

國立中正大學

112 學年度碩士班招生考試

試題

[第 2 節]

科目名稱	資料結構
系所組別	電機工程學系-計算機工程組

—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. Binary Search Tree (BST)

Complete the breadth first traversal on a BST using a queue. Answer the following questions.

- i. (5 points) Draw a diagram to the design of your queue and explain how you can apply the concept of ADT (abstract data type) in your design. Explain your strategy of using a queue to perform the breadth first traversal.
- ii. (5 points) Define the data structures of the queue described above using C or pseudo code.
- iii. (15 points) Define the following operations to the queue:
 - 1) NewQ: to create and initialize a queue to use.
 - 2) EnQ: to perform enqueue
 - 3) DeQ: to perform dequeue
- iv. (10 points) Define a function which performs the breadth first traversal on a BST. Use C or pseudo code to complete your answer. Be sure to define the function header and local variables clearly.

2. Sorting

- i. (15 points) Define the function to perform the **Selection Sort** on an integer array. The sorted array is in ascending order. Use C or pseudo code to complete your answer. Be sure to define the function header and local variables clearly.
- ii. (10 points) Analyze the time complexity of the function above and show the result in the Big-O notation. Be sure to show the steps of analysis with your explanation and the associated detail calculation.

3. Application

Consider a string defined by a linked list of characters illustrate here, in which a string "HELLO" is represented. For the questions below, use C or pseudo code to complete your answers. Be sure to define the function header and local variables clearly.



- i. (5 points) Design the data structure of a node with a field storing a single character and a pointer to the next node.
- ii. (15 points) Write the function to perform string comparison on two such strings.
- iii. (10 points) Write the function to perform string copy to produce a new string based on a given string. Be sure to create a new string and not just having a pointer pointing to the given string.
- iv. (10 points) Write the function to free the memory of all nodes in a given list.