Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Computer Science and Technology
200 level 2nd Semester Examination – Dec.-2017/Jan.- 2018
CST225-2 Data Structures

Uva Wellassa University

Instructions to candidates
Duration: Two (02) hours
Number of questions: Four (04)
Mark allocation: 100
Answer all the questions

1.
   a. What is data structures ? (2 mark)
   b. List three (03) areas in which the data structures are applied. (3 mark)
   c. Write the prefix and postfix notations for the following expression.
      (A+B)*C-(D-E)^F/G (6 mark)
   d. Write an algorithm to give a recursive method for removing all the elements from a stack data structure. (7 mark)
   e. Briefly explain the concept of delimiter matching using a stack. (7 mark)

2.
   a. Differentiate array and list. (4 mark)
   b. Write the steps to insert and delete elements in a queue using linked list. (6 mark)
   c. State two (02) advantages of singly linked list over doubly linked list. (2 mark)
   d. The lazy deletion strategy can be used as an alternative to the deletion operation. In order to delete an element in lazy deletion, it is marked as deleted using an extra bit (boolean value). The number of deleted and non-deleted elements in the list is kept as the part of the data structure. If there are same numbers of deleted elements as non-deleted elements we traverse the entire list performing the standard deletion algorithm on all marked nodes.
      i. Discuss the advantages and disadvantages of this strategy. (6 mark)
      ii. Write an algorithm to implement the singly linked list deletion operation using lazy deletion. (7 mark)

49

3.

a. Construct a binary search tree by inserting 30, 10, 16, 19, 45, 62, 39, 28, and 73 respectively into an empty tree. (4 mark)

b. Show the results of splaying the nodes 16 and 62 of the above constructed binary search tree (3.a) respectively. (6 mark)

c. List the properties of red black tree. (4 mark)

d.

i. Construct a B-tree with order m=3 for the following key values.

23, 34, 12, 35, 61, 15, 37, 62, 45, 56, 10, 24, 35 (6 mark)

ii. Delete the values 62 and 15 respectively by showing how the above constructed B-tree is performing all the operations. (5 mark)

4.

a. Explain one (01) method of graph representations with sufficient examples. (7 mark)

b. Briefly explain one (01) common approach of searching a particular vertex in a graph. (7 mark)

c. A good hash function is essential for good hash table performance. Write three (03) criteria which can be used to select a good hash function. (3 mark)

d. What is meant by the loading factor in hashing? (2 mark)

e. Derive the 10-entry hash table for the hash function h(i) = (2i+5) % 11 to the key values 22, 45, 13, 88, 23, 94, 11, 39, 20 and 16. Assume that collisions are handled with double hashing where the second hash function is h'(i) = 7 - (i % 7). (6 mark)