



VIT

Vellore Institute of Technology

Final Assessment Test - June 2023

Course: BCSE202L - Data Structures and Algorithms
Class NBR(s): 5827/5830/5833/5835/5854/5863/5954/
6219/6332/6588/6597/7613

Time: Three Hours

Slot: C

Max. Ma

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

Answer ALL Questions
(10 X 10 = 100 Marks)

1. Write a pseudocode to find factorial of an integer using recursion. Write its recurrence relation and compute its time complexity, using substitution method.
2. Provide the pseudocode for infix to postfix conversion and show step by step how to convert the given infix expression: $(a-b)/c*(d+e-f/g)$ to postfix.
3. Assume that a singly linked list is implemented with a header node, but no tail node, and that it maintains only a pointer to the header node. Write a procedure that performs the following:
 - a) return the size of the linked list
 - b) print the linked list
 - c) test if a value x is contained in the linked list
 - d) add a value x if it is not already contained in the linked list
 - e) remove a value x if it is contained in the linked list.

4. Suppose S is the following list of 14 alphabetic character:

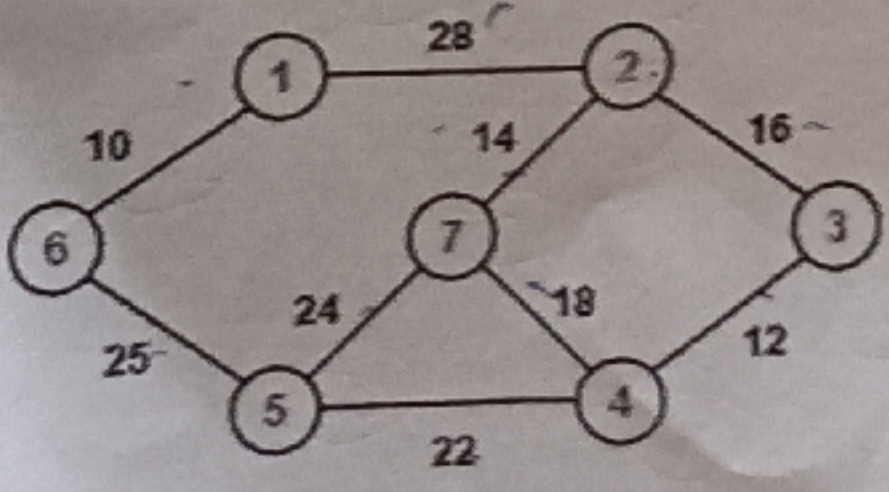
D	A	T	A	S	T	R	U	C	T	U	R	E	S
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Suppose the characters in S are to be sorted alphabetically. Write a pseudocode for quick sort and show the final position of first character D.

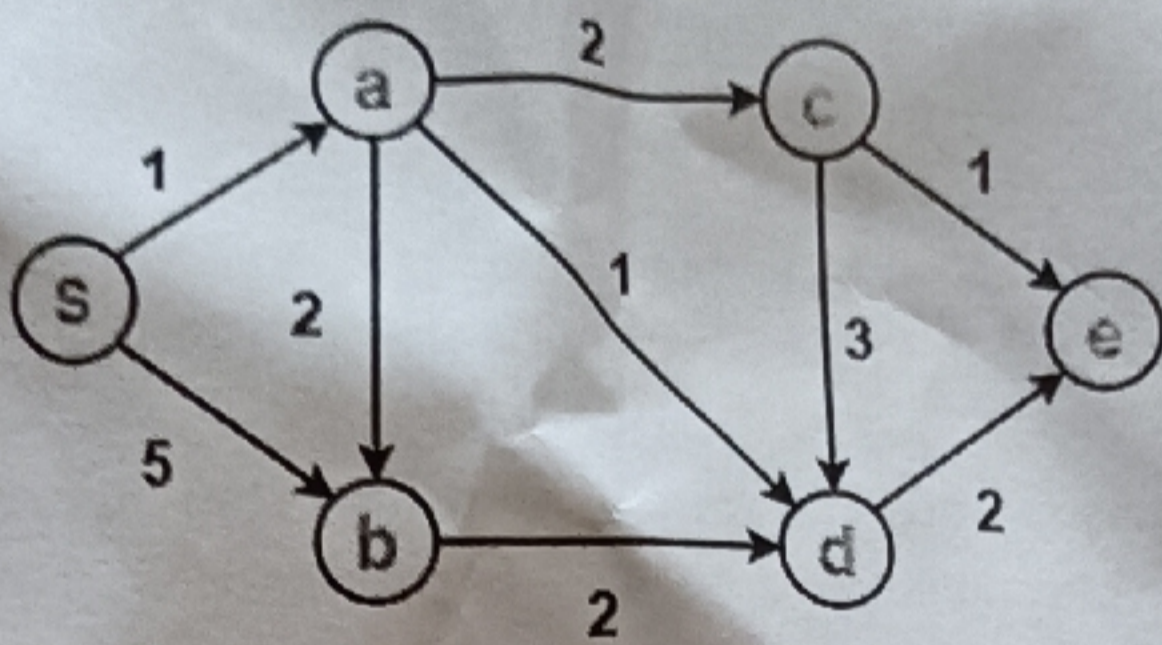
5. a) How would you implement mergesort without using recursion? [5]
- b) Write a recursive function that takes a pointer to the root node of a binary tree T and returns a pointer to the root node of the tree that results from removing all leaves from T. [5]

6. Construct a Binary Search Tree (BST) for the following sequence of numbers- 47, 12, 75, 88, 90, 73, 57, 1, 85, 50, 62 and then delete 75 and 47. Show the tree after every insertion and deletion.

7. Construct a minimum spanning tree (MST) for the given graph using Prim's Algorithm. Show step by step process.



8. Using Dijkstra's Algorithm, find the shortest distance from source vertex 'S' to remaining vertices in the following graph step by step. Do mention the algorithm also.



9. Diagrammatically show LL Rotation, RR Rotation, LR Rotation, RL Rotation. And Construct an AVL tree by inserting the following elements in the order of their occurrence. 64, 1, 44, 26, 13, 110, 98 and 85.
10. Consider a hash table consisting of $M = 11$ slots, and suppose that nonnegative integer key values are hashed into the table using the hash function $h1()$ defined below.

```

int h1 (int key) {
int x = (key + 7) * (key + 7);
x = x / 16;
x = x + key;
x = x % 11;
return x;
}

```

Using above mentioned hash function, insert the following keys:

43, 23, 1, 0, 15, 31, 4, 7, 11, and 3 into the hash table and resolve collisions by using linear probing and quadratic probing.

The integer key values listed above are to be inserted, in the order given. Show the home slot (the slot to which the key is hashed, before any probing), the probe sequence (if any) for each key, and the final content of the hash table after all insertions.

