INTELLIGENT DECISION SUPPORT SYSTEMS – EXERCISES III – SOLUTION CONCEPTS IN STRATEGIC GAMES

I. Indicate the truth (T) or falsity (F) for the below statements.

a) In the normal-form strategic games, players take action sequentially	
b) The pure Nash equilibrium is not always Pareto efficient	
c) For a normal-form strategic game involving two players and two actions for each of them, there is always at most one pure Nash equilibrium	
d) For the coordination games, all Nash equilibria are always Pareto efficient	
e) There is no pure Nash equilibrium for rock-paper-scissors	
f) A mixed strategy is fully mixed if its support contains at least two actions	
g) Every normal-form game has at least one Nash equilibrium	
h) Various orders of eliminating strictly dominated strategies can lead to different reduced games	
i) The equilibrium in dominant strategies is non-empty for all normal-form games	
j) The correlated equilibrium is non-empty for all normal-form games	

II. Consider the below normal-form strategic game involving two payers, A and B, and solve the following five sub-tasks:

a) identify dominated/dominating strategies, if any, for players A and B

the dominating strategy for player A is … \ is not existing

the dominating strategy for player B is … \ is not existing

b) find all pure Nash equilibria; the pure Nash equilibrium is (,)

c) justify why (T,L) is not a pure Nash equilibrium (hint: analyze actions of player A)

d) justify whether (T,L) or (B,R) or (B,L) is a Pareto efficient action profile

e) change the least number of utilities in the pay-off matrix to transform the normal-form game into a coordination game

A \ B	L	R
T	2 \ 2	0 \ 1
B	3 \ 0	1 \ 1

III. Consider the below normal-form strategic game involving two payers, A and B, and solve the following four sub-tasks:

a) find all Nash equilibria (including the mixed ones) by drawing a diagram with the best responses for players A and B

hint: for player A, consider $u_A(T,q) \geq u_A(B,q)$, i.e., $0q - 10(1-q) \geq -1q - 6(1-q)$

for player B, consider $u_A(L,p) \geq u_A(R,p)$, i.e., $0p + 0(1-p) \geq 10p - 90(1-p)$

b) compute an expected utility for player A / B for the following mixed strategy profile s=((0.5, 0.5), (0.1, 0.9))

$u_A(s) = 0 \cdot 0.5 \cdot 0.1 + (-10) \cdot 0.5 \cdot 0.9 + (-1) \cdot 0.5 \cdot 0.1 + (-6) \cdot 0.5 \cdot 0.9 =$

$u_B(s) =$

c) justify why the above mixed strategy profile is not a Nash equilibrium

d) change the least number of utilities in the below pay-off matrix to transform the normal-form game into a zero-sum game

A \ B	L (q)	R (1-q)
T (p)	0 \ 0	-10 \ 10
B (1-p)	-1 \ 0	-6 \ -90

IV. Consider the below normal-form strategic game involving two payers, A and B, and eliminate the strictly dominated strategies to identify the maximally reduced game.

A \ B	L	C	R
T	2 \ 3	2 \ 1	2 \ 0
M	3 \ 0	1 \ 1	0 \ 3
B	1 \ 3	1 \ 1	1 \ 0