MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2012/2013

THIRD YEAR FIRST SEMESTER EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE (CITY CAMPUS-EVENING)

SCS 301: DATA STRUCTURES AND ALGORITHMS

Date: 4th December, 2012 *Time: 5.30 – 7.30pm*

INSTRUCTIONS:

- Answer QUESTION ONE and any other TWO questions.

Question 1(30mks)

a) I) With appropriate examples, briefly describe the operation of each of the following data structures:

a)Stacks (2mks)
b)Queues (2mks)
c)Linked lists (2mks)

ii)Show the contents of each of the data structures in a given the following order of operations:

add(5), add(2),add(4), remove, add(6), add(1), remove (3mks for each data structure)

b) i) Sketch the heap represented by the array elements 1,2,3,4,5,6,7,8,9,10,11,12,13,14 in that order (6mks)
ii) What would the heap look like if the element "5" is deleted? (4mks)

c) You are given algorithms with the following running times: n log n, 1, 2^n, n^2, n!, n, n^3, log n. List their performance from slowest to fastest (5mks)

Question 2(20mks)

a) Sketch the graph given by the following adjacency list:

Vertex	Adjacent Vertices
a	b, c
b	a, c, e, f
c	a, b, f
d	
e	b
f	b, c (7mks)

b) Give the adjacency matrix representation for the above graph (7mks)

c) Sketch the incidence matrix representation for the above graph (6mks)

Question 3(20mks)

a) Describe the Breadth-First Search algorithm for traversing a graph (6mks)

b) Given the start vertex as "C" give the result of BFS traversal on the graph of Fig. 2(b). Clearly indicate the contents of the queue and the node colours at each step.

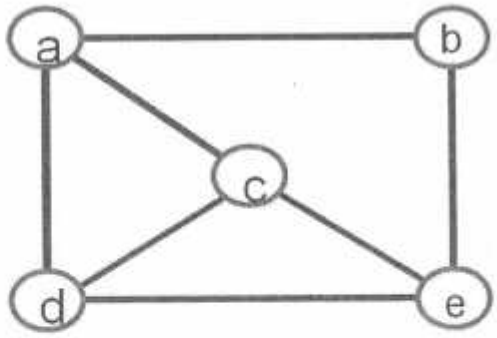

Fig Q2(b)

Question 3(20mks)

a) With appropriate examples explain what a minimum spanning tree is. (4mks)
b) Describe Kruskals method for finding a minimum spanning tree. (6mks)
c) Use Kruskals algorithm to find the minimum spanning tree of Fig Q3(c) (10mks)

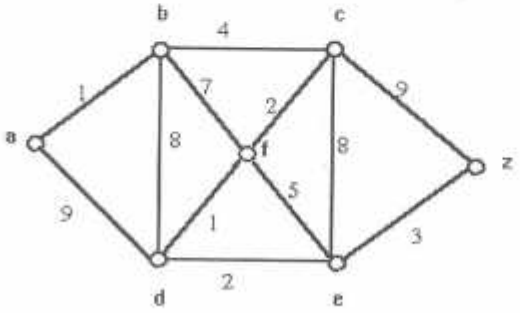

Fig Q 3(c)

Question 4(20mks)

a) Describe the mergesort algorithm for sorting the contents of an array.
b) Give a graphical description of how mergesort would sort the array " A" given below:
A = {5,2,4,6,1,3,2,6}

Question 5(20mks)

a) Give a recursive definition of a binary tree (2mks)
b) Give the following traversals of the tree of Fig Q5(b):
i) Inorder (6mks)
ii) Preorder (6mks)
iii) Postorder (6mks)

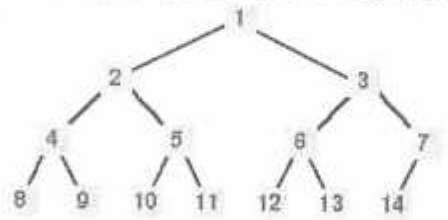

Fig Q5(b)