Date of Examination: 3rd **September 2022**
Duration: 45 minutes
Subject: CS60025 Algorithmic Game Theory

The last digit of your roll number from right be d'. Let us define $d = d' + 2$.

1. Compute all (i) SDSE, (ii) WDSE, and (iii) PSNE of the following game for all possible value of $n \in \{1, 2, \ldots\}$.

   ▷ The set of players $(N) : \{1, 2, \ldots, n\}$
   ▷ The set of strategies: $S_i = \{0, 1\}$ for every $i \in [n]$
   ▷ Utility:

   $$u_i(s_1, \ldots, s_i, \ldots, s_n) = s_i - \left\lceil \frac{d(s_1 + \cdots + s_n)}{n} \right\rceil$$

   [10 Marks]

2. Compute all MSNEs, if any, for the following game.

   ▷ The set of players $(N) : \{1, 2\}$
   ▷ The set of strategies: $S_1 = [d, d + 2], S_2 = [d + 3, 2d + 4]$
   ▷ Utility: $u_1(x, y) = -u_2(x, y) = |x - y|, \forall (x, y) \in S_1 \times S_2$

   [5 Marks]

3. Compute all MSNEs of the matrix game given by:

   $$\begin{bmatrix} d^2 & 3 \\ 4 & 2d \end{bmatrix}$$

   [5 Marks]