

國立中正大學

110 學年度碩士班招生考試

試題

[第 4 節]

科目名稱	資料結構
系所組別	資訊管理學系-乙組

—作答注意事項—

※作答前請先核對「試題」、「試卷」與「准考證」之系所組別、科目名稱是否相符。

1. 預備鈴響時即可入場，但至考試開始鈴響前，不得翻閱試題，並不得書寫、畫記、作答。
2. 考試開始鈴響時，即可開始作答；考試結束鈴響畢，應即停止作答。
3. 入場後於考試開始 40 分鐘內不得離場。
4. 全部答題均須在試卷（答案卷）作答區內完成。
5. 試卷作答限用藍色或黑色筆（含鉛筆）書寫。
6. 試題須隨試卷繳還。

1. (10 分) Assume the following message is encoded in Huffman codes with 1 and 0 bits

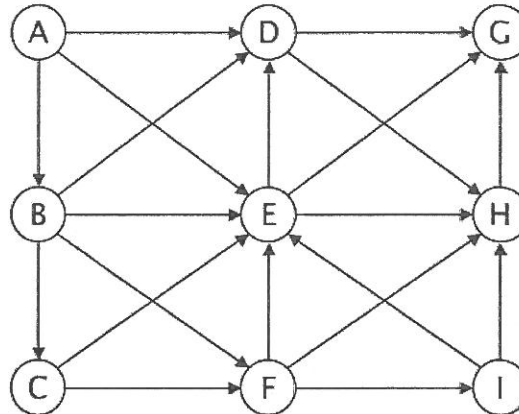
中正大學學正學大大學

What are the codes for each character of '中', '正', '大', '學'.

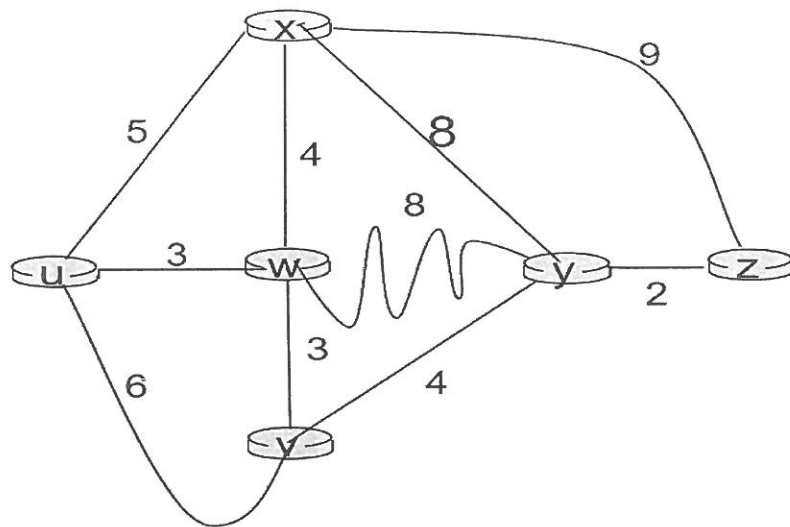
2. (10 分) Please mimic (模仿) the structure of binary tree whose nodes have a key value and two links to construct a ternary tree (三元樹) whose nodes have two key values and three links for the following integers that are inserted to the ternary tree one by one.

4, 33, 2, -2, 87, 44, 77, 1, 5

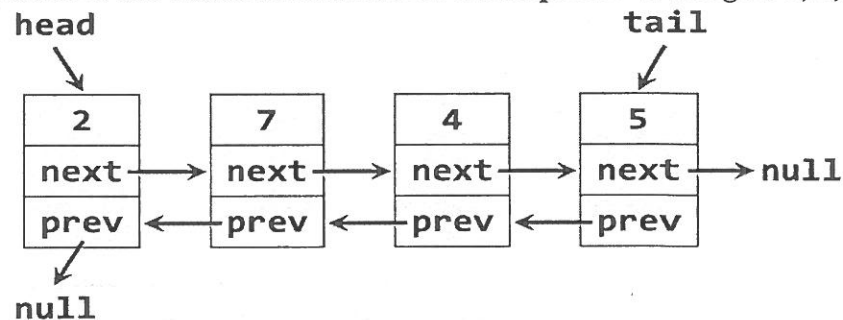
3. (20 分) Consider the following directed graph.



- Please write the three adjacent lists only for nodes A, B, and C. Note the elements in the adjacent lists are ordered in alphabetic order;
 - Please use the breadth-first search algorithm, starting from node E, to travel the graph. Please list all the nodes one by one that the travelling encounters.
4. (20 分) The complex number is composed by two parts, one is real number and the other the imaginary part, like $2 + 3i$, $-6.3 + -5.2i$. Suppose we use the notation, (rno, ino), to represent the complex number, where rno and ino is a floating number. For example, (2, 3), (-6.3, -5.2) represent the complex numbers, $2 + 3i$ and $-6.3 + -5.2i$, respectively. Please write the multiplication function in any programming language with two complex numbers being its input parameters to compute the multiplication of the two input complex numbers.
5. (20 分) The following graph shows the nodes, bi-directional edges, and length of edges. a. Please use either Kruskal's or Prim's algorithm to find the shortest paths from node u to all nodes; b. Suppose we just want to find the shortest path from node u to node z, and we intend to use dynamic programming to get it. Please write the recurrent equation for the shortest path from node u in the graph.



6. (20 分) Suppose you have the double linked list for the sequence of integers 2, 7, 4, and 5, as follows:



Suppose we have the definition of class for a node as follows:

```
public class LinkedQueue<T>
{
    public int Count { get; private set; }
    public void Enqueue(T element) { ... }
    public T Dequeue() { ... }
    public T[] ToArray() { ... }

    private class QueueNode<T>
    {
        public T Value { get; private set; }
        public QueueNode<T> NextNode { get; set; }
        public QueueNode<T> PrevNode { get; set; }
    }
}
```

- Please write the codes (in any programming language) for the subroutine get and set of NextNode and PrevNode;
- Please write the codes (in any programming language) for the subroutine Enqueue.