

國立臺北護理學院九十六學年度碩士班招生

資訊管理系碩士班

資料結構試題

注 意	1.請用中文或英文作答。 2.請依題號次序於答案卷上作答。
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I. This question relates to sorting values. (20%)

- (a) Explain how to merge two sorted arrays a_1 and a_2 into a third array a_3 , using diagrams to illustrate your answer. What is the time complexity of the array merge algorithm?
- (b) Merge-sort is a widely-used sorting algorithm. Suppose that you got only one array a with values. Write down the array merge-sort algorithm. Use diagrams to show how this algorithm works. What is its time complexity?

II. This question relates to the fundamental data structures. (20%)

- (a) Explain the fundamental concepts and difference among a *list*, a *stack* and a *queue*.
- (b) What is a *dequeue* data structure. Show how a *dequeue* could be represented by a doubly-linked list, using a diagram to display the invariant of this representation.

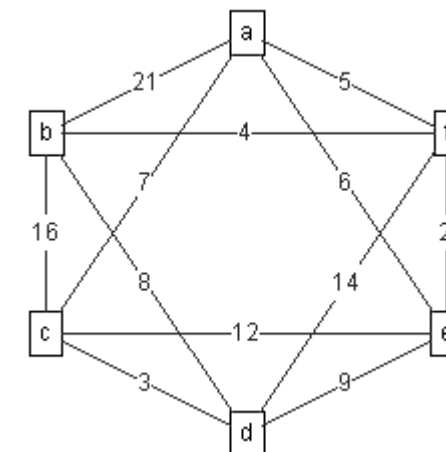
III. This question relates to the Binary Search Tree. (20%)

- (a) Draw the tree that results from inserting the numbers “20, 10, 8, 28, 7, 3, 22, 30, 18, 23, 35, 19” into a Binary Search Tree in that order. Continued answer questions (b) ~ (e).
- (b) What is the height of the tree?
- (c) Indicate the leaf nodes.
- (d) How many interior nodes are there?

- (e) Write down the preorder, inorder and postorder traversals of the tree.
- (f) According to the result of question (a), re-draw a new tree that results from deleting number 10.

IV. This question relates to the minimum spanning tree problem. (20%)

- (a) Consider the following weighted graph. Apply Prim’s algorithm in calculating the minimum spanning tree for the graph and draw the minimum spanning tree identified by Prim’s algorithm.



- (b) Design a data structure, which can store the above weighted graph.
- (c) Write down the pseudo code of Prim’s algorithm, and what is the time complexity required by Prim’s algorithm.

V. This question relates to the algorithm analysis problem. (20%)

Mergesort and Quicksort are two divide and conquer algorithms. Compare and contrast them with respect to:

- (a) Their time complexity,
- (b) Their space complexity,
- (c) Their stability when implemented,
- (d) The ease of “splitting the unsorted file” and “joining the sorted sub-files”.