Problem Set 1 Answers

1

(a) The $5 million you originally spent for the land, plant, and equipment is a sunk expenditure and thus not an economic cost. However, there is a "user cost of capital" associated with the land, plant and equipment, based on its current market value of $8 million and your cost of funds and the rate of depreciation or appreciation of the asset over the planning horizon. Your (opportunity) cost of investing $8 million for one year is $800,000, but these assets will appreciate by $480,000 over the year, giving a (net) user cost of capital of $320,000. (The depreciation rate is 6%.) This is a fixed cost of making DRAM's, to which we must add the other fixed costs of $500,000 to get a combined fixed cost of $820,000 for the year. The variable costs are a constant $4 per chip, so the cost function is $C(Q) = 820,000 + 4Q$, in the range of $0 < Q < 10,000,000$. (One could also report that $C(0) = 0$, by definition, and that $C(Q)$ is infinite for $Q > 10,000,000$, since your maximum capacity is ten million chips per year. Of course, in practice there would likely be a way to push production beyond "rated capacity," at some cost penalty, but that is beyond the scope of this problem.)

(b) The average cost function is $AC(Q) = 820,000/Q + 4$, again up to ten million chips per year. This declines with Q, so the minimum AC is achieved at full capacity utilization. At ten million chips per year, the fixed costs come to $0.082 per chip, so average costs are $4.082 per chip. This is your minimum average cost, and thus the minimum price at which is makes sense to stay open for the year.

2

Solution: There are three opportunity costs:

1. The salary you could earn if you do not quit: $46k.
2. The interest income your savings could earn if you do not cash in: $\$200k \times 0.06 = \$12k$.
3. The rent your building could earn if you do not use it for your restaurant: $\$2.5k \times 12 months = \$30k$.

There are four direct costs:

1. Maintaining the equipment: $4k.
2. Food: $50k.
3. Hiring extra help: $40k.
4. Utilities and supplies: $14k.

Note that the $200k cost of the equipment is not an economic cost because it is essentially reversible. That is, you can always sell the equipment for its current market value as long as you maintain it. Only the interest you would have earned on the money tied up in the equipment and the cost to maintain it are economic costs.

Adding up opportunity and direct costs yields $196k. This is the break-even revenue for first year of operations.

Solution: The interest payments correspond to a cost (building the tunnel) that is sunk (literally!). It should therefore not be taken into consideration in the decision of whether or not to continue operations. However, if bankruptcy is a viable option for the owners of Eurotunnel, and if the situation is expected to remain the same (operating profit less than interest payments), then the optimal option is to declare bankruptcy. **3**

4

a.) Take the inverse of the demand function, or p = 204 - $\frac{q}{100}$.
pq is revenue, so pq = 204q - $\frac{q^2}{100}$

b.) Take the derivative of revenue, or 204 - $\frac{q}{50}$

c.) MC is the derivative of TC, or q. Set MC = MR, or
204 - $\frac{q}{50}$ = q. q=200, p = 202, profit = TR - TC or
40800-400-20000 = 20400

d.) Samsong's demand will fall as a new competitor steals some of the demand, with decreased demand and no longer a monopoly their price will fall.

Solution: Light bulbs are a generally used homogeneous good. External suppliers enjoy economies of scale and specialization and supply the entire industry. In contrast, the plastic exterior cover must be custom-designed and manufactured for each make and model. Because it requires more Relationship Specific Investment (RSI), it is more likely to be made in-house. **5**