
INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR
CS21003 Algorithms I: First Class Test 2021 Spring

Date of Examination: 30th January 2021

Duration: 30 minutes + 5 minutes (for scanning, concatenating, and uploading)

Full Marks: 10

Subject: CS21003 Algorithms I

Part I

Answer all question.

1. Prove or disprove the following statement. Let $f, g, h : \mathbb{N} \rightarrow \mathbb{N}$ be any functions. The function h is strictly increasing. Then we have $f = \mathcal{O}(g)$ if and only if $h(f) = \mathcal{O}(h(g))$.

[2 Marks]

2. Compute asymptotic complexity of $T(n)$ in terms of Θ for the following recurrence.

(a)

$$T(n) = \begin{cases} T(n-1) + T(n-2) + n & \text{if } n \geq 2 \\ -3 & \text{otherwise} \end{cases}$$

[4 Marks]

(b)

$$T(n) = \begin{cases} T(\lceil \frac{n}{2} \rceil) + T(\lceil \sqrt{n} \rceil) + n & \text{if } n \geq 2 \\ 1 & \text{otherwise} \end{cases}$$

[4 Marks]

All the best
