UGEB253N Games and Strategic Thinking
Bimatrix game exercise

1. For each of the following bimatrix games, determine whether it can be transformed to a zero sum game. If it can, find α and β such that $\alpha A + \beta E = -B$ where E is the 2×2 matrix with all entries equal to 1.

   (a) $(A, B) = \begin{pmatrix} (2,5) & (4,1) \\ (3,3) & (1,7) \end{pmatrix}$

   Solution. Yes. $\alpha = 2, \beta = -9$

   (b) $(A, B) = \begin{pmatrix} (7,4) & (-5,-2) \\ (3,2) & (1,1) \end{pmatrix}$

   Solution. No. $\alpha = -\frac{1}{2}, \beta = -\frac{1}{2}$

2. For each of the following two-person bimatrix game, find

   (i) the prudential strategies for the players and the payoffs to the players if both of them use prudential strategies.

   (ii) the mixed Nash equilibrium and the corresponding payoffs to the players.

   (a) $(A, B) = \begin{pmatrix} (2,1) & (3,4) \\ (5,3) & (1,2) \end{pmatrix}$
   Solution. Prudential: $I = (0.8, 0.2)$, $II = (0.5, 0.5)$, payoffs:$(2.6, 2.5)$;
   Nash: $I = (0.25, 0.75)$, $II = (0.4, 0.6)$, payoffs:$(2.6, 2.5)$

   (b) $(A, B) = \begin{pmatrix} (1,-2) & (2,1) \\ (4,2) & (0,3) \end{pmatrix}$
   Solution. Prudential: $I = (0.8, 0.2)$, $II = (0, 1)$, payoffs:$(1.6, 1.4)$;
   Nash: $I = (1, 0)$, $II = (0, 1)$, payoffs:$(2, 1)$