

**Sabancı University**  
**Faculty of Engineering and Natural Sciences**

**CS301 – Algorithms**

**Homework 5**

Due: December 16, 2020 @ 23.59

(Upload to SUCourse+ - **see late submission policy below**)

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**PLEASE NOTE:**

- Provide only the requested information and nothing more. Unreadable, unintelligible and irrelevant answers will not be considered.
- You can collaborate with your TA/INSTRUCTOR ONLY and discuss the solutions of the problems. However you have to write down the solutions on your own.
- Plagiarism will not be tolerated.
- Submit your answers as a single PDF file
- Late submission is allowed for only 10 hours. Each hour late submission costs 10% of your grade. For example, if you submit 2 hours late, your grade will be multiplied by 0.8.

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1. Assume  $n$  operations are executed on a data structure in order. The cost function is given below.

$$\text{Cost of } i^{\text{th}} \text{ operation} = \begin{cases} i & \text{if } i \text{ is an exact power of 2} \\ 1 & \text{otherwise} \end{cases} \quad (1)$$

Find the amortized cost per operation as tight as possible by using

- (a) aggregate analysis method.
- (b) accounting method. (Find the cost as small as possible per step)
- (c) potential method. (Find a potential function, such that  $\Phi(i) \geq \Phi(0)$  and show amortized cost for every step when this potential function is used)