INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR
Algorithmic Game Theory 2020-21: Second Class Test

Date of Examination: 3 October 2020
Duration: 30 minutes (for writing answers) + 10 minutes (for taking photos, concatenating, and uploading to moodle)
Full Marks: 20
Subject No: CS60025
Subject: Algorithmic Game Theory
Department/Center/School: COMPUTER SCIENCE AND ENGINEERING
Special instruction (if any): You do not need to prove anything that is already proven in the class.

Answer all the questions.

1. Prove or disprove.

   ▷ Let $A \in \mathbb{R}^{m \times n}$ be a matrix such that the sum of entries in each row is 0. Then the value of A is 0.

   [5 Marks]

2. Let an array A store n integers (may or may not be distinct) from the range 1 to $10n$. Given an integer x in $[1, 100n]$, show that the expected number of comparison made by any randomized algorithm to search if x is stored in A or not is $\Omega(n)$. A randomized algorithm outputs the correct answer on every input with probability at least $\frac{9}{10}$.

   [10 Marks]

3. Prove or disprove.

   ▷ Every potential game has a PSNE.

   [5 Marks]