

系別：資訊工程學系

科目：資料結構

考試日期：3月2日(星期日) 第2節

本試題共6大題，1頁

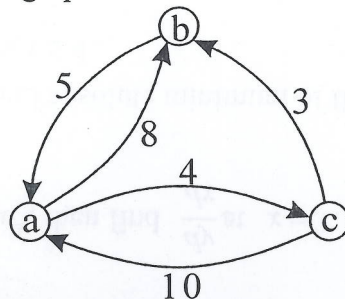
1. Is the following postfix expression valid? Prove your answer. (10%)

$abc + * defg - * + - hi * j - kl + m * +$

2. *Fibonacci sequence* is defined as follows. (20%)

$$\begin{cases} f_n = f_{n-1} + f_{n-2}, \text{ for } n > 1 \\ f_0 = 0 \\ f_1 = 1 \end{cases}$$

- (a) Write a recursive function to compute  $f_n$ . (5%)  
 (b) According to (a), derive its recurrence relation. (5%)  
 (c) Solve the recurrence relation obtained from (b). (10%)
3. Start with an empty AVL tree and perform the following sequence of insertions: MAR, MAY, NOV, AUG, APR, JAN. Draw the AVL tree following each insertion. (20%)
4. Let  $T$  be a binary tree. Given that the *inorder sequence* of  $T = \mathbf{GDBAKHMLECIFJ}$  and the *preorder sequence* of  $T = \mathbf{ABDGCCEHKLMIJ}$ , answer the following questions. (20%)  
 (a) Draw the binary tree  $T$ . (10%)  
 (b) What is the *postorder sequence* of  $T$ ? (10%)
5. Analyze the worst case time complexity of *Quicksort*. (15%)
6. Consider the following directed graph. (15%)



- (a) Represent the graph by *adjacency matrix*. (5%)  
 (b) Use *Floyd's algorithm* to find the *all-pairs shortest paths* for the above figure step by step. (10%)