EE320 Exercise 6

Semester 2, 2014

Chapter 8: Optimization without Constraint : More-Than-One Independent Variable Cases

1. Let the total cost function depend on goods x, y and z ;
$TC = 1,000 + 3x^2 + 2y^2 + 2z^2 - 2xy - 40z - 20x$
Determine the level of x , y and z which minimize total cost and determine the minimum total cost. [$x = 4, y = 2, z = 10$and $TC = 760$]

2. One producer produces Q units of goods and sells them to the two markets where the demand for market one and market two is $Q_1 = 24 - 0.2P_1$ and $Q_2 = 10 - 0.05P_2$ respectively and total cost of the production is $TC = 35 + 40Q$ where $Q = Q_1 + Q_2$

a) If the producer sells products to market one and market two with different prices, what are the prices and quantities in the two markets so that the producer will maximize profit. $[Q_1 = 8, Q_2 = 4, P_1 = 80$ and $P_2 = 120$]

b) If the producer sells products to market one and market two with same price, what are the price and quantity in the two markets so that the producer will maximize profit.[Q = 12, and P = 88]

c) Which strategy will you suggest the producer, a) or b) ? and why?

3. A producer produce same type of cars from two factories which have the following total cost function; $TC_1 = 500q_1 + 2q_1^2$ and $TC_2 = 100q_2 + q_2^2$ where q_i represent the production level from factory i in each week $(i = 1, 2)$

a) If the producer can sell unlimited amount of cars with the price of 1,000 Baht per unit , what level of production should the firm produce for each week from each two factories to maximize profit? and what is the maximum profit ? [$q_1 = 125$ and $q_2 = 450$]

b) If the producer has monopoly power and the demand function is
$Q = 1575 - P$ where Q is the quantity demanded for each week and P is the price of a car,

determine the price and the level of production per week from each two factories which maximize profit to the firm and what is the maximum profit? $[q_1 = 67.5, q_2 = 335]$

4. A producer produce and sell product X and Y
where the demand function for X and Y is
$X = 50 - 0.5P_X$
$Y = 76 - P_Y$
where $TC = 3X^2 + 2XY + 2Y^2 + 55$
Determine quantity and price of X and Y which maximize profit and determine the maximum profit. $[X = 8, Y = 10, P_x = 84, P_y = 66$ and $\Pi = 725]$

5. Company M has 2 factories, the first factory is in Thailand,the second factory is in China. These two factories produce the same product but with different cost of production. Company M produces and sells this goods in both countries which have different demand function for this goods.

a) Write down the equation representing demand, total revenue ,total cost and total profit of the company M.

b) Show that ,if the company M need to export the products from Thailand to China and the company M want to maximize profit, the company M need to produce and export the goods such that marginal cost of producing last unit in China will equal to marginal cost of producing last unit in Thailand plus the marginal cost of exporting(transportation)last unit of goods.

c) Show that,if company M has zero transportation cost, company M will maximize profit at the level of production where the marginal revenue from selling last unit in Thailand equal to the marginal revenue from selling last unit in China and the marginal cost of producing last unit in Thailand equal to the marginal cost of producing last unit in China.