Hierarchical Memory Algorithms - Mid Semester Examinations
14:00 -16:00

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INSTRUCTIONS

1. **All questions carry 10 marks**

2. **DO NOT DISCUSS OR SEARCH THE INTERNET.**

3. **For every question, assume that the input could be much larger than the internal memory.**

4. **Argue clearly about the I/O complexity of your algorithm.**

5. **If your work is not legible, I wont be able to read it and you may not get credits for your work.**

6. **Keep your video feeds on throughout the examination. You are allowed to take a single biobreak of at most 5 minute.**

1. **Design an algorithm to compute the product of two numbers.**

2. **Assume that you are given a number n in binary. Design an algorithm to compute n mod 3.**

3. **Assume that you are given a number n is binary. Design an algorithm to compute $n \mod 13$.**

4. **Assume that you are given two sorted arrays A and B of integers. Compute the median of the A and B combined. You may assume that the elements are distinct.**

5. **Consider n water tanks in $\mathbb{R}^2$. Assume that each tank has a height and associated list of neighboring tanks. If tank A is a neighbour of tank B and height of A is greater than height of B, water from A will be eventually drained to B. If there are multiple neighbors at lower height, water flow into all those neighbors. Design an algorithm to find all the tanks that can contain water in the steady state.**

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