2.11

a. Draw a conceptual graph to show total revenue and total costs that this company is experiencing.



b. Identify three types of fixed costs that the airline should carefully examine to lower its breakeven point. Explain your reasoning.

1. Insurance and taxes on facilities
2. Rental or lease agreement for aircrafts.
3. Salaries of top management.

These costs are those that an airline would have to pay on a monthly or yearly basis, with the emphasis that they remain constant or fixed for a long duration of time.

c. Identify three types of variable costs that can possibly be reduced to lower the breakeven point. Why did you select these cost items?

1. Number of workers.
2. Employee hourly wages.
3. Overtime pay.

Seeing as these costs vary with time and certain condition, minimizing these costs could lower the breakeven point of the business.

2.12. A company produces circuit boards used to update outdated computer equipment. The fixed cost is $42,000 per month, and the variable cost is $53 per circuit board. The selling price per unit is *p* = $150 −0.02*D*. Maximum output of the plant is 4,000 units per month. (2.2)

a. Determine optimum demand for this product.

CF= $42,000 per month cv= $53 per circuit board p = 150 – 0.02D Max Output = 4000 units per month



$\frac{150-53}{2(0.02)}$ = 2,425 units per month.

b. What is the maximum profit per month?

Profit = Total Revenue – Total Costs = 

(150\*2425 - 0.02\*24252) – (42,000 + 53\*2425) = $75,612.50

c. At what volumes do breakeven occur?

Break Even occurs when: Total Revenue = Total Cost





-0.02D2 + (150-53)D – 42,000 = 0



$$D=\frac{-97\pm \sqrt{97^{2}-4(-0.02)(-42,000)}}{2(-0.02)}$$

D1’ = 481 and D2’=4369, these are the volumes at which break even occurs.

481 and 4369

d. What is the company’s range of profitable demand?

The domain or range of profitable demand is between 480 – 4369.

2.13. A local defense contractor is considering the production of fireworks as a way to reduce dependence

on the military. The variable cost per unit is $40. The fixed cost that can be allocated to the production of

fireworks is negligible. The price charged per unit will be determined by the equation *p* = $180 − *(*5*)D*, where

*D* represents demand in units sold per week. (2.2)

a. What is the optimum number of units the defense contractor should produce in order to maximize

profit per week?

CF= $0 cv= $40 per circuit board p = 180 – 5D

  =$\frac{180-40}{2(5)}$ = 14 units per week

b. What is the profit if the optimum number of units are produced?

Profit = Total Revenue – Total Costs



(180\*14 – 5\*142) – (0+40\*14) = $980 per week

2-14. A large wood products company is negotiating a contract to sell plywood overseas. The fixed cost that can

be allocated to the production of plywood is $900,000 per month. The variable cost per thousand board feet

is $131.50. The price charged will be determined by *p* = $600 − *(*0.05*)D* per 1,000 board feet. (2.2)

a. For this situation determine the optimal monthly sales volume for this product and calculate the profit

(or loss) at the optimal volume.

CF= $900,000 per month cv= $131.50 per circuit board p = 600 – 0.05D Max Output = 4000 units per month

 $\frac{600-131.5}{2(0.05)}$ = 4685 units per month.

Profit = Total Revenue – Total Costs



(600\*4685 - 0.05\*46852) – (900,000+131.5\*4685) = $197,461.25 per month

b. What is domain of profitable demand during a month?

Break Even points occurs when: Total Revenue = Total Cost





-0.05D2 + (600-131.5)D – 900,000 = 0 \*[600-131.5=468.5]



$$D=\frac{-468.5\pm \sqrt{[468.5^{2}-4\left(-0.05\right)\left(-900,000\right)]}}{2\*(-0.05)}$$

Break even points

D1= 2697.8 and D2= 6672.3 units per month. Range of profitable demand is 2697.8-6672.3 units.

2-15. A company produces and sells a consumer product and is able to control the demand for the

product by varying the selling price. The approximate relationship between price and demand is

*p* = $38 + $\frac{2700}{D}-\frac{5000}{D^{2}}$ , for *D >* 1,

where *p* is the price per unit in dollars and *D* is the demand per month. The company is seeking to

maximize its profit. The fixed cost is $1,000 per month and the variable cost (*cv*) is $40 per unit. (2.2)

1. What is the number of units that should be produced and sold each month to maximize profit?

CT = CF + cvD CF = $1000 cv= $40

CT= 1000+40\*D

Profit= Revenue- CT = p\*D - CT

= (38 + $\frac{2700}{D}-\frac{5000}{D^{2}}$)\*D – (1000+40\*D) =38D+ 2700 - $\frac{5000}{D}$ – 1000-40D

Profit =1700-2D-$\frac{5000}{D}$

Differentiate; $\frac{dProfit}{dD}= -2+\frac{5000}{D^{2}}$=0

Therefore 2=$\frac{5000}{D^{2}}$ hence 2D2 = 5000, yielding D=50

Demand to maximize to profits is 50 units.

1. Show that your answer to Part (a) maximizes profit.

To show that the value of D maximizes profit, chose higher and lesser values of D, and substitute them in the formula.

D=49, Profit = 1700 -2D - $ \frac{ 5000}{49}$ = $1499.9592

D=51, Profit = 1700 -2D - $ \frac{ 5000}{51}$ = $1499.9608

D=50, Profit = 1700 -2D - $ \frac{ 5000}{50}$ = $1500.0000

From the above we see that a demand of 50 maximizes profits.

2-17. The annual fixed costs for a plant are $100,000, and the variable costs are $140,000 at 70% utilization of available capacity, with net sales of $280,000. What is the breakeven point in units of production if the selling price per unit is $40?

CF= $100,000 CV= $140,000 p = 40 Revenue = $280,000 TR = price × demand = *p* · *D*.

Breakeven point= TR= TC D=$\frac{TR}{p}$ = $\frac{280000}{40}$= 7000 units. *CT* = *CF* + *CV* *cv=* $\frac{C\_{V}}{D}$*=* $\frac{140000}{7000}$*=20*



D’=$\frac{100000}{(40-20)}$ = 5000 units