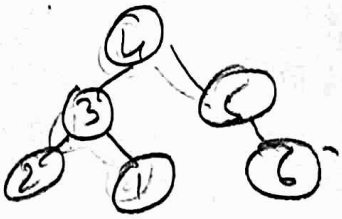


VIT

Vellore Institute of Technology

School of Information Technology and Engineering

Fall Semester 2022-2023

Continuous Assessment Test – I

Programme Name & Branch: MCA

Course Name & code: ITA5002, Problem solving with Data structures and Algorithms

Class Number (s): VL2022230106724 Slot: A1+TA1 **Faculty Name: Prof. E. SREEHARI**

Exam Duration: 90 Min. **Maximum Marks: 50**

Answer all the questions **(5 * 10 = 50)**

1.a) Arul and Mathew developed two algorithms for solving computational problem of same type. Discuss briefly on what basis how you will analyze which algorithm is best and what are the parameters you will consider in order to choose the best algorithm? (4 Marks)

b) Analyze the time complexity of the program module given below?

```
Algorithm add (A, B , n)
{
  for(i=0;i<n;i++)
   {
     for(j=0,j<i;j++)
       {
         C[i][j]=A[i][j]+B[ii[j];
       }
   }
}
```

(3 Marks)

c) Analyze the time complexity of the program module given below?

```
Algorithm compute()
{
  for(i=0;i<n;i++)
   {
     for(j=1;j<n;j=j*2)
       {
        cout << i*j<< " ";
       }
   }
}
```

(3 Marks)

2.a) Evaluate the given expression

6 2 3 + - 3 8 2 / + * 2 ^ 3 + (5 Marks)

b) Choose an appropriate data structure to implement the balancing parenthesis application in language construct? Explain with suitable example. (5 Marks)

3. Students of a programming class submitted their assignments. Their register numbers are stored in a FIFO list in the order in which the assignments are submitted. Register number of the ten students who submitted last will be at the rear of the FIFO list. Hence delete the required number of elements from the simple queue so as to retrieve and display the last 10 students. Design the pseudo code using array to display the register number of the ten students who submitted last? (10 Marks)

4.a) The employee data was implemented with linked list of 100 employees. You have to add new employee data with the details such as employee name, employee_ ID, subject_ code, class_ name. Develop an algorithm to insert the new employee node at the end of the Singly Linked List? (5 Marks)

b) Design an algorithm to display the Linked List values in a backward manner by constructing the doubly linked list representation with the ascending order values of 5 nodes? (5 Marks)

5. Create AVL Tree for the following elements: 1, 2, 3, 4, 5, 6, 7, 8 and discuss the AVL rotations as well? (10 Marks)

****ALL THE VERY BEST****

VIT
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

School of Information Technology and Engineering

Fall Semester 2022-2023 - Fresher

Continuous Assessment Test – II

Programme Name & Branch MCA

Course Name & code: Problem Solving with Data Structures and Algorithms & ITA5002

Class Number (s): VL2022230106724

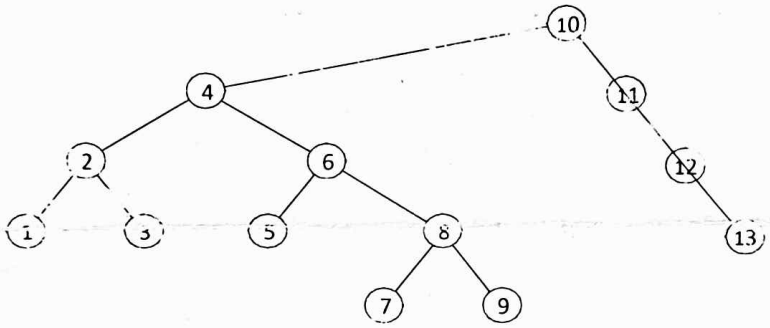
Slot: A1+TA1

Faculty Name (s) Dr.N.Krishnamoorthy

Exam Duration: 90 Min. **Maximum Marks: 50**

General instruction(s):

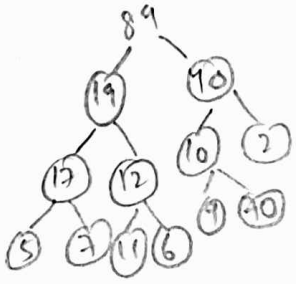
Q No	Question	Max Marks
1.	Show the result of accessing the keys 3, 9, 1, 5 in order in the splay tree	10



