

考生注意：

1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

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1. Suppose you are playing a turn-based strategy game which has a graph layout as shown in figure 1. On the map, each node  $N$ , stands for a castle, and the weighted value associated with edge,  $e<I, J>$ , is the cost to go to a war between two adjacent castles,  $I$  and  $J$ . At first, you have one castle as your starting point. At each turn, you choose one and only one enemy's castle which is adjacent to your territory to attack and conquer.
  - a. Design a data structure, which determines whether two specified castles,  $I$  and  $J$ , are adjacent in constant time, to represent the above graph. (5%)
  - b. Consider the playing style of this game. Write down an algorithm using your data structure to decide the invading sequence with the minimum war cost. (10%)
  - c. Explain the complexity of your algorithm. (10%)

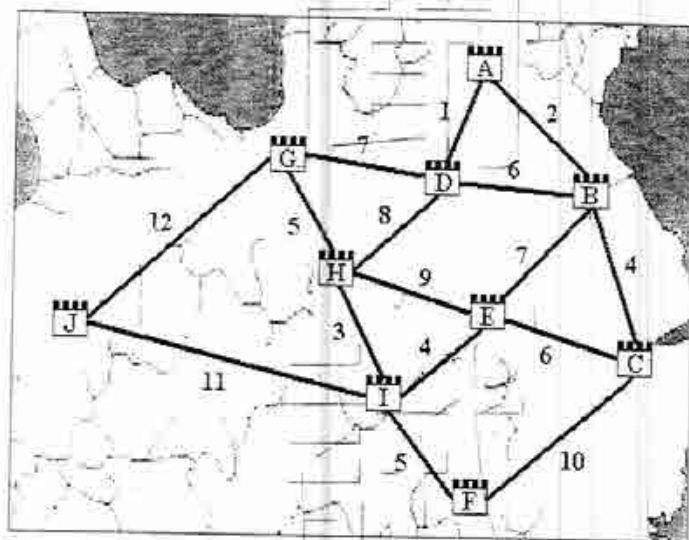


Figure 1.

2. Show and explain the time complexities of Quick sort under three situations, the best case, the average case and the worst case. (20%)
3. Consider the following matrices chain production,
 
$$M_1 (3 \text{ by } 4) * M_2 (4 \text{ by } 2) * M_3 (2 \text{ by } 5) * M_4 (5 \text{ by } 6) * M_5 (6 \text{ by } 3).$$
  - a. Write down a C or JAVA-like program to perform the matrix chain product operation based on the strategy of dynamic programming with the fewest scalar multiplications. (20%)
  - b. Use your program to find the "best" parenthesization order and the execution times of scalar multiplications for the above five matrices. (10%)

科目：資料結構與演算法 適用：資工所

編號：415

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4. a. Define the Voronoi diagrams. (5%)  
b. Write down a Divide-and-Conquer algorithm to construct the Voronoi diagram. (10%)  
c. Use your algorithm to construct the Voronoi diagram of figure 2. (10%)

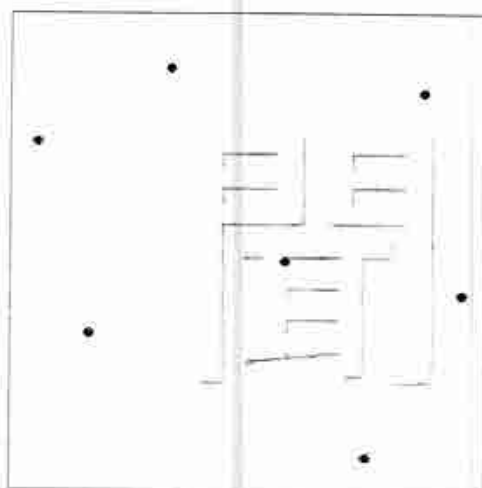


Figure 2.