University of British Columbia
Vancouver School of Economics

Economics 221 (002 & 004)
Introduction to Strategic Thinking
Winter Session, Term 1, 2014
M. Vaney

Midterm Examination

name

number

Part	*Points Available*	*Points Earned*
A.1	5	
A.2	5	
B.1	20	
B.2	20	
Total	**50**	

Time Allowed: 75 Minutes
ANSWER ALL PARTS OF THE EXAMINATION.

PART A: *Answer ALL questions.* Each question is worth 5 marks.

1. What is included in the Extensive Form Representation of a game? How does the Normal Form Representation of a game differ from this? *(5 marks)*

2. Jason and Kate are out at a restaurant. They have ordered a dessert along with two spoons. They play a game where they simultaneously choose a fraction (between 0 and 1) of the dessert to offer the other person. Let a $(0 \leq a \leq 1)$ be the fraction that Jason offers to Kate. Let b $(0 \leq b \leq 1)$ be the fraction that Kate offers to Jason. The amount of dessert that will go to each person will be (dessert to Jason, dessert to Kate)

$$\begin{aligned}
(b, a) \text{ if } a + b &\leq 1 \\
(0, a) \text{ if } a + b &> 1 \text{ and } b > a \\
(b, 0) \text{ if } a + b &> 1 \text{ and } a > b \\
(\frac{1}{2}, \frac{1}{2}) \text{ if } a + b &> 1 \text{ and } a = b
\end{aligned}$$

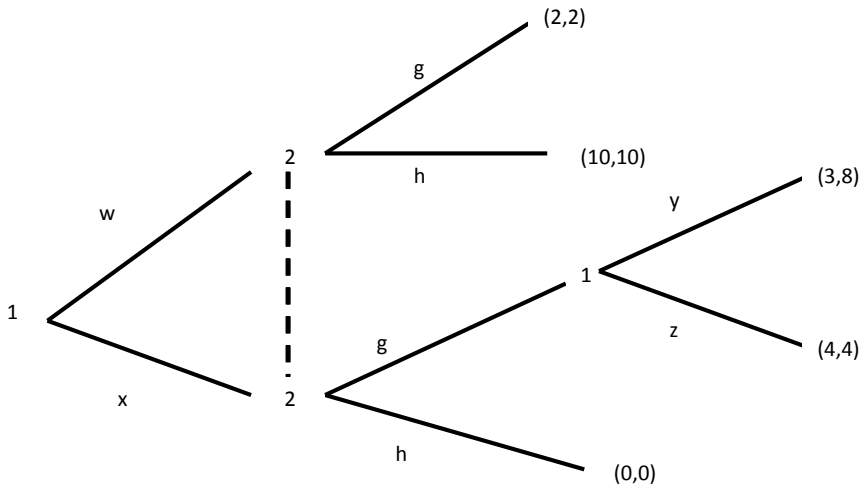
Jason's happiness/payoff is measured as 10 times the share of dessert he eats. Kate's happiness is measured by how close the two come to equally sharing the dessert. Explain whether the players in this game have discrete or continuous strategies. Write out the payoff function for Jason. *(5 marks)*

PART B: ***Answer both questions.*** **Each question is worth 20 marks.**

1. Consider the following game, G. At the start of the game, Player 1 chooses U or D. If player 1 chooses U then Players 1 and 2 enter a simultaneous move subgame, G_1 given by the following game matrix:

		Player 2		
		L	C	R
Player 1	U	$7, 2$	$8, 5$	$5, 9$
	M	$3, 11$	$2, 3$	$12, 4$
	D	$6, 8$	$3, 6$	$4, 2$

If player 1 chooses D then Players 1 and 2 enter a sequential move subgame, G_2 given by the following game tree:



(a) Consider the entire game, G. Complete the following table: *(5 marks)*

	NUMBER of SUBGAMES:	_____
Player	**# of actions in a strategy**	**# of strategies**
1		
2		

(b) Find all the Nash equilibria to subgame G_1 (Hint: it may help to eliminate strictly dominated strategies). *(5 marks)*

(c) Find all the Subgame Perfect Nash equilibria to subgame G_2. *(5 marks)*

(d) Find all the Subgame Perfect Nash equilibria to the entire game, G. Does an application of Forward Induction lead to a unique prediction of the outcome of the game? *(5 marks)*

2. Two Developers must each choose whether to build a large or small office tower. The profits to a firm depend on the firm's own choice (Large or Small), the choice of the other firm (Large or Small) and whether or not there is a downturn in the economy (Normal Economy or Downturn). The state of the economy is considered an exogenous random event: a Downturn will occur with probability $p = \frac{1}{3}$. Profits to each firm are presented in the following tables:

Normal $(p = \frac{2}{3})$

		D 2 L	D 2 S
D 1	L	$(10, 10)$	$(16, 8)$
	S	$(8, 16)$	$(6, 6)$

Downturn $(p = \frac{1}{3})$

		D 2 L	D 2 S
D 1	L	$(7, 7)$	$(10, 4)$
	S	$(4, 10)$	$(8, 8)$

(a) Suppose that both Developers (1 and 2) are able to observe the state of the economy (Normal or Downturn) before simultaneously choosing what size of office tower to build. What strategy will each firm follow? *(5 marks)*

(b) Suppose that only Developer 2 is able to observe the state of the economy (Normal or Downturn) before the two Developers simultaneously choose what size of office tower to build. Show this situation in a game tree. *(5 marks)*

(c) Suppose that Developer 1 must make a decision before Developer 2. Developer 2 observes the decision of Developer 1 before making a decision. Neither Developer is able to observe the state of the Economy (Normal or Downturn). Show this situation in a game tree. *(5 marks)*

(d) Find the subgame perfect Nash equilibrium to the game described in (c). *(5 marks)*