2021
B.E. (Computer Science and Engineering)
Third Semester
CS-301: Data Structures

Time allowed: 3 Hours   Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit.

x-x-x

I.   Answer the following:-

    a) Mention a situation when it is better to use arrays rather than linked lists for storing items.

    b) What do you understand by max heap?

    c) Which data structure is used for performing recursion?

    d) What is the best and worst-case time complexity of bubble sort?

    e) What do you understand by space-complexity of algorithms?

    f) State the downside of using AVL tree.

    g) How is a complete graph different from a connected graph?

    h) What is the use of hash table?

    i) How many nodes are there in a complete binary tree at depth k ?

    j) What is the key distinction between a graph and a tree?   (10x1)

UNIT – I

II.   a) What is a doubly linked list? Write an algorithm to perform backward traversal of a doubly linked list. Also compute its time complexity.

    b) How is circular linked list different from a single linked list? Write an algorithm to insert an element at 6th position in a circular linked list.   (2x5)

III. a) Write an algorithm for Selection Sort. Demonstrate different passes of Insertion Sort using following array: 11, 87, 34, 76, 29, 54.

    b) State the basic idea of Radix sort.   (7,3)

IV.   a) Write an algorithm to check for balanced parentheses using stack.

    b) Explain the two major operations possible on queues. List some applications of queues. What are the drawbacks of array implementation of queues?   (2x5)

UNIT – II

V.   a) Create a binary search tree with following values: 13, 3, 4, 12, 14, 10, 5, 1, 8, 2, 7, 9. Write an algorithm to search a given element in a binary search tree and Illustrate the different steps followed for searching 12 from this binary search tree.

b) What are balanced binary trees? List their properties.   (7,3)

VI.   a) What do you mean by graph traversal? Distinguish between BFS and DFS algorithms in terms of data structure used, memory space consumption and traversal approach. Elaborate the traversing approach in both the cases taking an example graph.

b) List the various applications of graphs.   (7,3)

VII.   a) Write algorithms for inorder and postorder traversal of trees.

b) How can priority queues be implemented using heap data structure?

c) Why should collisions be avoided during hashing? Elaborate separate chaining technique for avoiding collisions during hashing.   (3,2,5)

x-x-x