

國立交通大學八十九學年度碩士班入學考試試題

科目名稱：資料結構與網際網路概論(472)

考試日期：89年4月23日 第 2 節

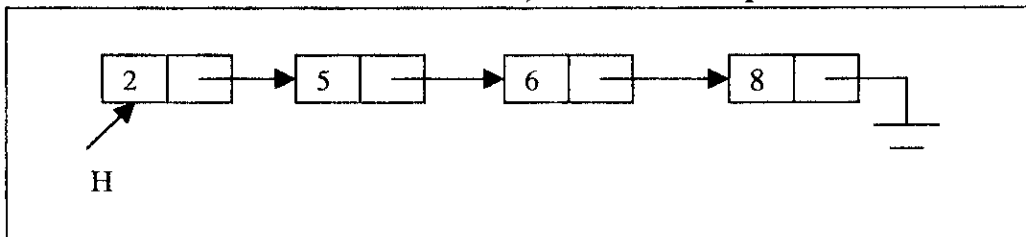
系所班別：資訊管理研究所 組別：甲組

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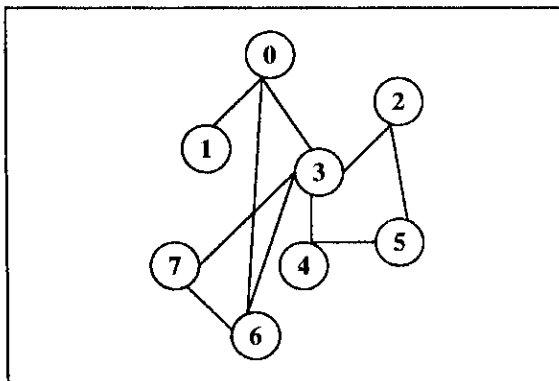
*作答前, 請先核對試題、答案卷(試卷)與准考證上之所組別與考試科目是否相符!!

1. (6%) Explain the following terms in the context of data structures:
 - (a) Priority queue
 - (b) Hashing
 - (c) Big-oh (for time complexity)

2. We have a linked sorted list as follows, where H is the pointer to the head.



- (a) (2%) Write a data structure for a node of the list? (preferably in C)
 - (b) (6%) Write a procedure INSERT(H, x) to insert the element x into the list pointed by H if x is not in the list.
3. Consider the following graph:



- (a) (2%) Write the depth first spanning tree starting at node 0 (visit the smaller number first).
- (b) (2%) What are the back edges of the spanning tree in (a)?
- (c) (4%) Use the depth first spanning tree to find the articulation points and biconnected components of the graph?

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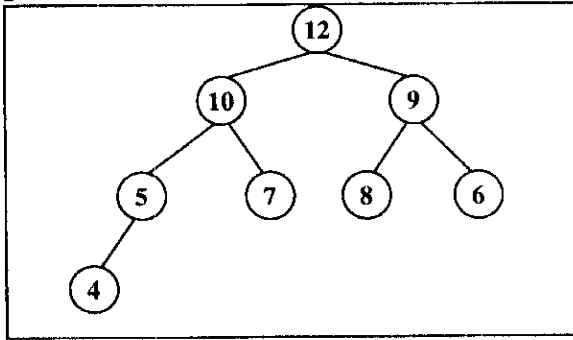
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4. (8%) Do the heap operations: INSERT(11), DELETE(8), INSERT(3), DELETE(7) on the following max heap step by step. Show the results after each operation.



5. (6%) Complete the following table for the time complexity of insertion and deletion operation in various data structures:

Data structure	Insertion	Deletion
Unordered array	$\Theta(1)$	
Sorted linked list		$\Theta(1)$
Max heap	$O(\log_2 n)$	

6. (4%) Write a C program to multiply the two matrices $A[n][n]$ and $B[n][n]$ and output the result.

7. (15%) There are four layers in the TCP/IP protocol suite. Please detail the functions of each of the four layers.

8. Explain the following terminology.

- (a) IP Spoofing (5%)
- (b) Trap Directed Polling (5%)
- (c) Certificate Revocation List (CRL)(5%)

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9.

- (a) (4%) What are the problems of using pointers in C language? Explain how Java eliminates problems with pointer arithmetic.
- (b) (4%) Explain how Java can achieve portability.

10.

(6%) Illustrate two possible approaches to provide database access on the Web.

11.

Let G represent a set of related Web pages. (i) Each Web page has one title (e.g. `<Title> IIM Homepage </Title>`). Each Web page may also contain several directed links (e.g. ` `) to other Web pages. Suppose that each Web page has been parsed to obtain the title and the directed links to other Web pages. The number of directed links to other Web pages is also available for each Web page. Other contents of Web pages are ignored. The function *contain(term, title)* will return true if the *title* contains the *term*, otherwise it will return false. We note that G is a directed cyclic graph.

- (a) (3 %) Design your data structure to store G .
- (b) (9 %) Let H denote the root (Home page of G). Write an algorithm to search from H to find all Web pages with the term "IIM" in their titles. You may need to handle the cycle problem in your search algorithm and/or data structure.
- (c) (4 %) Analyze the time complexity of your algorithm.