INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR
Algorithmic Game Theory: First Class Test 2018-19
Set #1

Date of Examination: 13 August 2019
Duration: 50 minutes
Full Marks: 15
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 question.

1. Let $\Gamma = \langle N = \{1,2\}; S_1 = [m], S_2 = [n]; u_1, u_2 \rangle$ be a game in normal form such that, for every $i \in [m]$ and $j \in [n]$, we have $u_1(i,j) + u_2(i,j) = 50$. Prove that there exists an MSNE $(x^*, y^*) \in \Delta([m]) \times \Delta([n])$ in this game where the payoff of every player in (x^*, y^*) is his/her corresponding security lever.

[5 Marks]

2. Compute all MSNEs of the following coordination game.

   ▷ The set of players $(N) : \{1,2\}$

   ▷ The set of strategies: $S_i = \{A, B\}$ for every $i \in [2]$

   ▷ Payoff matrix:

		Player 2	
		A	B
Player 1	A	$(10,10)$	$(0,0)$
	B	$(0,0)$	$(1,1)$

[5 Marks]

3. In Local-Weighted-Max-Not-All-Equal-2SAT problem, we are given a set of 2SAT clauses each having a weight. An assignment of the variables is said to satisfy a clause if and only if it makes exactly one of its literal true. The goal is to find an assignment which is locally optimal — by changing the assignment of any one variable, it is not possible to increase the sum of weights of the clauses satisfied. Prove that Local-Weighted-Max-Not-All-Equal-2SAT is PLS-complete.

[5 Marks]