

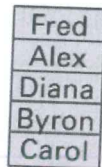
# 國立臺灣師範大學 101 學年度碩士班招生考試試題

科目：計算機概論

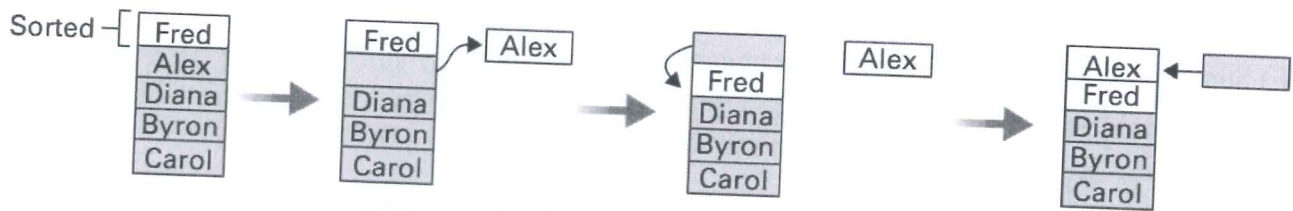
適用系所：資訊教育研究所

注意：1.本試題共 3 頁，請依序在答案卷上作答，並標明題號，不必抄題。2.答案必須寫在指定作答區內，否則依規定扣分。

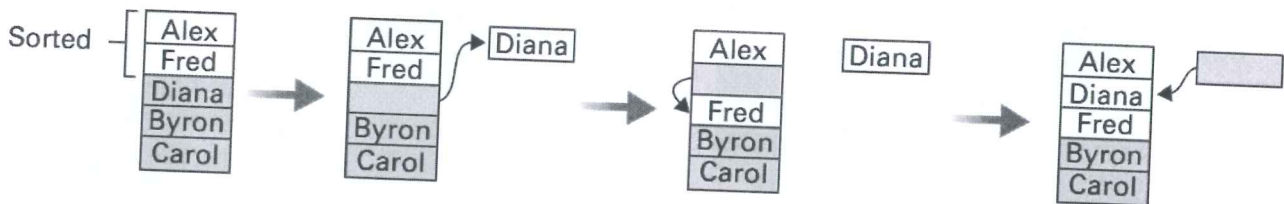
一、Consider the problem of sorting a list of names into alphabetical order. Consider the following list of five names.



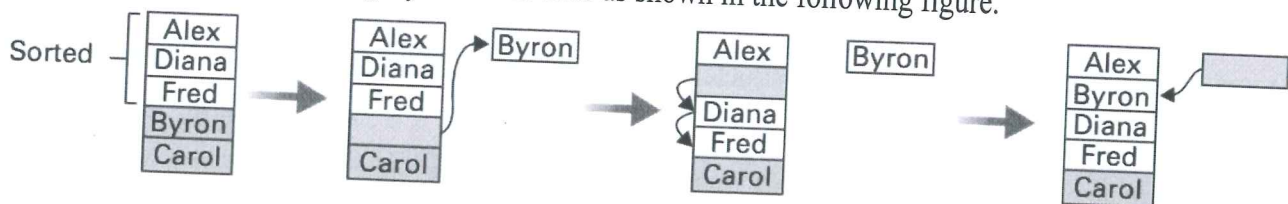
The insertion sort algorithm to sorting this list is to note that the sublist consisting of only the top name, Fred, is sorted but the sublist consisting of the top two names, Fred and Alex, is not. Thus we might pick up the card containing the name Alex, slide the name Fred down into the space where Alex was, and then place the name Alex in the hole at the top of the list, as represented by the following figure.



Now the top two names form a sorted sublist, but the top three do not. Thus we might pick up the third name, Diana, slide the name Fred down into the hole where Diana was, and then insert Diana in the hole left by Fred, as summarized in the following figure.