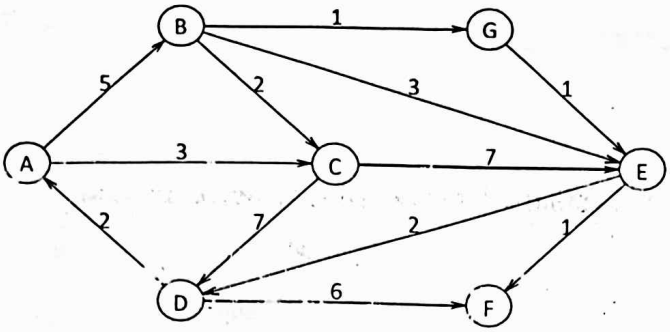
2. Write a program to perform the Binary Search for the given input A[14]={11,22,33,44,55,66,77,88,99,111,222,333,444} and it has to print the position of the number present in the upper half -starting from 1 to n(Mid), where n is the middle element of the input. After middle element again the position should start from 1 to n (Last). Here n is the last element from the input. 10

3. i) What is the minimum number of interchanges needed to convert the array 89,19,40,17,12,10,2,5,7,11,6,9,70 in to a heap with the maximum element at the root. On which algorithm is heap sort based on and what are the properties that heap should satisfy. List the ways in which priority queue can be implemented. (5 marks) 10

ii) Sort the following values 64,8,216,512,27,729,0,1,343,125 under radix sort procedure by mentioning the number of comparisons done to achieve it. (5 marks)

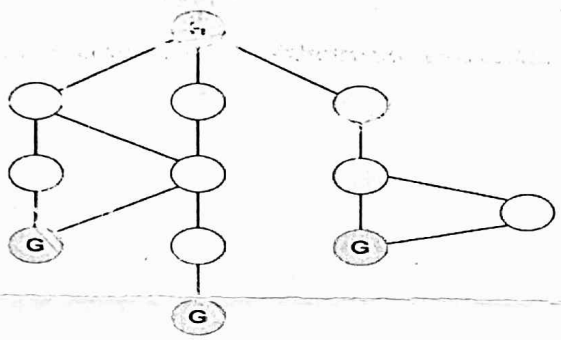


4. i. Find the shortest path from *A* to all other vertices for the graph given below using Dijkstras algorithm and show intial step and final step process with table updation. 10

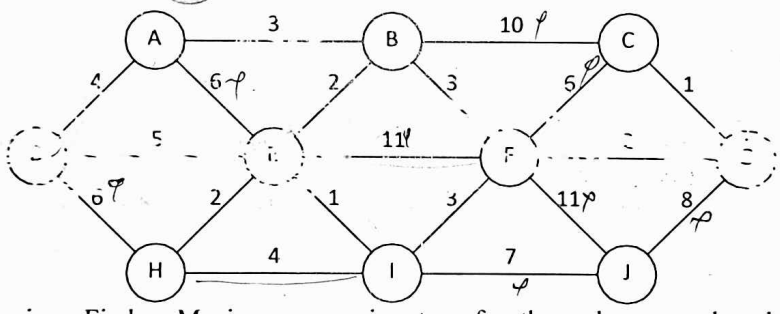


(7 marks)

ii) Consider a problem where you are standing at your house and you have multiple ways to go from your house to a grocery store. You are said that every path you choose has one store and is located at the end of every path. You just need to reach any of the stores. What traversal technique is suitable for this problem. State why it is suitable (3 marks)



5. 10



i. Find a Maximum spanning tree for the above graph using both Prim's and Kruskal's algorithms. Is this Maximum spanning tree unique? Why? (8 marks)

ii. Consider a complete undirected graph with vertex set {0,1,2,3,4}, entry W_{ij} in the matrix W below is the weight of the edge {i,j} What is the minimum possible weight of a spanning tree T in this graph such that vertex 0 is a leaf node in tree T?(2 marks)

$$W=\begin{pmatrix} 0 & 1 & 8 & 1 & 4 \\ 1 & 0 & 12 & 4 & 9 \\ 8 & 12 & 0 & 7 & 3 \\ 1 & 4 & 7 & 0 & 2 \\ 4 & 9 & 3 & 2 & 0 \end{pmatrix}$$

Final Assessment Test – Jan/Feb 2023

VIT® Vellore Institute of Technology

Course: ITA5002 - Problem solving with Data structures and Algorithms

Class NBR(s): 6724 Slot: A1+TA1

Time: Three Hours Max. Marks: 100

KEEPING MOBILE PHONE/SMART WATCH, EVEN IN 'OFF' POSITION, IS TREATED AS EXAM MALPRACTICE

Answer ALL Questions

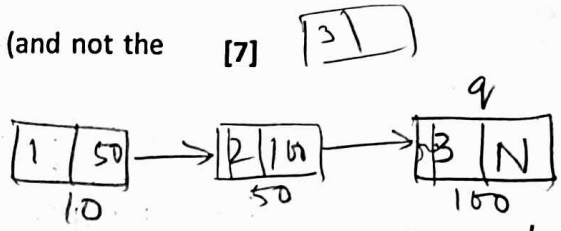
(10 X 10 = 100 Marks)

1. Narrate various asymptotic notations used in algorithm analysis and also explain different complexities involved in it with an example for recursive and non-recursive algorithms. **[10]**

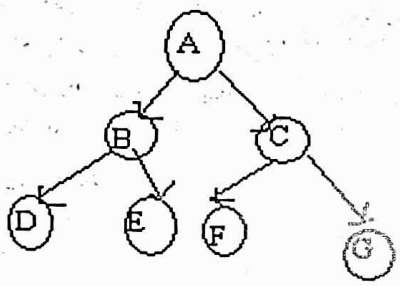
2. a) Swap two adjacent elements by adjusting only the links (and not the data) using **[7]**

   (i) singly linked lists
   (ii) doubly linked lists

   Write the pseudo code of it.



   b) **[3]**



   Give the in order, pre order and post traversal for the above tree.

