**NTU SSS Economics HE1001**

**Problem Set 3: Monopoly II and Game Theory**

**Monopoly II**

1. Suppose a firm can practice perfect first-degree price discrimination. What is the lowest price it will charge, and what will its total output be?

When a firm practices perfect first-degree price discrimination, each unit is sold at the reservation price of each consumer (assuming each consumer purchases one unit). Because each unit is sold at the consumer’s reservation price, marginal revenue is simply the price at which each unit is sold, and thus the demand curve is the firm’s marginal revenue curve. The profit-maximizing output is therefore where MR=MC, which is the point where the marginal cost curve intersects the demand curve. Thus, the price of the last unit sold equals the marginal cost of producing that unit, and the firm produces the perfectly competitive level of output.

1. Third-degree price discrimination requires the ability to sort customers and the ability to prevent arbitrage. Explain how the following can function as price discrimination schemes:

*Requiring airline travellers to spend at least one Saturday night away from home to qualify for a low fare.*

The requirement of staying over Saturday night separates business travelers, who prefer to return home for the weekend, from tourists, who usually travel on the weekend. Arbitrage is not possible when the ticket specifies the name of the traveler.

1. A monopolist is deciding how to allocate output between two geographically separated markets (East Coast and West Coast). Demand for the two markets are:

*East Coast: P*1 = 15 - Q1

*West Coast: P*2 = 25 - 2 Q2

The monopolist’s total cost is C = 5 + 3(Q1 + Q2). What are price, output, and profits if the monopolist can price discriminate?

Choose quantity in each market such that marginal revenue is equal to marginal cost. The marginal cost is equal to 3 (the slope of the total cost curve). The profit-maximizing quantities in the two markets are:

15 − 2*Q*1 = 3, or *Q*1 = 6 on the East Coast, and

25 − 4*Q*2 = 3, or *Q*2 = 5.5 in the West Coast

Substituting into the respective demand equations, prices for the two markets are:

*P*1 = 15 − 6 = $9, and *P*2 = 25 − 2(5.5) = $14.

Noting that the total quantity produced is 11.5, profit is

*π* =9(6) + 14(5.5) − [5 + 3(11.5)] = $91.50.

**Game Theory**

1. Two firms are in the chocolate market. Each can choose to go for the high end of the market (high quality) or the low end (low quality). Resulting profits are given by the following payoff matrix. Please solve for the Nash equilibria?

**Firm 2**

**Low High**

**Firm 1 Low** 20, 30 900, 600

**High** 100, 800 50, 50

1. Does this game exist any dominant strategy equilibrium?

When Firm 2 chooses Low, Firm 1’s best action is High.

When Firm 2 chooses High, Firm 1’s best action is Low.

=>Firm 1 does not have a dominant strategy.

When Firm 1 chooses Low, Firm 2’s best action is High.

When Firm 1 chooses High, Firm 2’s best action is Low.

=>Firm 2 does not have a dominant strategy.

Since both firms have no dominant strategy, this game does not exist any dominant strategy equilibrium.

1. Does this game exist any Nash equilibrium?

A Nash equilibrium exists when neither party has an incentive to alter its strategy, taking the other’s strategy as given. If Firm 2 chooses Low and Firm 1 chooses High, neither will have an incentive to change (100 > −20 for Firm 1 and 800 > 50 for Firm 2). Also, if Firm 2 chooses High and Firm 1 chooses Low, neither will have an incentive to change (900 > 50 for Firm 1 and 600 > −30 for Firm 2). Both outcomes are Nash equilibria. Both firms choosing Low, for example, is not a Nash equilibrium because if Firm 1 chooses Low then Firm 2 is better off by switching to High since 600 is greater than −30.

1. Two major networks are competing for viewer ratings in the 8:00–9:00 pm and 9:00–10:00 pm slots on a given weeknight. Each has two shows to fill these time periods and is juggling its lineup. Each can choose to put its “bigger” show first or to place it second in the 9:00–10:00 pm slot. The combination of decisions leads to the following “ratings points” results:

|  |  | Network 2 | |
| --- | --- | --- | --- |
|  |  | First | Second |
| Network 1 | First | 20, 30 | 18, 18 |
| Second | 15, 15 | 30, 10 |

(a) Find the Nash equilibria for this game, assuming that both networks make their decisions at the same time.

A Nash equilibrium exists when neither party has an incentive to alter its strategy, taking the other’s strategy as given. By inspecting each of the four combinations, we find that (First, First) is the only Nash equilibrium, yielding payoffs of (20, 30). There is no incentive for either network to change from this outcome. Suppose, instead, you thought (First, Second) was an equilibrium. Then Network 1 has an incentive to switch to Second (because 30 > 18), and Network 2 would want to switch to First (since 30 > 18), so (First, Second) cannot be an equilibrium.