## MA2210 - D term 2017 Homework V Show all work.

## ONE

Consider the Vortex-Bernoulli Research and Development Corporation question of Homework IV.

The company's contract with the government now requires that the project be completed within 119 weeks or else face fines. The company CEO is good at making deals so must now renegotiate with the government. What should the plan be to do be able to finish the project in 119 weeks? How much will this now cost?

Implement the simplex method in Excel to solve this problem. The crash data should be copied from the file VortexBernoulliData.xlsx and put in your Excel sheet to be used. Email your work to the PLA.

**TWO** Consider the game with the following payoff table:

			Player 2		
Strategy		1	2	3	4
	1	2	-3	-1	1
Player 1	2	-1	1	-2	2
	3	-1	2	-1	3

Determine the optimal strategy for each player by successively eliminating dominated strategies. Give a list of the dominated strategues and the corresponding dominating strategies in the order in which you were able to eliminate them.

**THREE** For the 2-person zero-sum game having the following payoff table, determine if this game has an equilibrium solution. If so determine the optimal strategy for each player.

		Player 2		
Strategy		1	2	3
Player 1	1	1	-1	1
	2	-2	0	3
	3	3	1	2

**FOUR** You have been offered three major investment strategies, and you must choose one for your fortune. The choices are

- A *conservative* investment that would perform very well in an improving economy and suffer a small loss in a worsening economy.
- A *speculative* investment that would perform extremely well in an improving economy but would perform very badly in a worsening economy.
- A *counter-cyclical* investment that would lose some money in an improving economy but would perform well in a worsening economy.

You believe that there are three possible scenarios over the lives of these potential investments, and being pessimistic about the trajectory of the economy, you have assigned them prior probabilities,

- An improving economy, 0.1
- A stable economy, 0.5
- A worsening economy 0.4.

You further estimate your profits in each scenario according to the following table (in millions of dollars):

	State of Economy		
Alternative	Improving	Stable	Worsening
Conservative	\$30	\$5	-\$10
Speculative	\$40	\$10	-\$30
Counter-cyclical	-\$10	\$0	\$15
Prior Probability	0.1	0.5	0.4

Which investment should you make under the following criteria?

- 1. Maximin payoff criteria.
- 2. Maximum likelihood criteria.
- 3. Bayes' decision rule.

**FIVE** You are given the following payoff table (in thousands of dollars) and associated prior probabilities.

	State of Nature		
Alternative	$S_1$	$S_2$	$S_3$
$A_1$	\$220	\$170	\$110
$A_2$	\$200	\$180	\$150
Prior Probability	0.6	0.3	0.1

- 1. Which alternative should be chosen under the maximin payoff criterion?
- 2. Which alternative should be chosen under the maximum likelihood payoff criterion?
- 3. Which alternative should be chosen under the Bayes' decision rule?
- 4. Using Bayes' decision rule, perform sensitivity analysis graphically with respect to the prior probabilities of  $S_1$  and  $S_2$ , without changing the prior probability of  $S_3$ . Determine the crossover point where the decision shifts from one alternative to the other.

That is, change the values of the prior probabilities of  $S_1$  and  $S_2$  while keeping the probability of state 3 still at 0.1 and then, figure out what the probabilities need to be for the Bayes decision to change from your choice in 3. to the other choice.

5. Repeat part 4. for  $S_1$  and  $S_3$ .

That is, change the values of the prior probabilities of  $S_1$  and  $S_3$  while keeping the probability of state 2 still at 0.3 and then, figure out what the probabilities need to be for the Bayes decision to change from your choice in 3. to the other choice.

- 6. Repeat part 4. for  $S_2$  and  $S_3$ .
- 7. If you feel that the true probabilities of the states of nature are within 10% of the given prior probabilities, which alternative would you choose?