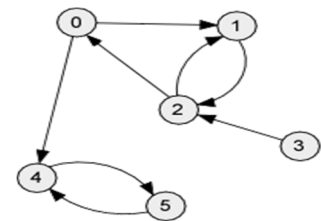
```
int f(int a,int b)
{
    if (a%b == 0)
        return b;
    else
        return f(b,a%b);
}
```

- a. What is the output value given by $f(300,65)$? (10%)
 - b. What is the output value given by $f(2477,127)$? (10%)
3. Answer the following questions with either true or false. Assume there are n elements in the data structure.
 - a. The core data structure of Depth-First Search is a list. (4%)
 - b. One can reverse the order of the elements in a linked list in time $O(n)$. (4%)
 - c. Returning the maximum element in a max-heap (but not deleting it from the heap) can be done in time $O(1)$. (4%)
 - d. One can implement a stack (of unbounded size) based on an array so that each individual push/pop operation is time $O(1)$. (4%)
 - e. One can implement a stack based on a linked list so that each individual push/pop operation is time $O(1)$. (4%)

4. Kruskal's algorithm builds a minimum cost spanning tree T by adding edges to T one at a time. The following is Kruskal's algorithm and the original graph with weighted values. Show the minimum cost spanning tree T by means of Kruskal's algorithm. (10%)



5. For the digraph shown in the right hand side: (20%)
- Obtain its adjacency-matrix
 - Obtain its adjacency-list representation
 - Obtain its inverse adjacency-list representation.
 - Obtain its adjacency-multilist representation



6. The pseudo program is shown in the following. (20%)

```
void program (item a[], item b[])
{
    int n,i,j,temp;
    n = a[0].valueC;
    b[0].valueA = a[0].valueB;
    b[0].valueB = a[0].valueA;
    b[0].valueC = n;
    if (n > 0)
        temp = 1;
        for (i = 0; i < a[0].valueB; i++)
            for (j = 1; j <= n; j++)
                if (a[j].valueB == i) {
                    b[temp].valueA = a[j].valueB;
                    b[temp].valueB = a[j].valueA;
                    b[temp].valueC = a[j].valueC;
                    temp++;
                }
    }
}
```

```
#define MAX_TERMS 100
typedef struct {
    int valueA;
    int valueB;
    int valueC;
} item;
item a[MAX_TERMS],
    b[MAX_TERMS];
```

- What is the purpose of carrying out the above pseudo program?
- Give the time complexity of the program in terms of big **oh**.