

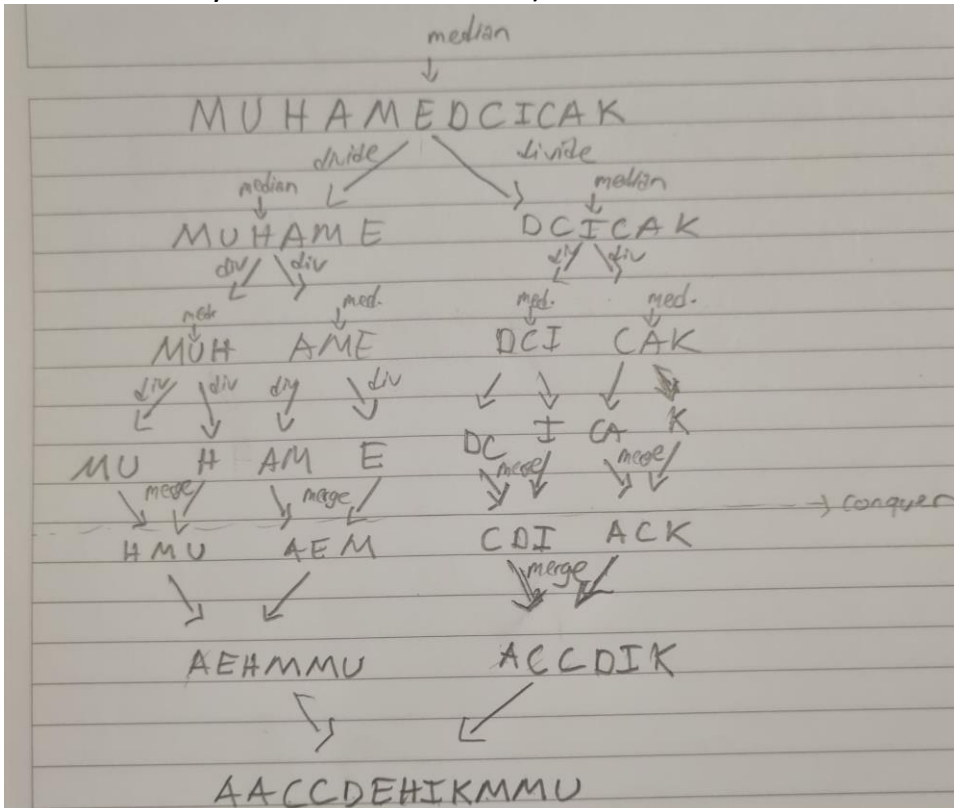
SE2228 Algorithm Analysis and Design: Assignment-2

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

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

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

$$T(n) = n + n \log n \text{ (since } T(1) = 1)$$

$$T(n) = O(n \log n)$$

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 Kruskal 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:

Initially: A=0, B=∞, C=∞, D=∞, E=∞

3.b) S: A

	A	B	C	D	E
1.	0	2	12	6	∞
2.	0	2	10	6	9
3.	0	2	10	6	9
4.	0	2	10	6	9
5.	0	2	10	6	9

Visited: A, B, D, E, C

3.d) BFS: A B C D E
DFS: A B C E D

I assume preference by lexicographical order of the letters.

Continuation

3.b) 1. visit A and update distances to its neighbours

2.	B	11	11	11	11
3.	D	11	11	11	11
4.	E	11	11	11	11
5.	C	11	11	11	11

4) Sort: 1. AB 2
2. DE 3
3. CE 4
4. DC 5
5. AD 6
6. BE 7
7. BC 8
8. BD 9
9. AC 12

Output (MST)

5) S: A, initially the spanning tree contains A.

Output (MST)