**Ag Bus 313 Final**

**Section 1**

**3/16/15**

**Dr. Hurley**

**General Instructions:** This exam is worth **200 points**. You must provide your own paper. You are allowed one 3x5 note card for the exam. This note card can have anything on it but if it is larger than 3x5 you will get a zero on the exam. You are allowed to use a calculator. ***You must show all your work when appropriate to get credit.*** This includes showing all applicable formulas you use. No cell phones, music players (ipods), or other technology devices are allowed to be in your possession during the exam. If you are caught with any of these items, you will receive a zero on the exam. **(Good Luck!)**

**Question 1 (100 Points Total):** Suppose you are the owner of a basketball venue that is hosting one bracket of March Madness. During this event you expect to sell your signature salsa to ravenous basketball fans. This salsa can be handmade in your kitchen at the venue using tomatoes and peppers, or you can use premade salsa that comes in medal cans that need extra employees outside your normal group that you hire. The reason you need to hire extra labor to open the cans is because the number of patrons who will come to your venue for March Madness is much larger than what your current staff could handle. The production function for your salsa can be represented as: S = f(T,J,E) = 6E(80-E) + 300(T4/3J1/2)1/2, where S represents the cups of salsa that you sell, T represents the tons of tomatoes you use, J represents the tons of jalapenos you use, and E represents the number of laborers you hire to open premade cans of your salsa that you have in storage.

To get the freshest tomatoes and jalapenos, you have a contract with a company known as Jalapomatoes who is in expert in sourcing the best tomatoes and jalapenos on the market. Since you are a valued customer of Jalapomatoes, the company is assuring you that it can supply you with all the tomatoes and jalapenos you need at a fixed price of $1,200 per ton of tomatoes and $1,200 per ton of jalapenos. Since you will need to hire outside help to open the premade cans of salsa, you have decided to use a local labor contractor you know. This individual has told you that she can get you as many employees to open the premade salsa that you need at a cost of $2,880 per employee.

Your fixed cost of production is $11,200 and covers the cost of the employees who make the salsa fresh from tomatoes and jalapenos. This fixed costs also covers all the other ingredients for the salsa as well as the cups to put the salsa in and the labor to sell the salsa. Note that the labor that opens the premade cans is not part of this fixed cost and is considered a variable cost. Due to a contract that you have with the individuals who sponsor March Madness, you are restricted to selling your salsa at a price of $12 per cup. At this price, you can sell as much salsa as you want and there is enough demand to consume all that you can produce.

Please answer the following questions making sure to give proper justification:

A) What is the profit maximizing amount of salsa that you can sell? How many employees will you need to hire from the labor contractor? How many tons of tomatoes and tons of jalapenos do you need from Jalapomatoes? How much profit can you make at the profit maximizing solution? **(45 Points)**

B) Suppose Jalapomatoes calls you and tells you that it can only supply you with 125 tons of tomatoes and 16 tons of jalapenos. How much profit would you have lost if you chose to use all the tomatoes and jalapenos that Jalapomatoes could provide and you decided to choose to maximize revenue instead of profit when choosing the optimal amount of employees to open the premade salsa in cans? **(Please note: to get this answer you need to calculate the new profit given 125 tons of tomatoes and 16 tons of jalapenos as well as the profit at revenue max.) (25 Points)**

C) Suppose that you hire no contract labor to open the cans of premade salsa, and tomatoes and jalapenos are in plentiful supply and can be considered variable, graph the cost minimizing solution if you had a production goal of 32,400 cups of salsa. ***(Treat all fixed cost as 0 when graphing.)* (30 Points)**

**Question 2 (80 Points Total):** Suppose you are a producer down in Temecula who owns hothouses. With March Madness approaching, you realize that there will be strong demand for both tomatoes and jalapenos to make salsa. Since you have an expertise in growing these commodities, you decide that you are going to grow both with the fixed amount of hothouse space you have available. Currently you own 10 hothouses that have a **combined** area of 91,250 square feet that can be used for producing tomatoes and jalapenos. This hothouse space is your limiting fixed input that can be allocated to producing both commodities.

Having grown tomatoes and jalapenos before, you have excellent knowledge on how many tons of tomatoes and tons of jalapenos you can get from a square foot of hothouse space. Looking at your past production records shows that your production function for tomatoes can be represented as: T = f(HT) = 9HT2/3 where T represents the tons of tomatoes that you produce and HT represents the square footage of your hothouse space you devote to the production of tomatoes. Your records also show that you can model your production of jalapenos with the following production function: J = f(HJ) = 27HJ2/3 where J represents the tons of jalapenos that you produce and HJ represents the square footage of your hothouse space you devote to the production of jalapenos.

