COMSATS - Lancaster Dual Degree Programme

COMSATS Institute of Information Technology Lahore

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☐ Sessional 1 ☐ Sessional 2 ■ Terminal Examination **SPRING 2016** 36

Course Title:	Data Structure and Algorithms				Course Code:	CSC114	Credit Hours:
Course Instructor/s:	Dr. Ghulam Rasool, Dr. M. Aksam Iftikhar, Dr. Ghulam Mahdi, M. Adnan				Programme Name:	BS Computer Science	
Semester:	3rd	Batch:	FA15-BCS, BSE	Section:	BCS(A,B&C), BSE(A, A-R, B)	Date:	31-5-16
Time Allowed:	**03 Hour**				**Maximum Marks:**		**100**
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Question 1. (14) **[Marks: 3+4+8+5=20]**

a) Differentiate between linear and non-linear data structures with examples **[3]** (3)

b) What is the difference between singly and doubly linked lists? What are the pros and cons of each type of linked list (in terms of memory, computation, and complexity of implementation) **[4]** (3)

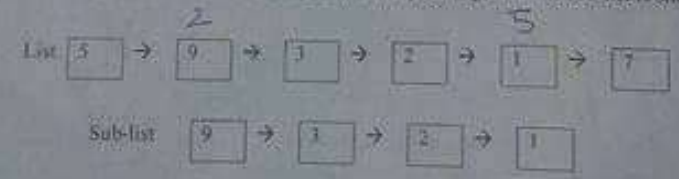
c) Write down pseudo codes for the following operations on a doubly linked list. Clearly mark the input and output of each operation. Also handle the cases of insertion and deletion when the list is empty. **[2+4+2]** (8)

i. Insertion at the beginning of the list

ii. Insertion at the end of the list

iii. Deletion from beginning of the list

d) Slicing a list is like a substring of a string, i.e., a sub-list is extracted from the list based on a start and end position. Provide a pseudo code for the SLICE method, which takes two inputs, i.e., start and end and outputs a copy of the list starting from the start position and going up to the end position. For example, for the following list, if start and end are 2 and 5, respectively, then the sub-list is shown at the bottom: **[5]**



Question 2: **[Marks: 4+4+3+3+6 = 20]**

a) Convert the following infix expressions to postfix. **[4]** (4)

i. (3+1) * ((1+2) * (5+4))

b) What is the value of following postfix expressions? Show the stack contents as each operand and operator is processed. Make it clear where the top of the stack is at each step? **[4]** (4)

i. 5 1 / 3 * 3 1 - *

c) What is the difference between a queue and a priority queue? Write down some of the applications of a priority queue. [3]

d) What is the difference between a queue and a deque? What is the most appropriate type of linked list that can be used to implement a deque? [3]

e) Write down the pseudo code for inserting a data element ITEM in a circular queue. [6]

[Marks:3+6+6+5= 20]

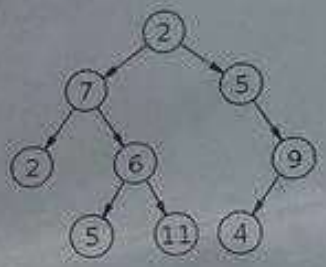
Question 3.

a) What is a binary search tree, why do we use it? [2+1=3]

b) Draw a binary search tree by inserting the following numbers [6]

11, 6, 8, 19, 4, 10, 5, 17, 43, 49, 31

c) Traverse the following binary tree by using inorder and postorder traversals? [6]



e) Write a pseudocode to sort a list of numbers in descending order using a minimum heap. Let n be the number of elements in the tree. What is the time complexity of your sorting algorithm? [3+2=5]

[Marks:7+7+6 = 20]

Question 4.

a) Show step by step procedure for sorting following data items stored in an array using insertion sort technique. [7]

29 10 14 37 13

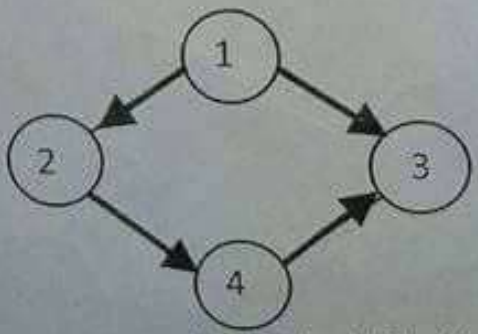
b) Write down a pseudocode for applying selection sort algorithm [7]

c) If you have a large data set stored on an external storage device and you need to sort it by using merge sort, describe major ideas about the sorting procedure. [6]

Question 5. [Marks: 7+6+7 = 20]

a) Define a graph data structure. What are different applications of graph? Can a graph be a tree and vice versa. [2+3+2=7]

b) What will be the adjacency matrix representation of the following graph? [6]



c) Write down a pseudo code to traverse a graph using Breadth First Search method [7]

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