E1 254 Game Theory
Jan - Apr. 2022
Second Test
March 2, 2022

Please write your answers on A4 size sheets only with a dark pen and in a legible way. Scan the answer script in a clean way so that it can be printed without any problem.

Attempt all the four questions.
Max marks: 15 Time: 80 minutes.
Use page # 2 for question # 2.
Write your name in capital letters, your programme, and the last ~~four~~ five digits of your SR #. Name the pdf file with your fullname.

1. Consider a matrix game:

$$\begin{bmatrix} 2 & -1 \\ -3 & 4 \end{bmatrix}$$

4 marks

(a) Write down the primal LP
(b) Find all optimal solutions and optimal value of the above LP
(c) Write down the dual LP
(d) Find all optimal ~~value~~ solutions and optimal value of the dual LP
(e) Find all mixed strategy Nash equilibria from the above.

(2) Compute all correlated equilibria for the following zero-sum game and show a picture depicting all those equilibria:

$$\begin{bmatrix} 1,-1 & -1,1 \\ -1,1 & 1,-1 \end{bmatrix}$$

4 marks

(3) Consider the following versions of the Divide-the-dollar problem and investigate whether convex or not. 3 marks

(a) Version 2: $v(12) = v(123) = 300$
(b) v3: $v(12) = v(13) = v(123) = 300$
(c) v4: $v(12) = v(13) = v(23) = v(123) = 300$

(4) Glove Market: Suppose k is a positive integer and

$N_L = \{1, 2, \ldots, k\}$
$N_R = \{k+1, k+2, \ldots, 2k\}$

4 marks

$$v(C) = \min\left(|C \cap N_L|, |C \cap N_R|\right)$$
$$\forall\, C \subseteq N_L \cup N_R$$

Compute the Core of this game. Also, compute the Shapley value of the game.