NORTHEASTERN UNIVERSITY
Department of Mechanical and Industrial Engineering

Supply Chain Engineering   **Prof. Gupta**
IE 7200   **Spring 2014 (Mondays)**

Homework No. 6
(Solution)

Problem 1.

The differential prices to be charged in each segment are as follows:
$p_1 = (20000/2*10) + 200/2 =$ **$1100**
$p_2 = (40000/2*30) + 200/2 =$ **$766.70**

The demand from each of the segments is given by:
$d_1 = 20000 - 10*1100 = 9,000$
$d_2 = 40000 - 30*766.70 = 16,999$

The profit from each segment is given by:
$Profit_1 = (1100 - 200) * 9000 = \$8,100,000$
$Profit_2 = (766.70 - 200) * 16999 = \$9,633,333$
Total Profit $= 8,100,000 + 9,633,333 =$ **$17,733,333**

If the management charges the same price over both segments, we need to maximize
$(p - 200)(20000 - 10p) + (p - 200)(40000 - 30p) = (p - 200)(60000 - 40p)$

Therefore, the optimal price in this case is given by
$p = (60000/2*40) + 200/2 =$ **$850**
The demand from each of the segments is given by:
$d_1 = 20000 - 10*850 = 11500$
$d_2 = 40000 - 30*850 = 14500$
Total Profit $= (850 - 200) * (11500 + 14500) =$ **$16,900,000**

Difference $= 17,733,333 - 16,900,000 =$ **$833,333**

Problem 2.

The differential optimal prices to be charged in each segment are given by:
$p_1 = (20000/2*10) + 300/2 =$ **$1150**
$p_2 = (40000/2*30) + 200/2 =$ **$766.70**

The demand from each of the segments is given by:
$d_1 = 20000 - 10*1150 = 8,500$
$d_2 = 40000 - 30*766.70 = 16,999$

The profit from each segment is given by:
$Profit_1 = (1150 - 300) * 8500 = \$7,225,000$

Profit$_2$ = (766.70 - 200) * 16999 = $9,633,333
Total Profit = 7,225,000 + 9,633,333 = **$16,858,333**

If the management charges the same price over both segments, we need to maximize the profit given by:
Profit = $(p – 300)(20000 – 10p) + (p – 200)(40000 – 30p) = (69000p – 40p^2 – 14000000)$

Differentiating profit w.r.t. p and putting it equal to 0 and solving for p gives the optimal price
p = (69000/80) = **$862.50**

Thus, the total profit is given by:
Total Profit = $(69000*862.50 – 40*(862.50)^2 – 14000000)$ = **$15,756,250**
This is less than the case of differential pricing.

Difference = 16,858,333 - 15,756,250 = **$1,102,083**