B. TECH. SEM - III (COMPUTER ENGG.) 2014 COURSE) (CBCS)
: SUMMER - 2018
SUBJECT: PRINCIPLES OF DATA STRUCTURES

Day: Tuesday **Date:** 22/05/2018 **S-2018-2236** **Time:** 02.30 PM TO 05.30 PM **Max. Marks: 60**

N.B:

1) All questions are **COMPULSORY.**
2) Figures to the right indicate **FULL** marks.
3) Use of non-programmable **CALCULATOR** is allowed.
4) Assume suitable data if necessary.

Q.1 **a)** What do you mean by 'Complexity of Algorithm'? How are asymptotic notations used to represent the complexity of an algorithm? **(05)**

b) Write pseudo code for reversing elements in a queue when array representation is used. **(05)**

OR

Q.1 **a)** Define the various operations on stack. How does array representation of stack benefit these operations? **(05)**

b) What is meant by array representation of queue? Write a function to delete an element from queue with array representation? What is its time complexity? **(05)**

Q.2 **a)** Write a count function to count the number of nodes in a linked list. **(05)**

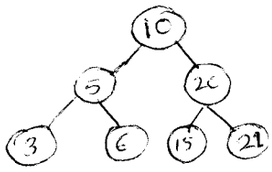
b) What is a circular linked list? List out its applications. Compare a circular linked list with Doubly linked list. **(05)**

OR

Q.2 **a)** What is the need for dynamic data structures? Write the data type for singly linked list and doubly linked list as ADT, assuming data to be of integer type. **(05)**

b) Write an algorithm to insert an element in a stack with linked list representation. **(05)**

Q.3 **a)** Differentiate between Binary Trees and Binary Search Trees. Insert number '19' in the following binary search tree and show the in order traversal of this tree. **(05)**



b) What is balance factor of a node T in a binary tree? What is AVL tree? Define structure of a node in AVL tree? **(05)**

OR

Q.3 **a)** What is a B Tree? Create a B Tree of order 3 by inserting the following data one at a time. Show all steps. **(05)**
18, 9, 25, 13, 10, 35, 61

P.T.O.

b) What are the coloring properties of Red-Black Tree? Why are Red-Black trees called as alternate to AVL trees? Are all Red-Black trees AVL tress? Can every AVL tree be colored as Red-Black Tree? **(05)**

Q.4 a) Write Kruskal's algorithm and compare the technique with Prims technique for constructing a minimum cost spanning tree. **(05)**

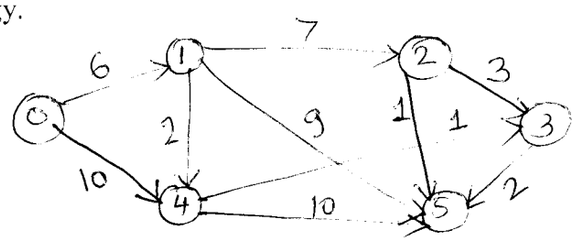
b) Write the algorithm for Heap sort and analyses the Heapify/Adjust function for its time complexity. **(05)**

OR

Q.4 a) List Graph ADT operations. Explain how a graph can be represented using either adjacency matrix or adjacency List with example. **(05)**

b) What are the time complexities of Bubble sort and Merge Sort? Why are they different? What will be the positions of elements after third iteration of selection sort for the following data? 20, 12, 16, 3, 14, 9, 8. **(05)**

Q.5 a) What is greedy strategy? Find shortest path from node 0 to 5 using a greedy strategy. **(05)**



b) Write a detailed note on code optimization. **(05)**

OR

Q.5 a) State the principle of optimality. How does it help in defining the dynamic programming strategy? List a few problems which can be solved using this strategy can these problems be solved using Greedy Technique too? Why? **(05)**

b) Write both Recursive and Non-recursive pseudo code for Binary search using Divide and Conquer strategy. **(05)**

Q.6 a) Write brief notes on solving 8 Queen's problem and Knapsack problem using backtracking. **(05)**

b) Sort the polynomial complexities in ascending order O(n log n), O (n^2), O (log n), O(1), O(n). Name the problems having the above time complexities. Also define briefly NP, NPC and NP-Hard problems. **(05)**

OR

Q.6 a) Compare backtracking technique with branch and bound. Explain how Graph coloring problem is solved using Backtracking. **(05)**

b) Write short notes on: **(05)**
i) Game Trees ii) Non-deterministically polynomial problems.

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