EE481: Industrial Economics, Semester 2/2016

Exercise#1 for Midterm Exam Preparation

1. Consider a market with three sellers producing homogenous products. Let the market demand is

$P=100-2Q$ where $Q=q_1+q_2+q_3$. To make this question easy, let us assume that there is no fixed cost and marginal cost is the same for the three sellers which is equal to 20 baht per unit of good produced.

a) Find the Cournot Nash equilibrium (P*, Q*)
b) Find the Stackelberg equilibrium where the seller 1 is the price leader; seller 2 and 3 are the price followers.
c) Illustrate your answer by graph.

<u>Two-seller game with simultaneous moves</u>

2. Let us consider a two-firm industry summarized by the cost function of each firm I (producing q_i units) given by $TC_i(q_i) = c_i q_i$, $I = 1, 2$, where c_1 and $c_2 \geq 0$ and the market-demand function given by

$P(Q) = a - bQ$, $a, b>0$, $a \geq c_i$, *where* $Q=q_1+q_2$.

a) Find the two firms' best response functions and illustrate them by graph (Note: q1 is on the vertical axis and q2 is on the horizontal axis)
b) Provide intuition for why the BR curves are downward sloping.
c) Find the Cournot equilibrium output levels (q_1^c , q_2^c) and total output level (Q). From the solutions you have calculated, show that if the output of the high-cost firm will be lower than the output of the low-cost firm.
d) Find the Cournot equilibrium price (p^c)
e) Find the Cournot profit (payoff) of firm *i*.
f) From the graph you have done in a), if R&D done by firm 1 leads to cost reduction for firm 1 (i.e., c_1 decreases), $BR_1(q_2)$ will shift to which direction? And what will happen to q_1^c , q_2^c, p^c, π_1^c , π_2^c ?

Two-seller game with sequential moves

3. Let us consider a two-firm industry summarized by the cost function of each firm I (producing q_i units) given by $TC_i(q_i) = c_i q_i$, $I = 1, 2$, where c_1 and $c_2 \geq 0$ and the market-demand function given by

$P(Q) = a - bQ$, $a, b > 0$, $a \geq c_i$, where $Q = q_1 + q_2$. To simplify the problems, let all firms have identical unit cost, $c_1 = c_2 = c$. Firm 1 chooses its output level before firm 2 does. Then, firm 2, after observing firm 1's output level, will choose its output level, and only then will output be sold and profits collected by the two firms.

a) Calculate $BR_2(q_1)$.

b) Write down the firm 1's profit maximization problem and then solve for q_1^s.

c) Solve for q_2^s.

d) Solve for p^s

e) In connection with Question 2, compare q_1^s with q_1^c; q_2^s with q_2^c; p^s with p^c; and Q^s with Q^c

f) Show explicitly that $\pi_1^s > \pi_1^c$ and $\pi_2^s < \pi_2^c$.