END SEMESTER EXAMINATION : NOV-DEC 2022

DATA STRUCTURES USING C

Time :3.00 Hrs
Maximum Marks :60

Note: Attempt questions from all sections as directed. Use of Scientific Calculator is allowed

**Section A : Attempt any Four questions out of Five . Each question carries 06 marks. [24 Marks]**

Q1. (a) Explain a sparse matrix with example. How is it represented in the memory? (3)
    (b) Suppose multi-dimensional arrays A and B are declared using (3)
       A (-2 : 2, 2 : 22) and B (1 : 8, -5 : 5, - 10 : 5)
- Find the length of each dimension and the number of elements in A and B.
- Considers 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 there are w = 4-word memory location.

Q2. What do you mean by efficiency of an algorithm? How can you compare efficiency of two algorithms? Explain the concept of best case, average case and worst case time complexity. Calculate the complexity of binary search algorithm. (6)

Q3. Write an algorithm to convert infix expression into postfix . Convert & Evaluate below given infix expression into postfix expression. (6)
A+(B*C-(D/E^F)*G)*H

Q4. (a) Write an algorithm to insert an element in the circular queue. (3)
    (b) Compare the usage of Linked List with Array data structure. In which situation one should prefer array over linked list. (3)

Q5. Write an algorithm to insert a number into a sorted linked list. Assume the list is sorted from smallest to largest value. After insertion, the list should still be sorted. Given the list 11 = (3, 17, 18, 27) and the value 20, on return 11 be the list (3, 17, 18, 20, 27). (6)

Section B : Attempt any two questions out of three. Each question carries 10marks. [20 Marks]

Q6. Write an algorithm for quick sort sorting technique. Use a quicksort algorithm to sort the following elements.
36,15,40,1,60,20,55,25,50,20

Why Quicksort is known as divide and conquer algorithm. Compare Complexity of bubble sort with quick sort algorithm. (10)

Q7. (a) Write an algorithm to perform push operation on stack using linked list. (3)
    (b) Draw a binary tree given: (7)

    i. Pre-order : F A E K C D H G B
      Inorder: E A C K F H D B G

    ii. Post- order : H D I E B J F K L G C A
       Inorder: H D B I E A F J C K G L

(P.T.O.)

Q8. (a) Relate Tree, Spanning tree and minimum spanning tree. Explain ans use Kruskal's algorithm for finding the minimum spanning tree of the graph. (5)
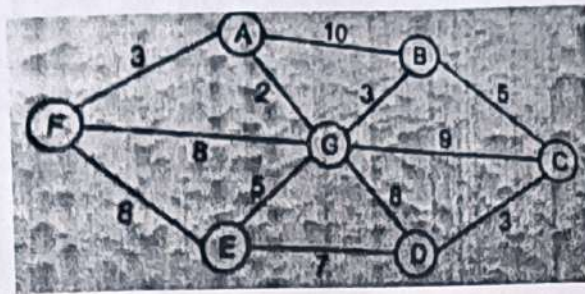
(b) Suppose the following list of letters is inserted in order into an empty BST (5)
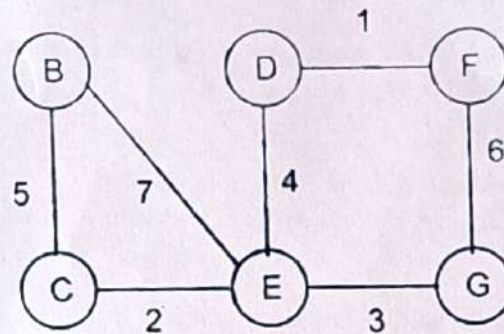
40 25 70 22 35 60 80 90 10 30
Draw the tree T.
Delete node 30 on original tree T.

Section C : Compulsory question [16 Marks]

Q9. (a) Using Dijkstra's algorithm, find the shortest path for the following graph with starting vertex B. (6)

(b) Define hashing. Explain any 3 techniques used for hashing. How collision can be handled in hashing? (4)

(c) Write an algorithm to search a number in an array that contains a maximum of 20 elements by using binary search. Assume that the array elements are entered in ascending order. If the number to be searched is present at more than one location in the array, the search should stop when one match is found. The program should also display the total number of comparisons made. (6)

algo

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