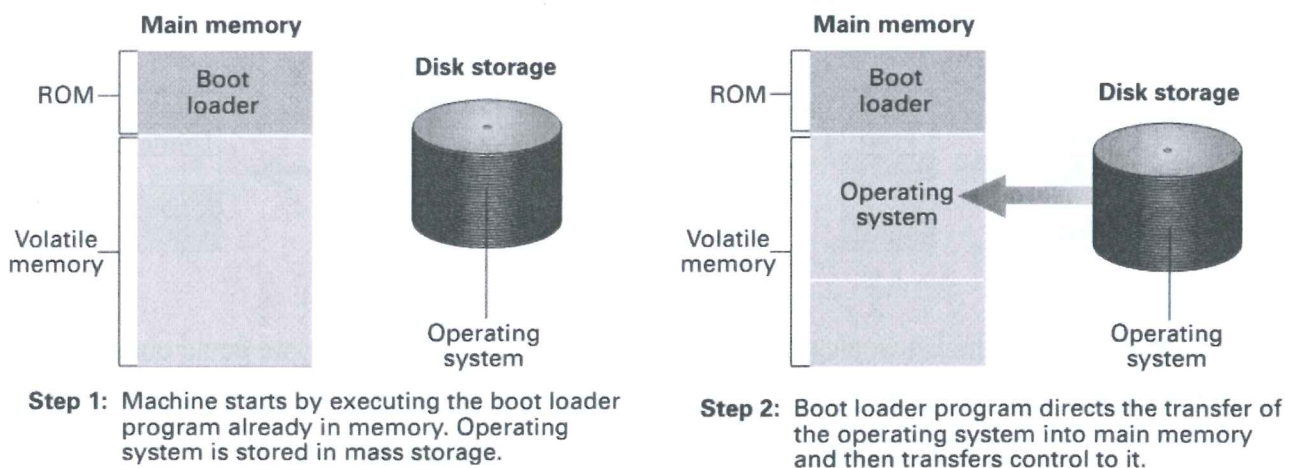
The top three entries in the list would now be sorted. Continuing in this fashion, we could obtain a list in which the top four entries are sorted by picking up the fourth name, Byron, sliding the names Fred and Diana down, and then inserting Byron in the hole as shown in the following figure.



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- (A) Finally, we can complete the sorting process by picking up the fifth name, Carol. Please draw a figure to show the last process.(5 分)
- (B) Recall that the insertion sort algorithm involves selecting a list entry, called the pivot entry, comparing this entry to those preceding it until the proper place for the pivot is found, and then inserting the pivot entry in this place. In the best possible case, each pivot is already in its proper place, and thus it needs to be compared to only a single entry before this is discovered. In this best case, applying the insertion sort to a list with  $n$  entries, what is the total number of comparisons? (5 分)
- (C) In contrast, the worst case is that each pivot must be compared to all the preceding entries before its proper location can be found. This occurs if the original list is in reverse order. In this case the first pivot (the second list entry) is compared to one entry, the second pivot (the third list entry) is compared to two entries, and so on. In this worst case, what is the total number of comparisons when sorting a list of  $n$  entries? (5 分)
- (D) In the average case of the insertion sort, we would expect each pivot to be compared to half of the entries preceding it. This results in half as many comparisons as were performed in the worst case. In the average case, what is the total of comparisons to sort a list of  $n$  entries? (5 分)
- (E) Suppose we find that a computer programmed with the insertion sort algorithm requires an average of one second to sort a list of 1000 names. How long do you estimate it takes to sort a list of 10000 names? (5 分)
- (F) The insertion sort algorithm is an example of using iterative structures. What is the meaning of iterative structures? (5 分)

二、The following figure shows the booting process in a typical desktop computer.



- (A) The computer's main memory is constructed from ROM and volatile memory. What does "volatile" mean? (5 分)
- (B) The computer has two types of memory: main memory and disk storage. It shows memory hierarchy. What is the purpose of memory hierarchy in a computer system? (5 分)

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- (C) The boot loader is stored in the machine's ROM instead of RAM. Please explain the main reason. (5 分)
- (D) Please explain the main reason why typical desktop computers are not provided with enough ROM to hold the entire operating system so that booting from disk storage would not be necessary. (5 分)

三、Consider the relations shown below.

X relation			Y relation	
U	V	W	R	S
A	Z	17	20	J
B	D	191	23	K
C	Q	17		

- (A) What is the appearance of the relation RESULT after executing the following instruction? (5 分)  
RESULT  $\leftarrow$  SELECT from X where W = 17
- (B) What is the appearance of the relation RESULT after executing the following instruction? (5 分)  
RESULT  $\leftarrow$  JOIN X and Y where X.W  $\leq$  Y.R
- (C) What is the purpose of the PROJECT instruction in a relational database? (5 分)
- (D) What is the difference between relational database and network database? (5 分)
- 四、(A) Suppose that the hard disk on your personal computer rotates at 7200 RPM, that each track contains 16 sectors, and that each sector contains 1024 bytes. Approximately what communication rate is required between the disk drive as they are read from the spinning disk? (5 分)
- (B) Estimate how long would it take to transfer an English novel with 8,000,000 characters encoded in ASCII at transfer rate of 57,600 bps. (5 分)

五、請解釋下列名詞(若只做中文翻譯，則不予計分)

- (A) SIMD architecture (4 分)
- (B) stored-program concept (4 分)
- (C) round-off error (4 分)
- (D) public-key cryptography (4 分)
- (E) HTML (4 分)