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CS581 Assignment 04 - Game Theory and Social Networks

1.

Player 1 \ Player 2	Hunt	Fish
Hunt	10, 10	0, 4
Fish	4, 0	6, 6

b. No, neither player has a strictly dominant strategy because if one player chooses to hunt or fish then it's in the second player's best interest to pick the same. For example if Player 1 picks hunt, then Player 2 should pick hunt as well to maximize their payout. Same goes with fishing.

c. Two Nash Equilibria are (hunt, hunt) and (forage, forage) because they work best in response to each other. Hunt is the best response to hunt with no particular order of players, and the same goes with fish.

2.

Player 1 \ Player 2	Straight	Swerve
Straight	-50, -50	10, -10
Swerve	-10, 10	-5, -5

b. No, neither player has a strictly dominant strategy because if player 1 chooses straight, then player 2 gets a better payout swerving; and if player 2 chooses straight then player 1 gets a better payout swerving. If both swerve then it's a minimal loss on both sides.

c. Two Nash Equilibria (Swerve, Straight) and (Straight, Swerve) because if the other player also chooses to drive to straight then they would suffer a great loss.

3.

Player 1 \ Player 2	Low Prod	Inc Prod
Low Prod	3600, 3600	3000, 4000
Inc Prod	4000, 3000	3200, 3200

b. Both players have strictly dominant strategy because regardless of Players 2's strategy, Player 1 should go with increased production to get better payoff. Same goes with Player 2 increasing production regardless of Player 1's strategies.

c. Two Nash Equilibria (Inc Prod, Low Prod) and (Inc Prod, Inc Prod) because they are the best response.

Player 1:

Inc Prod is the best response to Low Prod by Player 2

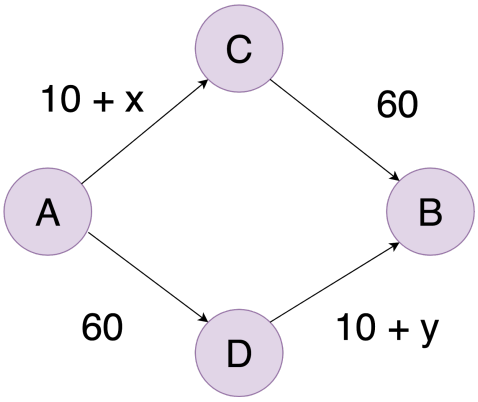
Inc Prod is the best response to Inc Prod by Player 2

Player 2:

Inc Prod is the best response to Low Prod by Player 1

Inc Prod is the best response to Inc Prod by Player 1

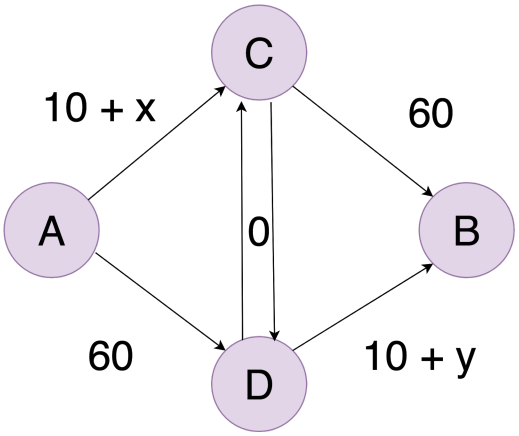
4.



b. (10 + 80) + 60 = 150 minutes

c. Nash equilibrium value of x would be, x = 40. Therefore the total travelling time would be 110 mins.

d. The Nash equilibrium would be an equal amount of cars on each route, so that there is equal congestion on both. It is in both routes, and every driver's best interest to be split evenly.



e. 60 + 60 = 120 minutes

f. (10 + 80) + (10 + 80) = 180 minutes

g. Total travel time is increasing if all cars choose Route III, while total travel of all care is reduced if they choose Route IV.

h. I would assign 20 cars on Route I, 40 cars on Route IV and 20 cars on Route II. This assignment will lead to a total time of, 10 + 20 + 60 = 90 minutes

5. Elimination of freeways can bring about many improvements in an area, one of which is making congestion less. Although freeways have many lanes and are a straightforward way of navigating, more cars are more likely to use it resulting in congestion. Taking down freeways results in different routes popping up that not every car is likely to use. An example would be a route modeling A to C where the more cars there are the longer the commute, which can be seen in many freeways. Freeways in an area also disallow commuters to stop at local businesses because it's inconvenient on their commute. Taking down freeways can help local businesses.

6. a. My firm should submit 5000 because it is a truthful bid. Since I can only make one bid I would put what my firm values it at so that I don't lose money, or risk the auction. If the firm values it at 5000 then it must mean that there will be a markup in the future that covers the risk of losing it at a lower price.

   b. My bid does not change based on the amount of bidders, because a truthful bid will always be the best option. Raising a bid based on thinking for other bidders is only speculative and can lose you money

7. a.

Bidder 1	Bidder 2	Selling Price
1	1	1
1	3	1
3	1	1
3	3	3

From the table above we can calculate that the expected value is (1 + 1 + 1 + 3) / 4 = 6/4

b.

Bidder 1	Bidder 2	Bidder 3	Selling Price
1	1	1	1
1	1	3	1
1	3	1	1
1	3	3	3
3	1	1	1
3	1	3	3
3	3	1	3
3	3	3	3

From the table above we can calculate that the expected value is (1 + 1 + 1 + 3 + 1 + 3 + 3 + 3) / 8 = 2

c. From the values above we can tell that the more bidders there are the higher the expected value of the bidder. More combinations of values will lead to higher changes for increasing the total selling price.