國立中央大學103學年度碩士班考試入學試題卷

所別：資訊管理學系碩士班 丁組(一般生)　科目：資料結構　共 1 頁　第 1 頁

本科考試禁用計算器

＊請在試卷答案卷（卡）內作答

1. (35%) You are given the adjacency matrix of a directed graph below.

$$A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

Answer the following questions in detail.

(a) Plot the directed graph. Explain your answer in detail.(7%)

(b) With a form of linked list, express the directed graph. Explain your answer in detail.(8%)

(c) Find out the eigenvalues and their corresponding eigenvectors of the adjacency matrix. Explain your answer in detail.(10%)

(d) With a form of linked list, express the eigenvalues and their corresponding eigenvectors. Explain your answer in detail.(10%)

2. (20%) Binary tree:

(a) Please construct a binary tree based on the following data: 27, 47, 13, 5, 22 (10%)

(b) Please illustrate the "in-order" tree traversal of the constructed binary tree. (10%)

3. (15%) Please show the results of using the Bubble Sort for the following data: 3, 2, 6, 4, 1, 5.

4. (15%) Assume that the probability of searching for each key is the same,

(a) Construct a 2-3 tree for the keys: N,E,W,Y,O,R,K,U,S,A (use the alphabetical order of the letters and insert them successively) (5%)

(b) Compare the average performance of binary search tree and 2-3 tree for successful searches via the case in (a). (10%)

5. (15%) Write a program that changes a decimal number to an octal number in **pseudo-code**. You have to use the following functions to finish the program.. Initially, STACK is empty.

Func **Push**(int data) can push an integer a into STACK.

Func **Pop**(void) can pop an element from STACK and return it to the calling module.