

科目：資料結構與演算法 適用：資工所

編號：415

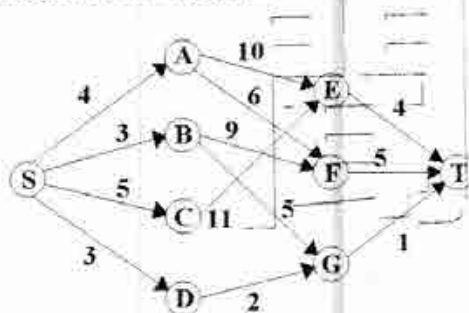
考生注意：

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。

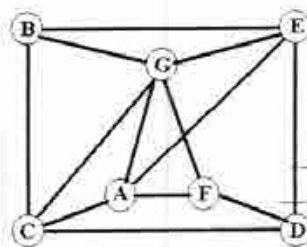
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1. Suppose you are given  $N$  elements and are required to determine the  $k$ th smallest element in linear time by the prune-and-search strategy.
  - a. Explain the basic concept of the linear-time prune-and-search selection algorithm. (10%)
  - b. How do you select the partitioning element  $p$  so that you can always prune away at least  $n/4$  elements during each iteration? Explain your answer. (10%)
  - c. Prove the time complexity of the algorithm in the worst case is  $O(n)$ . (10%)

2. Consider the following graph.



- a. Find the shortest route from  $S$  to  $T$  by the dynamic programming approach. (10%)
  - b. Solve the same problem by using the branch-and-bound approach. (10%)
  - c. So far as this problem is concerned, which approach is better. Explain your answer. (10%)
3. Give a proper representation of graph  $G = (V, E)$ , as shown in the following graph, for each of the following two requirements.



- a. Report all the vertices that are adjacent to a specified vertex  $V_i$  in time proportional to the number of vertices reported. (5%)
- b. Determine whether two specified vertices  $V_i$  and  $V_j$  are adjacent in constant

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time. (5%)

4. Consider the following input key sequence.

"ANAVLTREESORTINGPROBLEM"

a. Construct the AVL trees step-by-step. (15%)

b. Sort the key sequence by using the AVL tree sorting method. (15%)

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