Theme: GAME THEORY

Task 1.

1) Determine the lower and the upper prices of the game and existence of a saddle point for given payoff matrices.
2) Solve matrix games of size 2x2 using the analytical method.

(1) $A=\begin{pmatrix}10 & 7\\ 8 & 11\end{pmatrix}$	(2) $A=\begin{pmatrix}4 & -2\\ 1 & 3\end{pmatrix}$	(3) $A=\begin{pmatrix}2 & 8\\ 7 & 4\end{pmatrix}$	(4) $A=\begin{pmatrix}2 & -3\\ -2 & 4\end{pmatrix}$	(5) $A=\begin{pmatrix}4 & 0\\ 1 & 3\end{pmatrix}$
(6) $A=\begin{pmatrix}2 & 9\\ 8 & 0\end{pmatrix}$				

Task 2.

1) Determine the lower and the upper prices of the game and existence of a saddle point for given payoff matrices.
2) Simplify these matrices and exclude unprofitable strategies.

(1) $\begin{pmatrix}4 & 5 & 6 & 7 & 9\\ 3 & 4 & 6 & 7 & 6\\ 7 & 6 & 10 & 8 & 11\\ 8 & 5 & 4 & 7 & 3\end{pmatrix}$	(2) $\begin{pmatrix}3 & -2 & 5 & -1\\ 4 & 0 & 6 & 1\\ 2 & -1 & 3 & 2\\ 1 & 3 & 7 & 4\end{pmatrix}$	(4) $A=\begin{pmatrix}3 & 9 & 2 & 1\\ 7 & 8 & 5 & 6\\ 4 & 7 & 3 & 5\\ 5 & 6 & 1 & 7\end{pmatrix}$
(5) $A=\begin{pmatrix}4 & 5 & 9 & 3\\ 8 & 4 & 3 & 7\\ 7 & 6 & 8 & 9\\ 7 & 2 & 4 & 6\end{pmatrix}$	(6) $\begin{pmatrix}2 & 3 & 5 & 9\\ -2 & -4 & -2 & 7\\ 7 & 5 & 0 & -3\\ -1 & 6 & 1 & 2\\ 6 & 9 & 6 & 3\end{pmatrix}$	(7) $\begin{pmatrix}6 & 5 & 9\\ -2 & -2 & 7\\ 7 & 0 & -3\end{pmatrix}$
(8) $\begin{pmatrix}1 & 2 & 1 & 2\\ 2 & 1 & 2 & 4\\ 3 & 3 & 2 & 2\\ 4 & 1 & 3 & 3\end{pmatrix}$	(10) $\begin{pmatrix}6 & 7 & 7 & 5\\ 8 & 1 & 6 & 7\\ 4 & -3 & 4 & 3\end{pmatrix}$	(9) $A=\begin{pmatrix}2 & 4 & 8 & 5\\ 6 & 2 & 4 & 6\\ 3 & 2 & 5 & 4\end{pmatrix}$

Simplify matrices, calculate the lower price and the upper price and find the optimal solution of the game and the game price:

Task 3 $A=\begin{pmatrix}3&1&4&5\\4&3&5&7\\2&1&3&3\\5&5&4&3\end{pmatrix}$;

Task 4 $A=\begin{pmatrix}2&3&1&4\\4&3&4&5\\3&2&1&4\\5&4&1&6\end{pmatrix}$;

Task 5 $A=\begin{pmatrix}4&1&3&2\\4&2&4&3\\5&2&4&4\\1&4&7&5\end{pmatrix}$;

Task 6 $A=\begin{pmatrix}1&2&1&2\\2&2&3&3\\0&1&2&3\\5&1&2&3\end{pmatrix}$;

Task 7 $A=\begin{pmatrix}1&1&2&2\\2&3&3&4\\0&2&1&3\\5&2&3&5\end{pmatrix}$.

Task 8 $\Pi=\begin{pmatrix}1&2&0&4\\3&2&1&2\\0&4&2&3\\5&3&1&4\end{pmatrix}$

Task 9 $\Pi=\begin{pmatrix}-1&7&5&6&12\\4&8&9&6&15\\5&-7&4&5&14\end{pmatrix}$

Task 10 $\Pi=\begin{pmatrix}4&1&-2&3&5\\6&3&1&3&7\\3&2&6&4&4\end{pmatrix}$

Task 11 $\Pi=\begin{pmatrix}5&2&1&3\\6&3&2&2\\2&4&0&-3\end{pmatrix}$

Task 12 $\Pi=\begin{pmatrix}1&2&4&3\\0&2&3&2\\1&2&4&3\\4&3&1&0\end{pmatrix}$

Task 13 $\Pi=\begin{pmatrix}2&0&1&4\\1&2&5&3\\4&1&3&2\end{pmatrix}$

The payoff matrices are given. Solve the matrix game by the graphical method, find the optimal strategies and the game price.

Task 14 $\Pi=\begin{pmatrix}7&4&1&7&-2\\5&0&4&-3&2\end{pmatrix}$

Task 15 $\Pi=\begin{pmatrix}4&7&6&5&2\\6&3&7&4&8\end{pmatrix}^{\mathbf{T}}$

Task 16 $\Pi=\begin{pmatrix}5&4&6&4&6\\4&1&8&4&2\end{pmatrix}$

Task 17 $\Pi=\begin{pmatrix}1&5&9&3\\6&3&2&7\end{pmatrix}$

Task 18 $\Pi=\begin{pmatrix}11&9&6&0\\2&6&8&10\end{pmatrix}^{T}$

Task 19 $\Pi=\begin{pmatrix}0&5&3&4\\5&3&5&4\end{pmatrix}$

Task 20 $\Pi = \begin{pmatrix} 2 & 3 & 6 & 5 \\ 6 & 4 & 1 & 3 \end{pmatrix}$

Task 21 $\Pi = \begin{pmatrix} 7 & 2 & 6 & 4 \\ 2 & 6 & 5 & 7 \end{pmatrix}^T$

Task 22 $\Pi = \begin{pmatrix} 2 & 4 & 5 & 7 \\ 8 & 6 & 4 & 3 \end{pmatrix}^T$

Task 23 $\Pi = \begin{pmatrix} 2 & 1 & 4 & 3 \\ 3 & 7 & 1 & 2 \end{pmatrix}$

Task 24 $\Pi = \begin{pmatrix} 4 & 6 & 8 & 7 \\ 6 & 3 & 2 & 5 \end{pmatrix}^T$

Task 25 $\Pi = \begin{pmatrix} 3 & 2 & 1 & 1 \\ 1 & 3 & 4 & 2 \end{pmatrix}^T$

Task 26 $\Pi = \begin{pmatrix} 6 & 5 & 2 & 4 \\ -1 & 1 & 4 & 2 \end{pmatrix}^T$