招 生 學 年 度	九十九	招 生 類 別	轉學招生考試
系 所 班 別	資訊工程學系三年級		
科　　　　目	資料結構		
注 意 事 項	禁止使用掌上型計算機		

1. (16%) Explain the following terms:

   a. articulation point　　　b. complete binary tree　　　c. B-tree

   d. connected graph

2. (15%) Determine whether the following statements are correct

   a. $7n^2+8n+1000=O(n^3)$

   b. $2n^{28}+7e^n+10n\log n=\Omega(3^n)$

   c. $4n\log n+5n^{1.0001}=\theta(n^{1.0001})$

3. (12%) Use the hash function "h(x)= x mod 19" to store the keys shown below in an array with 19 elements. 224562, 137456, 214562, 140145, 214576, 162145, 144467, 199645, 234534

   Solve collisions by

   a. Linear Open Addressing

   b. Chaining

4. (6%) (a) What kind of data representation (array representation or linked representation) will you use to implement a max heap? Why?

   (15%) (b) According to the data representation selected in (a), please write the pseudocode for data insertion into a max heap. Please "analyze" the time complexity (in terms of O()) of your program.

5. (12%) What are the maximum and minimum heights of a binary tree with n nodes (you should explain your answer)?

6. (12%) The greatest common divisor (gcd) of two integers can be found using Euclid's algorithm. Euclid's algorithm is shown as follows.

$$gcd(x,y) = \begin{cases} gcd(y,x) & \text{if } x < y \\ x & \text{if } y = 0 \\ gcd(y, x \bmod y) & \text{otherwise} \end{cases}$$

   Write a recursive algorithm that calculates the gcd of two integers.

7. (12%) Write an algorithm that determines whether a graph is connected.