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CSIT124
[ET]

END SEMESTER EXAMINATION : NOV.–DEC., 2019

DATA STRUCTURES USING C

Time : 3 Hrs. *Maximum Marks : 70*

Note: ***Attempt questions from all sections as directed.***

SECTION – A (30 Marks)

Attempt any **five** *questions out of* **six.**
Each question carries **06** *marks.*

1. (a) What do you mean by complexity of an algorithm? Also explain the space-time tradeoff of algorithms. (3)

   (b) Give an algorithm for linear search and derive its complexity. (3)

2. Suppose S is the list of 14 alphabetic characters :

   D A T A S T R U C T U R E S

   Suppose the characters in S are to be sorted alphabetically. Use the quicksort algorithm to find the final position of the first character D.

P.T.O.

3. Consider the following deque of characters where DEQUE is a circular array which is allocated six memory cells :

Left = 2, Right = 4, DEQUE: __, A, C, D, __, __

Describe the deque while the following operations take place.

(a) F is added to the right of the deque.

(b) Two letters on the right are deleted.

(c) K, L, and M are added to the left of the deque.

(d) One letter on the left is deleted.

(e) R is added to the left of the deque.

(f) S is added to the right of the deque.

(g) T is added to the right of the deque.

4. Consider the polynomial

$8x^2y^2z - 6yz^8 + 3x^3yz + 2xy^7z - 5x^2y^3 - 4xy^7z^3$

(a) Rewrite the polynomial so that terms are ordered. (2)

(b) How above polynomial is represented in memory using Header linked list? Also draw schematically diagram of the above representation. (4)

5. Suppose the following sequences list the nodes of a binary tree T in preorder and inorder respectively :

Preorder : G, B, Q, A, C, K, F, P, D, E, R, H
Inorder : Q, B, K, C, F, A, G, P, E, D, H, R

Draw the diagram of the tree.

6. Suppose multidimensional arrays A and B are declared using A(–2:2, 2:22) and B (1:8, –5:5, –10:5).

(a) Find the length of each dimension and the number of elements in A and B. (3)

(b) Consider the element B(3,3,3) in B. Find the effective indices E1, E2, E3, and the address of the element, assuming Base (B) = 400 and w = 4 words per memory location. (3)

SECTION – B (20 Marks)

Attempt any **two** *questions out of* **three.**
Each question carries **10** *marks.*

7. (a) Write a program which gives solution to the Tower of Hanoi problem for n 8 disks. Also test the program using n=3 and n=4. (5)

(b) Write a procedure which adds a given ITEM of information at the Kth position in a circular linked list. (5)

8. (a) Describe the insertion procedure for designing the Heap. Build a heap H from the following list of numbers :

44, 30, 50, 22, 60, 55, 77, 55 (5)

P.T.O.

(b) Write a procedure which deletes the last element in a circular header list. (5)

9. (a) Write an algorithm which finds the VALUE of an arithmetic expression P written in Postfix notation. Hence evaluate the following Postfix expression

P: 5, 6, 2, +, *, 12, 4, /, − (5)

(b) Give an algorithm for Quick Sort. Derive its complexity. (5)

SECTION – C (20 Marks)

(Compulsory)

10. (a) Let LIST be a linked list in memory. Write a procedure which finds the number NUM of times a given ITEM occurs in LIST. Highlight the difference between Breadth first search and Deapth first search. (8)

(b) Suppose the following eight numbers are inserted in order into an empty binary search tree T:

50, 33, 44, 22, 77, 35, 60, 40.

Draw the tree T. (4)

(c) Construct an AVL search tree by inserting the following elements in the order of their occurrence.

64, 1, 44, 26, 13, 110, 98, 85 (8)

(1300)