

Assignment Spring 2021

Solution by, **MR Association**



Group Members

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Question #1

Consider an array of 10 elements as [**15, 2, 8, 4, 1, 13, 9, 7, 11, 17**]. Sort the array in ascending order and perform the steps mentioned on bullet (c)&(d) using algorithms given below:

- a) Merge Sort
- b) Selection Sort
- c) Provide code for (a) and (b).
- d) Do not solve directly, rather show the changes made in array as you iterate through the loop for sorting.

Question #2

Calculate **$T(N)$** for given code using **Frequency Count Method**. Represent the time complexity as $O()$, $\Theta()$, $\Omega()$ also (without proving mathematically).

Question #3

Suppose three function's $T(N)$ as follows: $F(N)=2N^3+N^2+2$; $G(N)=N^3$; $H(N)=75$

Prove following using formal mathematical definitions:

- a) $F(N)=\Theta(G(N))$
- b) $F(N)=O(G(N))$
- c) $F(N)=\Omega(H(N))$

Question #4

Suppose the $T(N)$ of two algorithms as: $F(N)=5N^2+2N$; $G(N)=N^2$.

If $F(N)=\Theta(G(N))$, then prove:

a) $F(N)=O(G(N))$

b) $F(N)=\Omega(G(N))$

Question #5

- a) Consider an array [**18,22,20,25,30,44,60,51, 37**] and **value = 60**. Dry run the Given **Pseudo-code** and show in which time complexity class does the algorithm fall.
- b) **Update** and show the values of low, mid and high through the iterations.
- c) What is the **T(N)** of above algorithm asymptotically? Use a notation of your choice.