3. a) Convert the following infix expression to postfix and evaluate it using stack data structure 4*(3+5)12/2. **[6]**

   b) Distinguish Stack and Queue by mentioning its pros and cons. **[4]**

4. a) Show the result of inserting 2, 1, 4, 5, 9, 3, 6 and 7 into an initially empty AVL tree and also write the algorithms of it. **[5]**

   b) Show the result of inserting 3, 1, 4, 6, 9, 2, 5 and 7 into an initially empty binary search tree and write algorithm to show the result for deleting the root. **[5]**

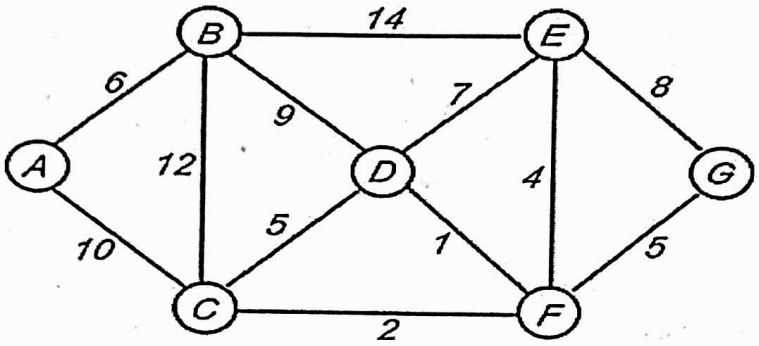
5. a) Show how heap sort process with its algorithm for the given input 142, 543, 123, 65, 453, 879, 572, 434, 111, 242, 811 and 102 and also mention its time complexities with respect to best case, worst case and average case. **[7]**

   b) Compare and contrast the pros and cons of Linear Search with Binary search on various parameters. **[3]**

6. a) Represent the adjacency list for the following adjacency matrix that represents the following graph. [3]

	1	2	3	4	5
1	0	1	0	1	0
2	1	0	1	0	1
3	0	1	0	1	0
4	1	0	1	0	1
5	0	1	0	1	0

b) [7]



Calculate the Minimum total cost to visit all the nodes (A,B,C,D,E,F and G) by using Prim's and Kruskal's Algorithm and check whether the total cost by those two algorithms are same? If not why? Justify.

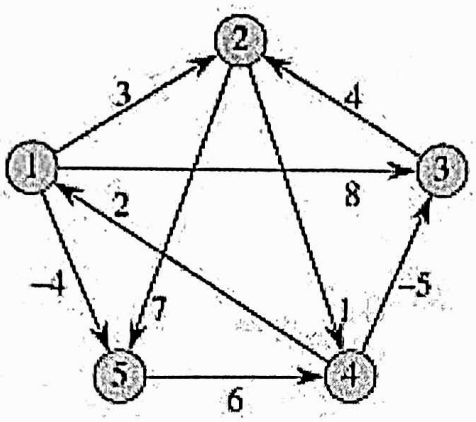
7. For the given weighted directed graph matrix calculate the shortest path from the source vertex A to all other vertex by using Dijkstra's algorithm. Represent the pseudo code and also the initial and final table updations only. [10]

$$\begin{array}{c} \\ A \\ B \\ C \\ D \\ E \end{array}\begin{bmatrix} A & B & C & D & E \\ 0 & 4 & 0 & 0 & 0 \\ 0 & 0 & 3 & 3 & 0 \\ 2 & 0 & 0 & 0 & 2 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 5 & 0 & 2 & 0 \end{bmatrix}$$

8. A file contains only colons, spaces, newlines, commas and digits in the following frequency: colon (100), space (605), newline (100), comma (705), 0 (431), 1 (242), 2 (176), 3 (59), 4 (185), 5 (250), 6 (174), 7 (199), 8 (205), 9 (217). Construct the Huffman code. [10]

9. Show the operation of all the bin packing strategies on the input 0.42, 0.25, 0.27, 0.07, 0.72, 0.86, 0.09, 0.44, 0.50, 0.68, 0.73, 0.31, 0.78, 0.17, 0.79, 0.37, 0.73, 0.23, 0.30 **[10]**

10. Write the algorithm for All Pairs Shortest path and compute the same for given graph by applying the Concept of Dynamic Programming. **[10]**



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