Answer all questions. If you don’t explain (= show your work for) your answers you will get no credit.

NAME: ___________________________________ University ID: ____________________

CIRCLE THE NAME OF YOUR TA:  Ethan Krohn  or  Francis Graham

If you don’t know the name of your TA, then write your Section Number: _______________

• By writing your name on this exam you certify that you have not violated the University’s Code of Academic Contact (for example, you have not copied from the work of another student and you have not knowingly facilitated cheating by another student).

• If you submit the exam without writing your name and ID, you will get a score of 0 for this exam.

• If you do not stop writing when told so (at the end), a penalty of 10 points will be deducted from your score.
1. [50 points] Consider the following game, where the payoffs are von Neumann-Morgenstern payoffs:

(a) [4 points] How many proper subgames does this game have?

(b) [2 points] Write one pure strategy of Player 2.

(c) [8 points] Write one mixed strategy of Player 2 which is not a pure strategy.

(d) [6 points] Write one behavioral strategy of Player 2 which is not a pure strategy.
(e) [30 points] This game has many subgame-perfect equilibria. Find two subgame-perfect equilibria and determine the payoff of each player at those two subgame-perfect equilibria.
Continue your answer to Question 1 on this page
2. [50 points] A set of lights is controlled by two switches, each of which can be in either the Up position or in the Down position. One switch is in room number 1, where Ann is; the other switch is in room number 2, where Bob is. The lights are in room number 3, where Carla is. There are two lights: one red and one green. The red light is on if the two switches are in different positions (one up and the other down: it doesn’t matter which is up and which is down), while the green light is on if the two switches are in the same position (both up or both down). All this is common knowledge among Ann, Bob and Carla.

(a) [4 points] Represent the possible states (you need to specify the position of each switch and which light is on).

(b) [12 points] Represent the possible states of information of Ann, Bob and Carla by means of information partitions.

(c) Let $G$ be the event “the green light is on”. Write the following events:

(c.1) [4 points] $G =$

(c.2) [4 points] (Ann knows $G$) $K_A G =$

(c.3) [4 points] (Bob knows $G$) $K_B G =$

(c.4) [4 points] (Carla knows $G$) $K_C G =$
(d) Let $L$ be the event “either the green light is on or the red light is on”. Write the following events:

(d.1) [4 points] $L = \quad$ 

(d.2) [4 points] (It is not true that Ann knows $L$) $\neg K_A L = \quad$

(d.3) [4 points] (Bob knows that Carla knows $L$) $K_B K_C L = \quad$

(d.4) [4 points] (Carla knows that Ann does not know $L$) $K_C \neg K_A L = \quad$

(d.5) [2 points] (It is common knowledge that $L$) $CKL = \quad$