EE 382V: Social Computing **Fall 2018**

Chapter 10: Questions 6 and 7

Scribe: Nikita Trivedi

Question 6.

In this question we have been given a set of 3 sellers a, b and c offering their houses for sale and a set of 3 buyers x, y and z having their own valuations for each of the houses. The figure below shows the valuations of each buyer for each of the houses:

Buyer	Value for *a*'s house	Value for *b*'s house	Value for *c*'s house
x	6	3	2
y	10	5	4
z	7	8	6

Figure 6.1: Buyer's valuations

We first calculate the payoff of each buyer for all the houses.

As we know that,

Payoff for a buyer = Buyer's valuation of the house - Price of the house

Let P(x,a) be the payoff of a buyer x for the seller a

Let P(x,b) be the payoff of a buyer x for the seller b and so on..

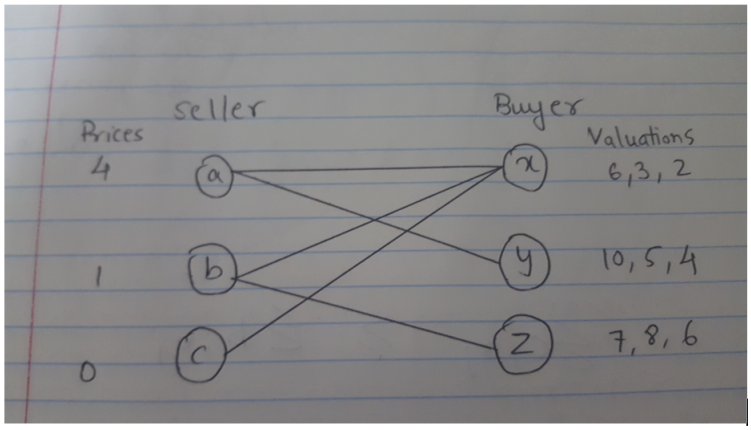
Therefore

P(x,a) = 2 , P(y,a) = 6 , P(z,a) = 3

P(x,b) = 2 , P(y,b) = 4, P(z,b) = 7

P(x,c) = 2 , P(z,b) = 4, P(z,c) = 6

The figure below shows a preferred-seller graph for the buyers and sellers where the buyers are connected to the sellers that give them the maximum payoff.



As we can see from the graph above that for buyer y, seller a is the preferred seller (since seller a gives this buyer the maximum payoff).

Also, for buyer z, seller b is the preferred seller (since seller b gives this buyer the maximum payoff).

Hence, buyer y must get the house from seller a and buyer z must get the house from seller b.

As we can see that there is no seller that gives a maximum payoff to the buyer x, since all the three sellers give an equal payoff of 2 to the buyer x. Hence, buyer x would get the house from seller c.

Also, since each house is now bought by a different buyer, the set of prices we have here are market-clearing prices. The market clearing value is [4,1,0]

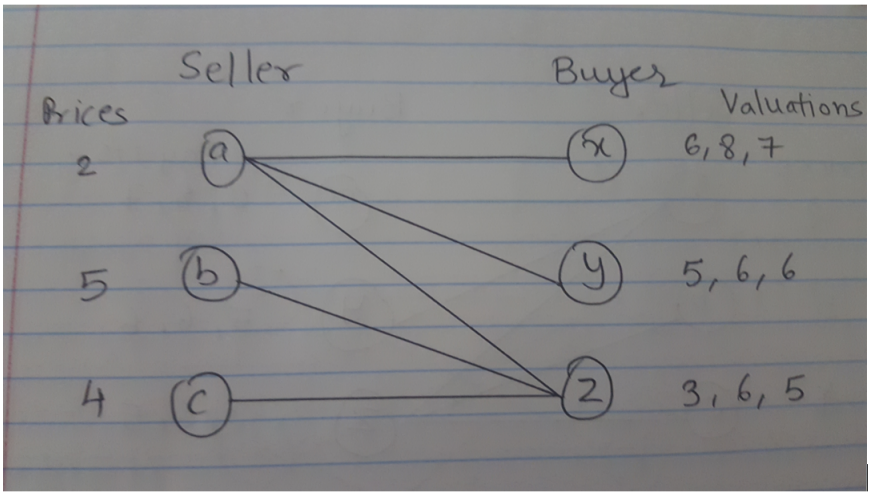
Question 7.

In this question we have been given a set of 3 sellers a, b and c offering their houses for sale and a set of 3 buyers x, y and z having their own valuations for each of the houses. The figure below shows the valuations of each buyer for each of the houses:

Buyer	Value for a's house	Value for b's house	Value for c's house
x	6	8	7
y	5	6	6
z	3	6	5

Figure 6.2: Buyer's valuations

Based on the buyer's valuations for each houses and their actual prices, we match each buyer on the right with its preferred seller or sellers on the left. A preferred seller is the one which gives the highest payoff to a buyer.



Based on the above graph, we see that since seller 'a' is the preferred seller for both x and y, we know that the above set of prices are not market clearing since we have a constricted set S= x,y of buyers that prefer the same seller, N(S)=a.

Hence, to make these prices market clearing, we increase the price of a by 1. So, the new prices become, a=3, b=5 and c=4. Hence the next round of the bipartite auction procedure is shown as follows:

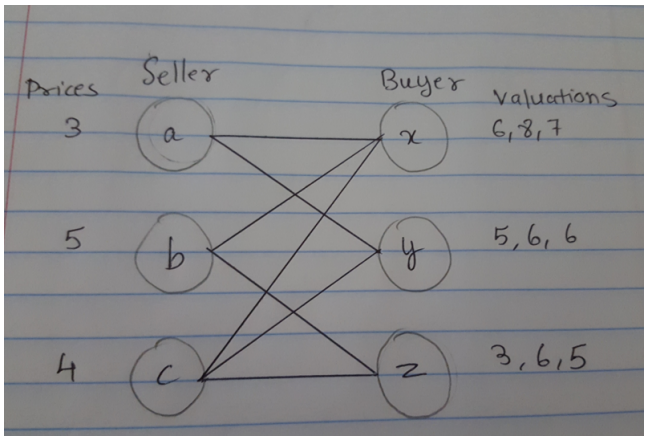


Figure 6.3: Bipartite graph after increasing the price for seller a

From the above graph we can see that buyer x has a payoff of 3 for all the houses, hence x could go with any of the three houses. Buyer y has a payoff of 2 with seller a and c. Hence, y could go with either seller a or c. Buyer z has a payoff of 1 for seller b and c. Hence, z could go with seller b or c.

Hence, there are three possible ways in which the buyers could be matched with the sellers:

1) [(x,c),(y,a),(z,b)] or

2) [(x,b),(y,a),(z,c)] or

3) [(x,a),(y,c),(z,b)]

Hence, the market clearing price for the above set of buyers and sellers is [3,5,4]