

國立中正大學  
113 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。

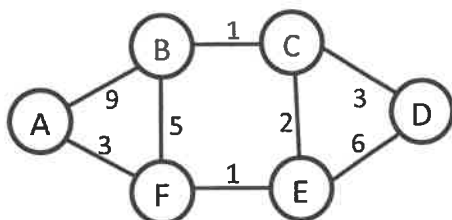
1. **Heap.**

- i. (10 points) Given an integer array, create a function to transform that array into a **heap**. Use C or pseudo code to complete your answer. Make sure no extra array is used besides the given array.
- ii. (5 points) Using your function above, process this array defined as `int myArray1[5] = {10, 3, 40, 5, 100}` to make it into the corresponding heap. Draw the result.
- iii. (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 detail calculation along with your explanation.

2. **Sorting.**

- i. (15 points) Including the method above in constructing a heap, define a **heap sort** function which sorts the data in an ascending order. Use C or pseudo code to complete your answer. Make sure no extra array is used besides the given array.
- ii. (15 points) Analyze the time complexity of the heap sort function above and show the result in the Big-O notation. Be sure to show the steps in analysis and the associated detail calculation along with your explanation.

3. **Graphs.** Use the graph below to answer the questions.



- i. (10 points) Draw the **adjacent matrix** to represent the above graph. Use C or pseudo code to define the corresponding data structures.
- ii. (5 points) Show the **shortest paths** from the node A to each node as the destinations Show all five paths. Be sure to show the cost of each path. (Node A to Node B; Node A to Node C; Node A to Node D; Node A to Node E; and Node A to Node F).
- iii. (15 points) Given an adjacent matrix like above, construct a function which produces the costs of the shortest paths from one specific node to each of other nodes. Use C or pseudo code to complete your answer. The function needs to support up to 20 nodes.
- iv. (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 in analysis and the associated detail calculation along with your explanation