B. TECH. SEM - III (COMPUTER ENGG.) 2014 COURSE)
(CBCS) : WINTER - 2017

SUBJECT: PRINCIPLES OF DATA STRUCTURES

Day: Monday **Time:** 10.00 AM TO 01.00 PM
Date: 15/01/2018 **Max. Marks: 60**

W-2017-2028

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 is an abstract data type? Represent queue as an ADT. **(05)**

b) Show the steps to convert an infix expression a +b* (c-d)/e using a suitable data structure. **(05)**

OR

Q.1 **a)** What is meant by data structures? List the advantages and disadvantages of using array representation for implementing queue. **(05)**

b) What is a stack? Write pseudo code to reverse the characters of a string using stack with array representation. **(05)**

Q.2 **a)** What are dynamic data structures? Describe the different types of linked lists with help of diagrams. **(05)**

b) Write a function for deletion of a node pointed by p in a doubly linked list. **(05)**

OR

Q.2 **a)** List out five operations on a linked list. List the prototype of functions used for those operations. **(05)**

b) What is circular linked list? Write a function for inserting a number at the rear of a circular linked list representation of a queue. **(05)**

Q.3 **a)** Define depth of a node, height of a node, path and sibling in a binary tree. Construct a binary search tree with at least 7 nodes. List the preorder traversal of the nodes in the constructed tree. **(05)**

b) What is a B^+ tree? What are its characteristics? Give structure of its internal node. Compare it with m-way search tree. **(05)**

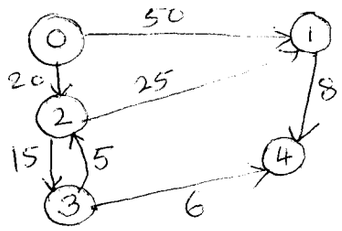
OR

Q.3 **a)** Characters a, b, c, d, e, f have probabilities 0.05, 0.11, 0.12, 0.20, 0.25 and 0.27 respectively. Find optimal Huffman code. Draw Huffman tree and find the average code length. **(05)**

b) Write short notes on: i) Threaded binary trees ii) M-way trees. **(05)**

P.T.O.

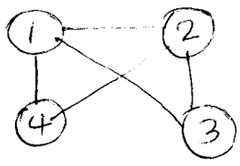
Q.4 **a)** Find the shortest path from node zero to all other nodes using Dijkstra's Algorithm. **(05)**



b) Compare the complexities of Merge sort and Quick sort Algorithms. Solve, showing steps, the Quick Sort problem below. **(05)**
55, 36, 25, 11, 19, 100, 60

OR

Q.4 **a)** What is spanning tree? Find spanning trees of the following graph. Write the algorithm for finding spanning tree with minimum cost, using Prim's technique. **(05)**



b) List the desired properties of a hash function. Briefly explain any three hash functions. **(05)**

Q.5 **a)** Write down the general divide conquer strategy as a control abstraction. Analyze it with respect to time complexity. **(05)**

b) What is 'principle of optimality'? How does this principle apply to dynamic programming? List a few problems which can be solved using dynamic programming. Compare this technique with Greedy technique. **(05)**

Q.5 **a)** Write pseudo code for Binary search using divide and conquer strategy. What is its best case, worst case and average case time complexity? **(05)**

b) With the help of a diagram draw an AND/OR graph. Explain the technique used to solve a problem which can be represented by an AND/OR graph. **(05)**

Q.6 **a)** Write short notes on following: i) Game Trees ii) Graph coloring problem **(05)**

b) Describe 8 queens problem and how backtracking is used to solve it. **(05)**

OR

Q.6 **a)** Solve the 0/1 Knapsack problem using backtracking. Knapsack capacity M = 20, $w_1 = 17$, $w_2 = 5$, $w_3 = 14$, $w_4 = 4$ and $p_1 = 10$, $p_2 = 2$, $p_3 = 5$, $p_4 = 7$ **(05)**

b) Define NP, NP- Hard and NP-Complete problems. List few NPC problems. Compare Backtracking with Branch and Bound technique. **(05)**

* * * * *