Date: 14 . 09 . 20

AHSANULLAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

2nd Year 1st Semester, Final Examination, Spring 2017

Department of Computer Science and Engineering

Course No: **CSE2103** Course Title: **Data Structu**

Full Marks: 70 Time: 3 Ho

[The figures in the right margin indicate full marks]

There are **7 (Seven)** questions. Answer any **5 (Five)**

1. a) Write down the formal definition of a data structure with an example. (3)
   b) How can you save storage space when the elements to be in an array are of varying lengths? Explain with an example. (4)
   c) Design a sequential memory allocation for an n-dimensional array. (7)

2. a) Convert the number $(0101011101001000)_2$ into Logical, Integer and Character string. (3)
   b) Derive the equation of Horner's Method. Calculate the decimal value and the number of multiplications required to convert $(1234)_5$ using Horner's method. (4)

and the number of multiplications required to convert $(1234)_5$ using Horner's method.

c) Write an algorithm to maintain the max-heap property and demonstrate your algorithm on the following array: 16 4 10 14 7 9 3 2 8 1 at index 2. (7)

3. a) What are the advantages of introducing a dummy element into a linked list?

b) A middle node of a doubly linked list is pointed by p. Design an algorithm to swap the node with its next node.

c) Design an algorithm to insert an element into a sorted doubly linked list keeping the list sorted. Also write an algorithm for deleting an element from a circular linked list.

4. a) Write an algorithm for the Depth First Search (DFS).

b) Write a non-recursive algorithm for the Towers of Hanoi problem.

c) State the algorithm to transfer an Infix expression into a Postfix expression using stack. Convert the following Infix expression into Postfix expression using stack: "(A + B) * (C – D * E + F)".

5. a) "Bubble sort is one of the slowest sorting algorithms" – Justify the statement.

b) Write down the algorithm for Quick sort and also illustrate the steps of the algorithm based on the following data: 16 25 20 8 13 10 27.

c) Write down the algorithm for Insertion sort. Calculate the cost of the

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6. a) Write an efficient algorithm for sequential search to search an item in an ordered linked list. (3)

b) Write an algorithm for searching and inserting into a hash table with collisions resolved by double hashing. (4)

c) The following data are to be stored in a hash table: (7)

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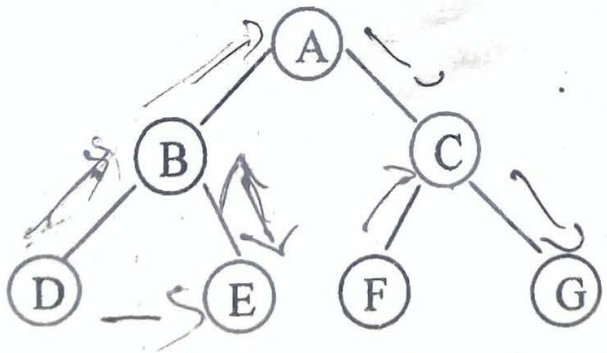
Use compression method of hashing and linear probing as the method of collisions resolution with a table size of 30 and Code : A = 00001, B = 00010, C = 00011, ..., Z = 11010.

7. a) Write an algorithm to find the successor of a node in a binary search tree. (3)

b) To what binary tree does the forest in the following figure correspond via the natural correspondence? To what forest does it correspond (considering it as a binary tree)? (4)



c) Define a complete binary tree. Write down the recursive procedures (7)