UNIVERSITY OF ENERGY AND NATURAL RESOURCES, SUNYANI

SCHOOL OF ENGINEERING

DEPARTMENT OF COMPUTER AND ELECTRICAL ENGINEERING

(BSc. Computer Engineering), Mid-Semester Examination

Time: 1 hr 45mins **Date: 17th March, 2017**

CENG 208 DATA STRUCTURES AND ALGORITHMS

Instruction: Attempt All Question

Question 1

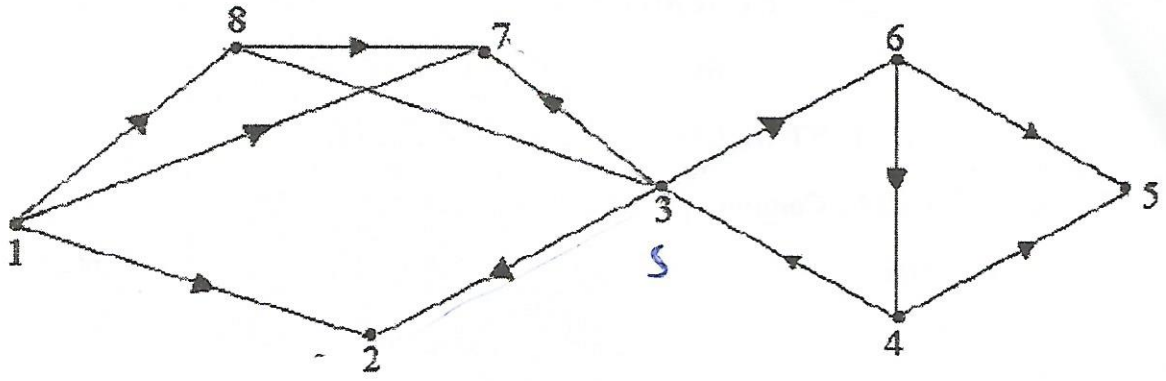
In each of the following question, please specify if the statement is true or false. If the statement is true, explain why it is true. If it is false, explain what the correct answer is and why.

a. A complete binary tree with a height of h can have more nodes than a full binary tree with a height of h.

b. When using linked list to perform insertion sort, each time we remove an element from the input list and insert it to the correct position in the linked list. Assume that we have n numbers to be sorted, the time complexity for sorting these numbers using the insertion sort algorithm is $O(n^2)$.

c. Given a set of input representing the nodes of a binary tree, write a non-recursive algorithm that must be able to output the three traversal orders. Write an algorithm for checking validity of the input, i.e., the program must know if the input is disjoint, duplicated and has a loop.

d. Show the result of running BFS and DFS on the directed graph given below using vertex 3 as source. Show the status of the data structure used at each stage.



Question 2

a. An, array, A contains n unique integers from the range x to y (x and y inclusive where n=y-x). That is, there is one member that is not in A. Design an O(n) time algorithm for finding that number.

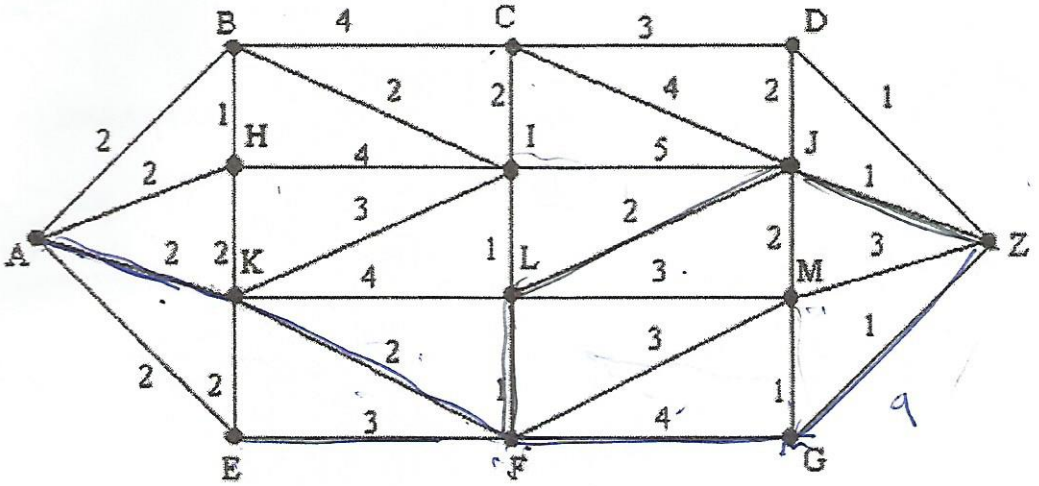
b. Two Binary Trees are similar if they are both empty or if they are both nonempty and left and right sub trees are similar. Write an algorithm to determine if two Binary Trees are similar.

