國立中正大學
111 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。

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科目名稱：資料結構　　本科目共 1 頁　第 1 頁

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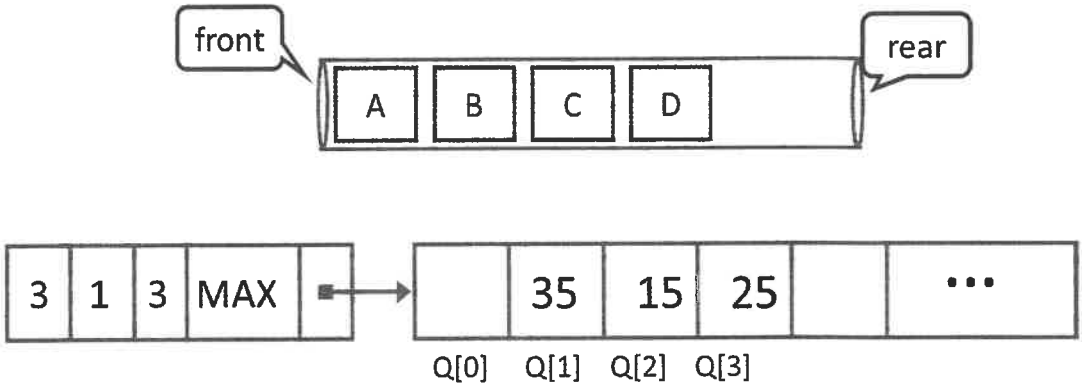
1. Queues

Consider the following concept of a queue where the elements, A, B, C, and D, are integers. An example of design using an array is given below. The head of the queue contains five fields, the element count, the index to the front, the index to the rear, the maximum size of the array storage, and the pointer to the array storage. Answer the following by writing C code or pseudo code.



i. (5 points) Define the data structures to the queue head and the queue storage shown above.

ii. (20 points) Define the Enqueue function and the Dequeue function as regular FIFO (First In, First Out) manner.

iii. (10 points) Re-design your queue operations to make the above a priority queue in which the larger value comes out first.

2. Sorting

i. (15 points) Define the function to perform the **Heap Sort** on an integer array. The sorted array will be in ascending order. Be sure to define the function name, parameter list, return value, local variables, and calling method. Use C or pseudo code to complete your answer.

ii. (15 points) Analyze the time complexity of the function above and show the result in the Big-O notation. Be sure to show the steps in analysis and the associated calculation in detail.

3. Application

Consider a file containing 2 integers. There are two lines in the file, and each line contains just one integer with an unknown number of digits. Your task is to read those two integers, add two integers, and print the result. Answer the following by writing C code or pseudo code. For example, adding 11111111112222222222333333333344444444444 and 55555555556666666666777777777 will result 111111111177777777780000000000222222221.

i. (5 points) Design your data structure to store the integers. *Note: unknown number of digits.*

ii. (15 points) Using the data structure above, write the function to read two integers from the input file.

iii. (15 points) Write the function to add such two integers and print the result.