**Q5.** Explain AVL tree? Construct an AVL tree by inserting the following elements in the given order: 16, 27, 9, 11, 36, 54, 81, 63, 72. **(5 marks)**

Q6. Create a min heap for the following elements in the given order and then apply heap sort on it.

12, 5, 35, 45, 10, 2, 25, 15, 50, 60, 75, 22 **(5 marks)**

Q7. Draw the minimum spanning tree of the following graph using kruskal's algorithm. Explain each step and find the weight of the resulting MST.
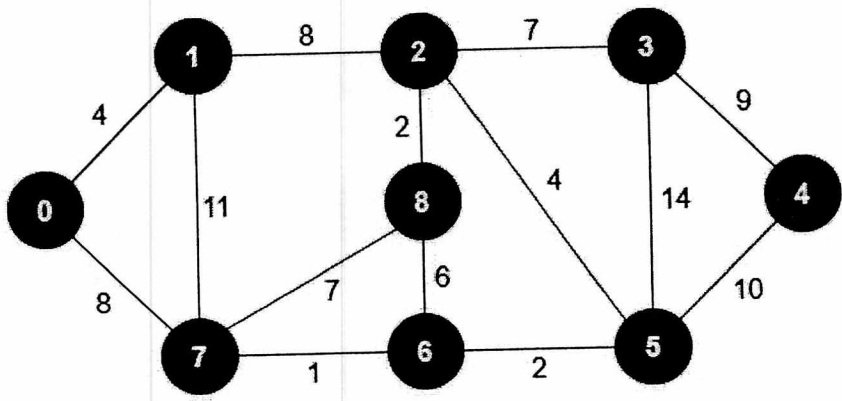
(5 marks)

Q8. Show the trace of the quick sort algorithm for the following data:

23, 56, 7, 8, 4, 67, 89, 57, 50, 66, 34

Also write the complexity of quick sort in worst and best case. **(5 marks)**

Q9. Write an algorithm of the merge sort along with worst and best case complexity. **(5 marks)**

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Branch/ Semester	: ECE	**Subject Code**	: CS-201
Subject Name	: Data Structures	**Duration**	: 3 Hrs
Date	: 28/11/2023	**Max. Marks**	: 50

Q1. a.) The height of a tree is the length of the longest root-to-leaf path in it. Find the maximum and minimum number of nodes in a binary tree of height 5.

b.) What is the maximum height of any AVL-tree with 7 nodes? Assume that the height of a tree with a single node is 0.

c.) Assume that the operators $+$, $-$, $\times$, are left associative and $\wedge$ is right associative. The order of precedence (from highest to lowest) is $\wedge$, $\times$, $+$, $-$. Find the postfix expression corresponding to the infix expression $a + b \times c - d \wedge e \wedge f$.

d.) What is the advantage of AVL tree over Binary Search tree?

e.) The following sequence of operations is performed on a stack: PUSH (10), PUSH (20), POP, PUSH (10), PUSH (20), POP, POP, POP, PUSH (20), POP

The sequence of values popped out is: **(5*2=10 marks)**

Q2. Write an algorithm to insert and delete an element from the queue using linked list.

(5 marks)

Q3. Consider a hash table with 9 slots. The hash function is h(k)=K mod 9. The collisions are resolved by chaining. The following 9 keys are inserted in the order 5, 28, 19, 15, 20, 33, 12, 17, 10. Find the maximum, minimum and average chain lengths in the hash table respectively.

(5 marks)

Q4. Construct the tree using the following traversals. The postorder traversal of a binary tree is 8, 9, 6, 7, 4, 5, 2, 3, 1. The inorder traversal of the same tree is 8, 6, 9, 4, 7, 2, 5, 1, 3. Also find the height of the binary tree.

(5 marks)