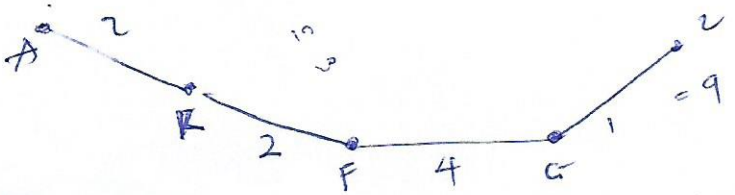
c. What do you mean by complexity of an algorithm? Explain the meaning of worst case analysis and best case analysis with an example.

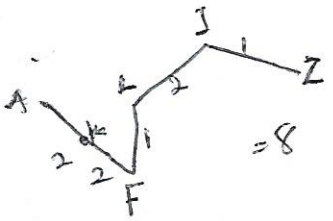
d. Write an algorithm which performs depth first searches through an un-weighted connected graph. In an un-weighted graph, would breadth first search or depth first search or neither find a shortest path tree from some node? Why?

Find the shortest path from A to Z using Dijkstra's Algorithm.

using with hashing has attached to a key which facilitates even key distribution in a table.







Question 3

a. Define hashing. Describe any two commonly used hash functions. Describe one method of collision resolution.

open addressing.

b. Let X = (X1, X2, X3,….Xn) and Y= (Y1, Y2, Y3,….Xm) be two linked lists. Write an algorithm to merge the lists together to obtain the linked list Z such that
Z = (X1, Y1, X2, Y2,….Xm, Ym,Xm+1….Xn) if m<=n or
Z = (X1, Y1,X2,Y2….Xn,Yn,Yn+1….Ym) if m>n.

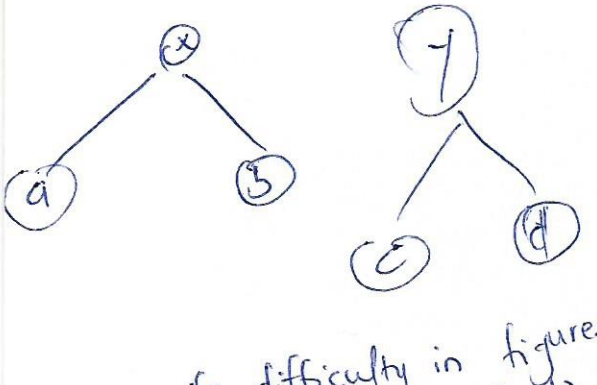
c. A double ended queue is a linear list where additions and deletions can be performed at either end. Represent a double ended queue using an array to store elements and write modules for additions and deletions.

d. Let P be a pointer to a singly linked list. Show how this list may be used as a stack. That is, write algorithms to push and pop elements. Specify the value of P when the stack is empty.

Start
let $x = (x_1, x_2, x_3 \ldots x_m)$
$y = (y_1, y_2, y_3 \ldots y_n)$
if $m = n$
$n = y$
if $m <= n$,
then add(x+y)
or
$m > n$
then output (x+y+1-m)
if $m = > n$,
output error.

Good luck

Dr. Benjamin Asubam Weyori



the difficulty in figures of the methods used to solve a problem.