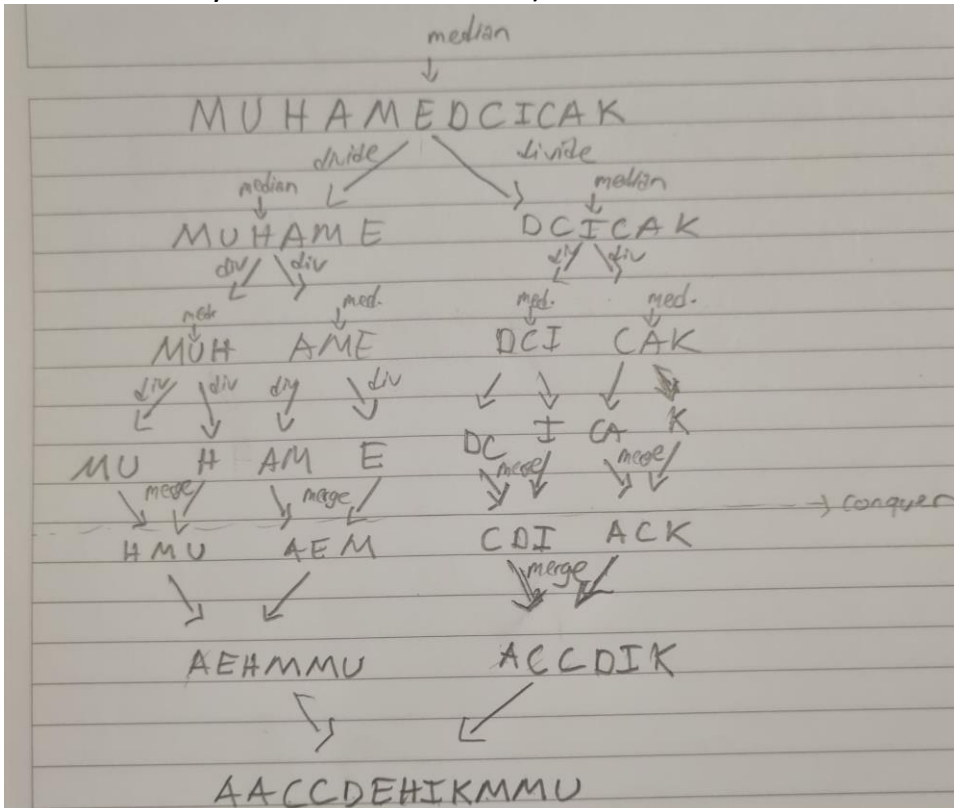# SE2228 Algorithm Analysis and Design: Assignment-2

(In the questions, use **q**=last two digits of your Id)   21.03.2023

1.Show how the merge sort algorithm works on your name+surname
(Example : John Smith→ JohnSmith . Explain the algorithm by drawing merge sort tree using the letters of your name&surname)

2.Express the complexity of Merge Sort as a recurrence equation and solve it.

$T(1) = 1$

$T(n) = 2T(n/2) + n$

$T(n) = 2(2T(n/4) + n/2) + n$

$T(n) = 4T(n/4) + 2n$

$T(n) = 4(2T(n/8) + n/4) + 2n$

$T(n) = 8T(n/8) + 3n$

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$T(n) = 2^kT(n/2^k) + kn$

Suppose than $2^k = n$, then $\log_2(n) = k$, thus;

$T(n) = nT(1)+n\log n$

$T(n) = n + n\log n$ (since $T(1) = 1$)

T(n) = O(nlogn)

3. The graph G contains the following vertices and edges with the following weights.
AD 6 AB 2 AC 12 BC 8 DE 3 DC 5 BD 9 CE 4 BE 7

a.Draw this graph and give DFS and BFS listings of the vertices.

b. Run Dijkstra's Algorithm to find the shortest distances in the graph G from a start vertex (Choose the start yourself) to all other vertices.

4. Apply Kruskall algorithm to find a MST of the graph G.
   (Show the implementation steps)
5.Apply Prim's Algorithm to find a MST of the graph G.
   (Show the implementation steps)

Answers to 3, 4 and 5: