

**VIT**Vellore Institute of Technology
(Chartered to be University under section 3 of the UGC Act, 1956)**Final Assessment Test – November 2022**

Course: BCSE202L - Data Structures and Algorithms

Class NBR(s): 3367/3372/3397/3568/3575

Slot: B1+TB1

Time: Three Hours

Max. Marks: 100

KEEPING MOBILE PHONE/SMART WATCH, EVEN IN 'OFF' POSITION, IS TREATED AS EXAM MALPRACTICE**Answer any TEN Questions****(10 X 10 = 100 Marks)**

1. a. Write the recursive code for calculating the sum of digits of a given number. The number can have any number of digits. [5+5]
b. Solve the following recurrence equation

$$T(n) = 3T\left(\frac{n}{2}\right) + n^2$$

using Master Method.

2. For the following infix expression, compute the prefix and postfix expression.
 $((A + (B * C)) / (F + G))$
Demonstrate every operation performed on the stack.

3. Perform selection sort on the following array. Show after each iteration (Outer loop - only).

41	30	21	78	31	42	18	45	12	54
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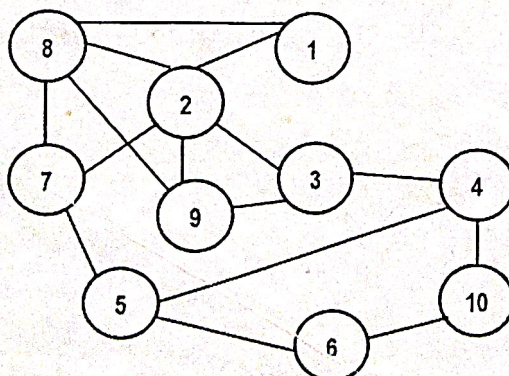
Explain selection sort with complete pseudo-code.

4. a. From the given pre-order traversal of the BST, draw the Binary Search Tree (BST): [5+5]
46, 32, 21, 10, 25, 38, 36, 40, 50, 48, 90, 86, 96

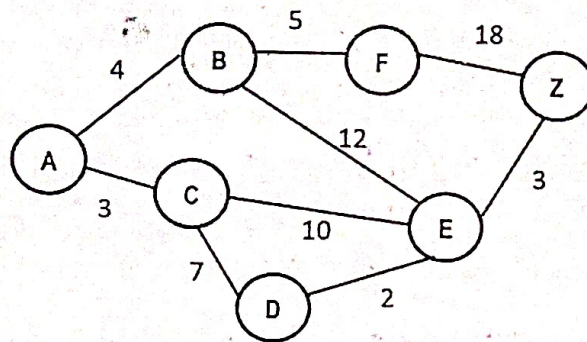
- b. Given the postfix
 $4\ 4 + 7 - 9 \times 3 \div$
construct the expression tree.

5. Create a binary search tree for the following words:
one, two, three, four, five, six, seven, eight, nine, ten
Illustrate the tree after the insertion of all elements. Delete "one" from the tree. Draw the tree after removal.

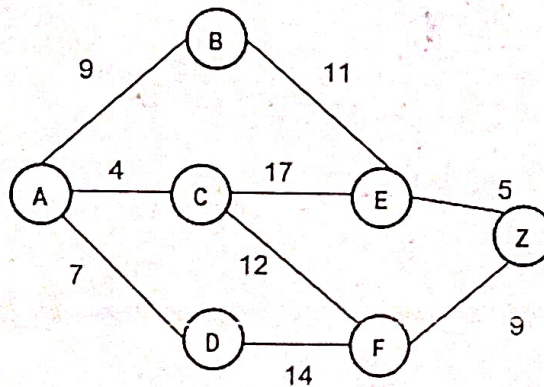
6. Perform the BFS and DFS search algorithms on the following graph, following numeric order, starting at 1. Search for node 12 and find if the search is successful or unsuccessful.



7. Using Kruskal's and Prim's algorithms, compute the Minimum Spanning Tree (MST) for the following graph.



8. Compute the shortest path from A to Z using Dijkstra's algorithm for the following graph.



9. Demonstrate what happens when we insert the keys 82, 50, 17, 92, 57, 78, 98, 65, 75, 91 into a hash table with collisions resolved by quadratic probing. Consider a hashing table with nine slots and let the hash function be $h(k) = k \bmod 9$. Provide the final hash table.
10. Perform sorting of the following numbers using a max heap. 2, 7, 26, 25, 19, 17, 1, 90, 3, 36, 92, 100.
11. Create an AVL tree for the following numbers: 20, 50, 67, 80, 78, 10, 5, 90, 99, 87. Illustrate the AVL tree after each rotation. Delete keys 5 and 10. Show the new AVL tree.

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