※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

一 選擇題 (40%)

1) A stack follows a _____ rule.

　　A. LILO　　　　B. fair stay　　C. FILO　　D. FIFO

2) In a circular doubly linked list with 10 nodes, we will need to change __ links if we want to delete a node other than the head node.

　　A. 3　　B. 2　　C. 4　　D. none of the above

3) The time complexity for sorting n numbers using the insertion sort algorithm is _____.

　　A. $O(n^2)$　　B. $O(n \log n)$　　C. $O(n)$　　D. $O(n^2 \log n)$

4) When we use a max heap to implement a priority queue, the time complexity of both the add and delete operations are _____.

　　A. $O(\log n)$　　　B. $O(n)$　　　C. $O(n \log n)$　　　D. none of the above

5) _____ is when an object or class is based on another object or class, using the same implementation.

　　A. Polymorphism　　B. Inheritance　　C. Strong coupling　　D. Abstract data type

6) In object oriented programming, _____ is a language feature that allows a subclass or child class to provide a specific implementation of a method that is already provided by one of its superclasses or parent classes.

　　A. method disengaging　　B. method dereferencing　　C. method overriding　　D. none of the above

7) _____is a computer programming mechanism in which the method being called upon an object or the function being called with arguments is looked up by name at runtime.

　　A. Late binding　　B. Runtime interpretation　　C. Runtime checking　　D. none of the above

8) In computer science, a _____ is a technique that is commonly used for lossless data compression.

　　A. pseudo code　　B. Hamming code　　C. Huffman code　　D. none of the above

9) The memory address of the first element of an array is called

　　A. floor address　　B. foundation address　　C. first address　　D. base address

10) Which of the following is not the required condition for binary search algorithm?

　　A. The list must be sorted

　　B. there should be the direct access to the middle element in any sublist

　　C. There must be mechanism to delete and/or insert elements in list

　　D. none of above

二 問答題

1. Give the best Big-O characterization for each of the following running time estimates (where n is the size of the input problem). (24%)

A. $\log(n) + 10000$

B. $n(\log n) + 15n + 0.002n^2$

C. $37n + n \log(n^2) + 5000 \log(n)$

D. $1000n^2 + 16n + 2^n$

E. $n+(n-1)+(n-2)+....+3+2+1$

F. $2^{10} + 3^5$

2. The table below represents a portion of a computer's main memory containing a linked list. Each entry consists of two cells, the first being data, the second being a pointer to the next entry. If the nil pointer is represented by 00 and the list's head pointer contains 52, modify the memory cells so the data at address 50 replaces the second entry in the list. (6%)
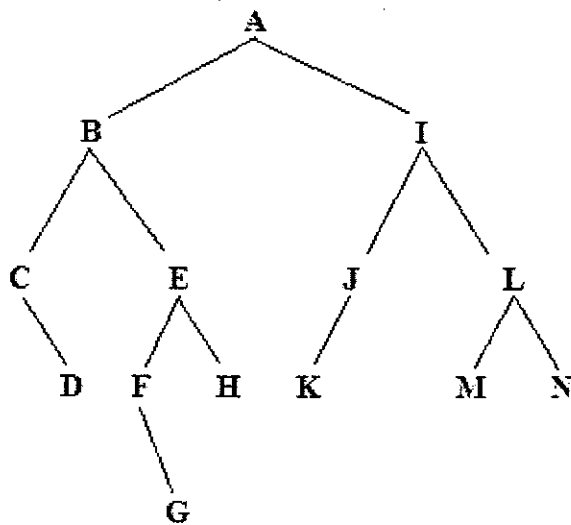
Address	Contents
50	AA
51	00
52	BB
53	58
54	CC
55	00
56	DD
57	00
58	EE
59	54

3. (9%)

A. Is the following tree a "Binary Tree"? (yes or no)

B. Which node is the sibling of E?

C. Which node is the sibling of H?

A

B　　C　　　D　　E

F　G　　　　H　　I J K

M

L

N
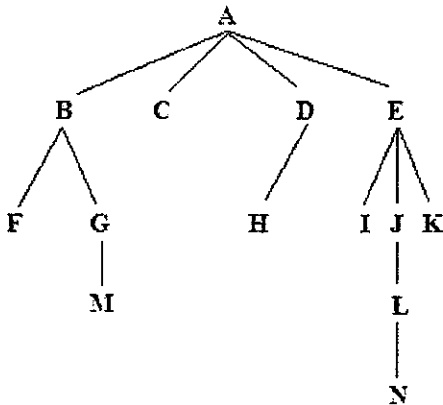
4. Answer the following 3 questions based on this graph. (12%)

A

B　　　　　　I

C　　E　　J　　L

D　F　H　K　　M　N

G

A. What's the result of "Preorder Traversal"?

B. What's the result of "Inorder Traversal"?

C. What's the result of "Postorder Traversal"?

5. An algorithm takes 0.5 ms for input size 100. How large a problem can be solved in 1 min if the running time is the following (assume low-order terms are negligible)? (9%)

　A. linear

　B. $O(N \log N)$

　C. quadratic