B. Tech. Degree IV Semester Supplementary Examination April 2022

CS/IT 15-1405 DATA STRUCTURES AND ALGORITHMS
(2015 Scheme)

Time: 3 Hours   Maximum Marks: 60

PART A
(Answer *ALL* questions)

(10 × 2 = 20)

I. (a) Write the different passes when the following numbers are applied to the Quick sort algorithm.

    5   15   7   2   20   10   6   17

(b) Write one collision resolution method commonly used in hashing.

(c) Write the postfix equivalent of the following expression.

$$(3+5)/(2 \wedge 7 - 4*6) + 4 - 5.$$

(d) Differentiate between Ascending Priority Queue and Descending Priority Queue.

(e) How is the balance factor for a node calculated? What role is played by it in maintaining the balance of a tree.

(f) Draw the expression tree for $((a+b)+c*d*f)-g$.

(g) Define the terms in connection with graphs:

   (i)   spanning tree

   (ii) strongly connected graphs

(h) Differentiate between B-trees and B+-trees.

(i) How can you convert a deque into a stack?

(j) How is selection sort different from bubble sort?
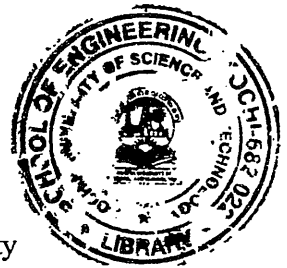
PART B

(4 × 10 = 40)

II. (a) The keys 35,46,22,17,54,9 are inserted into an initially empty hash table with hash function k%7 and linear probing. Draw the resultant hash table.   (4)

(b) What is the difference between max heap and min heap? Explain the heapify () function with a suitable example.   (6)

OR

III. (a) Convert the following matrix to the sparse matrix format.   (6)

0	0	45	0	0	0
0	1	0	0	0	0
23	78	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	77
44	0	0	90	0	0
15	0	0	0	22	0

Suggest an algorithm to find the transpose of it when in the sparse matrix format.

(b) What are associative arrays? Give one application of it.   (4)

(P.T.O.)

IV. (a) Explain with the help of an algorithm, the conversion of infix expression to postfix form. Using the algorithm, convert the following expression and write all the intermediary stack stages. (6)

$A + B * C - D + E / F$

(b) Write down the algorithm for postfix evaluation. (4)

OR

V. (a) Assuming you have a singly linked list at hand, write the routines for (6)

(i) delete the last element of the list

(ii) given an element in the list, find the next element which is greater than this.

(b) How do you represent a polynomial in one variable using a singly linked list? (4)

VI. (a) Given the following traversal orders, construct the tree. (5)

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Inorder   :  E  I  C  F  J  B  G  D  K  H  L  A
Preorder  :  A  B  C  E  I  F  J  D  G  H  K  L
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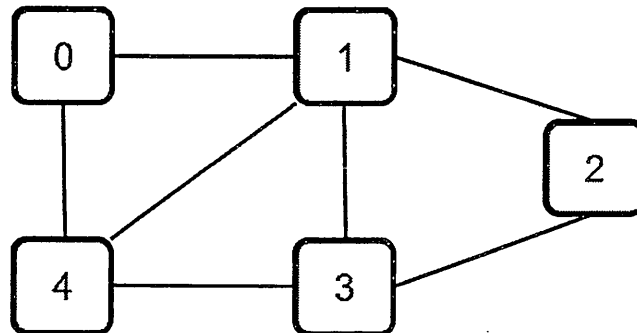
(b) How do in-threaded trees make the inorder traversal easier ? Explain with an example. (5)

OR

VII. (a) Discuss the searching algorithm in a binary search tree. When will be the worst case over the search time. (5)

(b) Illustrate the cases which lead to double rotations in an AVL tree. (5)

VIII. (a) (5)

Write the adjacency matrix and the adjacency list representation of the above graph structure.

(b) Differentiate between Kruskal's and Prim's algorithm for finding the minimum spanning tree. (5)

OR

IX. (a) What are the conditions for which the multiway search tree becomes the B-tree ? Discuss the deletion routine in a B-tree and how to handle the node underflow situation. (6)

(b) Explain the working of Dijktra's single source shortest path algorithm with a suitable example. (4)

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