Since you are a risk averse producer, you decide that you want to lock in the prices you will receive for your tomatoes and jalapenos. To do this, you meet with a representative of a large processor in the Central Valley and establish a contract with him that gives you a fixed price for each of your commodities. The contract states that you will receive $50 per ton of production of tomatoes and $150 per ton of production of jalapenos. The contract also states that the processor will purchase at these prices all that you produce of each commodity.

While your main input for producing tomatoes and jalapenos is hothouse space, you also have other fixed inputs, but they are in plentiful supply and do not constrain your production. The cost of all these fixed inputs excluding hothouse space is $37,500. The cost of hothouse space is $60 per square foot.

Please answer the following questions:

A) What is the optimal profit at your optimal solution? **(40 Points)**

B) What would the trade-off be between tomatoes and jalapenos at you optimal solution? Please explain. **(10 Points)**

C) Graph the optimal solution. Be sure to use revenue rather than profit when you are graphing the optimal solution. **(20 Points)**

D) Now suppose that another processor approaches you to purchase your tomatoes and jalapenos because they are short on the amount of product they have available. If the processor offers you $75 per ton of tomatoes and $225 per ton of jalapenos how will your optimal production change and what is the new profit you would receive? Please explain. **(10 Points)**

**Question 3 (20 Points Total):** Assume you are in a small town in the Central Valley that has two supermarkets. One of the supermarkets is a large chain franchise, while the other is a small independent grocer. As March Madness is coming up, each supermarket is attempting to figure out its advertisement strategy that will bring shoppers to their respective stores. You can initially assume that neither supermarket can see what the other is doing in terms of advertising strategy. Each store owner knows the other well enough that they know each other’s’ possible strategies and payoffs to these strategies.

The local independent grocer has three possible strategies that it can do in terms of advertising. All of its advertising is done in newspaper advertising circulars. The first strategy is known as the Beers and Dogs strategy. Under this strategy, the independent grocer puts the sale items regarding beer and hot dogs on the first page of its circular. The second strategy available to the grocer is known as the Frozen Pizza strategy. This strategy focuses on highlighting that the store will be selling frozen pizzas at a buy one get one free deal. The third strategy the independent grocer has available is known as the Finger Foods strategy. This strategy highlights on the first page of its advertising circular the different microwaveable snack foods that are on sale at the store.

The large chain supermarket has five strategies available to it. Due to its national presence, it is able to advertise in newspaper circulars and television ads. The first strategy that this store is considering is known as the Name Brand Chip TV ad. This strategy entails the company advertising a national name brand potato chip on TV with a theme of March Madness. The second strategy available is the Pizza strategy. Since the supermarket has the capability to make hot grab-and-go pizzas, it believes that putting an advertisement on the first page of it newspaper advertising circular will bring in many customers. The third strategy available to the large chain supermarket is the Alcohol strategy. This strategy entails putting all of its best deals on alcoholic beverages on the first page of its advertising circular. The fourth strategy the retailer has available is the General TV strategy. This strategy calls for the retailer to create a general commercial showing many products from the store that consumers may demand when their watching the basketball tournament. The fifth strategy is known as the Free Basketball strategy. This strategy advertises on TV that the store will be giving away free March Madness basketballs with the purchase of $150 or more in groceries.

The table below represents the payoffs in terms of 100 dollars of sales for each supermarket based on the strategy they decide to use. The large retail franchise’s payoffs are represented first, while the independent grocers is listed second.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | **Independent Grocer** | | |
| **Beers and Dogs** | **Frozen Pizza** | **Finger Foods** |
| **Large Franchise Supermarket** | **Name Brand Chip TV** | 53, 889 | 288, 526 | 455, 345 |
| **Pizza** | 528, 679 | 205, 271 | 909, 259 |
| **Alcohol** | 822, 992 | 21, 223 | 302, 332 |
| **General TV** | 443, 68 | 769, 47 | 88, 156 |
| **Free Basketball** | 457, 142 | 936, 698 | 736, 93 |

Please answer the following questions:

A) Are there any dominant or dominated strategies for either of the grocers? If so, what is it or are they? **(5 Points)**

B) Does a Nash equilibrium exist? If so, what is it or are they? **(5 Points)**

C) If the national franchise supermarket could get advance knowledge of the strategy that the independent grocer chooses and each knows this, what would each supermarket decide to do? Please explain. **(10 Points)**