編號： 202

國立成功大學 108 學年度碩士班招生考試試題

系　　所：電機資訊學院-資訊聯招

考試科目：程式設計　　　　　　　　　　　　　　　　考試日期：0223，節次：2

※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

Part I.

資料結構 (50%)

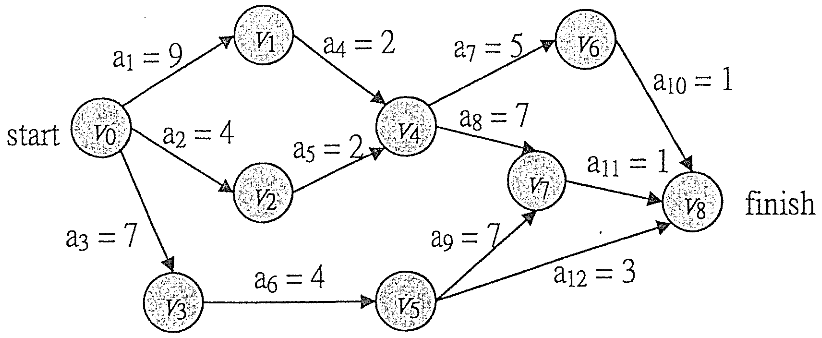
1. Answer **True** or **False** for the following statements. Give correct answers or explain clearly for **False** statements. (12%)

   (1) Let G be a graph with e edges and v vertices. If G is represented by adjacency matrix, DFS requires $O(e^2)$ time. (4%)

   (2) The path from vertex u to vertex v on a minimal cost spanning tree of an undirected graph G is also a shortest path from u to v. (4%)

   (3) In static hashing, the worst-case number of comparisons needed for a successful search is $O(n)$ for open addressing. The number could be reduced to $O(\log n)$ by using chaining method. (4%)

2. Consider the following AOE network: (18%)



   (1) Obtain $e(i)$ and $l(i)$ for all activity i. (7%)

   (2) List all critical activities. (7%)

   (3) List all critical paths. (4%)

3. Given the following 8 runs: (20%)

5	8	23	1	4	3	16	11
13	18	27	15	10	20	17	21
22	30	38	19	24	32	35	25

   (1) Draw the corresponding winner tree. (5%)

   (2) Draw the restructured winner tree after one record has been output. (5%)

   (3) Draw the loser tree based on the answer of question (2). (5%)

   (4) Derive the total required time to merge n records through a winner tree with k runs. (5%)

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二、演算法：(50%)

4. (10%) How can we prove the given problem is NP-complete?

5. (10%) Give an algorithm that determines whether or not a given undirected graph G=(V,E) contains a cycle. Your algorithm should run in O(V) time, independent of |E|.

6. (10%) True or false, please explain your answer.
   (a) (2%) 0-1 knapsack problem can be solved by greedy strategy.
   (b) (2%) In an undirected graph, we can apply the Depth-First-Search algorithm (DFS) to get tree edges and cross edges.
   (c) (2%) Based on the top-down approach, we can use the memorization to reduce the time.
   (d) (2%) Unweighted longest simple path problem has the optimal sub-structure.
   (e) (2%) If we first apply the topology sort to a directed graph and then run the DFS algorithm on this graph, no back edges can be obtained.

7. (10%) Use Master theorem to solve the recurrence $T(n) = T(2n/3) + 1$.

8. (10%) Write the breadth first spanning tree starting at node 0 (visit the smaller number first).