

國立中央大學 108 學年度碩士班考試入學試題

所別： 資訊管理學系 碩士班 甲組(一般生)

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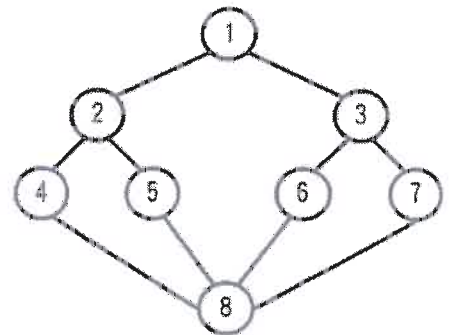
科目： 資料結構

本科考試禁用計算器

申論問答題(含簡單計算)

**Question 1. (33%)**

- (A) Please use the following data {33, 78, 11, 48, 20, 55, 33, 99} to build a binary search tree (6%). Based on the binary search tree, please describe the procedure of in-order (6%) traversal and show the final result.
- (B) Based on the following data: 3, 2, 6, 4, 1, 5, please describe the processes and their results by using the Selection Sort (7%).
- (C) Please describe the Depth-first Search (DFS) (7%) and Breadth-first Search (BFS) (7%) of Graph Traversal according to the graph shown below and show their final results.



**Question 2. (33%)**

You are given a matrix  $A = \begin{bmatrix} x_{11} & x_{12} & x_{13} & x_{14} \\ x_{21} & x_{22} & x_{23} & x_{24} \\ x_{31} & x_{32} & x_{33} & x_{34} \\ x_{41} & x_{42} & x_{43} & x_{44} \end{bmatrix}$  for the following questions.

- (A) With  $\{x_{11} = 1, x_{12} = 2, x_{21} = 3, x_{22} = 0, x_{24} = 6, x_{33} = 1, x_{32} = 5, x_{44} = 0, x_{43} = 7\}$  and otherwise  $x_{ij} = \infty$  (infinity) for  $A$ , what structure in graph is represented by  $A$ ? Explain your answer in detail (17%).
- (B) With  $\{x_{ij} = 0 \text{ if } i = j\}$  and  $\{x_{ij} = 1 \text{ if } i \neq j\}$  for  $A$ , what structure in graph is represented by  $A$ ? Explain your answer in detail (16%).

**Question 3. (14%)**

Let  $T$  be a 2-3 tree of height  $h$ . What is the possible number of leaves?

- (A) What is the possible number of leaves? (4 %)
- (B) Prove your answer to (a). (10 %)

**Question 4. (20%)** 【程式設計題，為了閱卷品質和您的得分著想，你所寫的程式須注意可讀性，字跡工整並適當縮排】

There are  $n$  integer elements in an array  $A$ . Write a non-recursive program in C language to find the  $k^{\text{th}}$  small element in the array  $A$ . You are not allowed to sort the array  $A$ . (20 %)

參考用