1. Answer “True, False or Uncertain” and defend/explain if not true.
   a) All fixed costs are sunk cost. ANS: False – almost surely some fixed costs are avoidable in real world situations (like sub-leasing if you do not use the property you rented yourself).
   b) All variable costs are sunk costs. ANS: False – by definition, a variable cost is exactly that, it varies with output. You can avoid variable costs by not hiring/buying the variable factor of production.
   c) In the short-run, to profit maximize, firms should always produce the output at which the marginal revenue equals the marginal cost. ANS: False – this is only a first order necessary condition. You also have to make sure that at this output level, mc “cuts” marginal revenue from below and that, in the event of loses at this output level, it is worth operating at all.
   d) If the market demand curve is completely price inelastic, then consumers’ surplus is zero at the competitive price and quantity. ANS: False – the market demand curve would be vertical and at the market equilibrium there would be infinite consumers’ surplus.
   e) Under a linear and downward sloping market demand curve, total revenue is maximized where the own price elasticity of demand is zero and the marginal revenue is one. ANS: False – total revenue is maximized where own price elasticity of demand equals one and marginal revenue equals zero.
   f) If an entrepreneur’s firm is earning positive accounting profit, then it must be earning nonnegative economics profit. ANS: False – one can’t assert this, since if the value of implicit costs is higher than the amount of accounting profit, then economic profit will be negative.
   g) Knowing the firm's cost functions is all the information one needs to know to determine the profit maximizing level of output which the firm should produce. ANS: False – the cost functions only give you half the necessary information, you need to know the nature of demand and marginal revenue, too and you use mr together with mc to determine the point of profit maximization for the firm.
   h) Since firms must always pay their fixed costs in the short-run, they should always produce a positive amount of output in the short-run. ANS: False – they should only produce in the short run provided that market price is at least as large as the firm’s average avoidable costs.
   i) If a producer is minimizing the costs to produce a given level of output, then he/she is maximizing profits by producing that level of output. ANS: False – the firm is presumed to be ALWAYS cost minimizing for any level of output considered. The cost functions are minimum cost functions. One needs to know the demand and marginal revenue structure as well before determining the position for profit maximization.
   j) Economists are silly to say that profits are competed away in the long-run in perfectly competitive firms because no one would bother to stay in the industry if it is not profitable for them to do so. ANS: False – this is confusing zero accounting profit with the notion of zero ECONOMIC profit. Since economic profit takes into consideration the opportunity costs of the entrepreneurially supplied factors of production, even with zero economic profit, the owner is covering his/her opportunity costs.

2. ANS: Set up the “bang per buck” analysis and you find that the “bang per buck” in capital is: (45/$10 = 4.5) and the “bang per buck” in labor is: (49/$7 = 7) so the “bang per buck” is better in labor so the firm is not cost minimizing. It should use more labor and less capital. Note in doing so, the marginal
product of labor will fall and the marginal product of capital will rise until you get to the efficient solution where you equalize the “bang per buck” across all variable inputs employed.

3. As chief economist of Beta Books Publishing Co., (a firm in a perfectly competitive industry) you have been asked to present the company's profit/loss situation at the Annual General Meeting of stockholders. Show, using graphs, the three alternative short-run scenarios described below. Clearly label the areas denoting profit/loss. When should the firm shut-down in the short-run?

ANS: Note, Pa, Xa is positive profit with profit = (Pa-ATCa) times Xa
Pb, Xb is ZERO profit (I switched the order) and since Pb = ATCb, there is no profit.
Pc, Xc is loses, but the firm still operates and profit = (ATCc – Pc) times Xc.
The firm would shut down once the price falls below the point at which mc and avc intersect.

4. ANS:
   a) Accounting Profit = Total Revenue (tr) - Explicit Costs.
   Total Revenue = $350,000 (given).
   Explicit Costs = Labor expenses + Maintenance + Electricity = $125,000 + $50,000 + $5,000 = $180,000 (assuming capital invested came from savings).
   If capital invested came from a bank loan, then Explicit Costs = $180,000 + $10,000 = $190,000.
   This includes the interest to be paid to the bank at the end of the year, at the market interest rate of 10%. Therefore, accounting profit = $350,000 - $180,000 = $170,000, if capital invested came from savings, and $350,000 - $190,000 = $160,000, if capital invested came from a bank loan.

   b) Economic Profit = Total Revenue - Explicit Costs - Implicit Costs = $350,000 - $180,000 - Implicit Costs (since capital invested came from savings). Implicit Costs = $60,000 + $10,000 = $70,000. (Salary as a professor and earnings at the end of the year, if he had put the money in the bank. Note this assumes the $100,000 is spent on Capital which doesn't depreciate.) So, economic profit = 350,000 - $180,000 - $70,000 = $100,000

   c) Economic Profit = $100,000. Therefore, the cafe owner's decision to open the cafe is right.
d) At a salary of $160,000 as a hotel school professor, implicit costs of the cafe owner are just covered. Therefore, the cafe owner would be indifferent between opening the cafe and being a professor at the salary of $160,000.

5. ANS: The airline should expand its route and gain $100,000 additional profit. Notice that: $mc$ of second flight = total cost with 2 flights - total cost with 1 flight = $(2 \times 1,050,000) - 1,500,000 = 600,000$. $\Delta \Pi = mr - mc = 700,000 - 600,000 = 100,000$. The relevant issue is whether marginal revenue exceeds marginal cost, not whether marginal revenue covers average costs. This example illustrates the rule that in the short run, output should be increased if $mr > mc$ at the current level of output.

6. Current Information for ZicroSoft

Total revenue: $2,000,000
Fixed cost: $150,000
Variable cost: $1,500,000
Average total cost: $55
Average variable cost: $50
Marginal cost: $55

a) What must be ZicroSoft's current level of output? ANS: $X = \frac{vc}{avc} = \frac{1,500,000}{50} = 30,000$

b) What price must ZicroSoft currently be getting for the CDs it sells?
   ANS: $P = \frac{tr}{X} = \frac{2,000,000}{30,000} = 66.67$

c) Given its current situation, would you advise this firm to increase output, decrease output, not change output, or shut down entirely? ANS: $P = 66.67 \Rightarrow mr = 66.67$ and you were given that $mc = 55 \Rightarrow$ Expand since $mr > mc$

d) Illustrate ZicroSoft's current position in a diagram that includes ZicroSoft's marginal revenue, marginal cost, average total cost and average variable cost. ANS: see graph
7. The taxi industry in Ithaca is illustrated below.

![Graph showing equilibrium in the taxi industry](image)

a) See graph: The original equilibrium is at P* and t* and T* and N*. Note: the left-hand picture is for a typical firm and the right-hand picture depicts the market.

b) Having the licenses would DECREASE supply. So supply shifts left. Market price would rise to P' and the lucky guys who got licenses would increase quantity supplied to t' even though the total amount traded in the market is less, T'. The lucky guys would also have positive profit. The market would just sit this way since there are no additional licenses forthcoming. NOTE there is no decrease/shift in demand. There is a decrease in quantity demanded since the price is now higher, but there is no shift in the demand curve itself (unless you want to argue that over time people realize the bus is not so bad so there is less demand for taxis or some story of that nature.)

c) The max someone would pay for a license is the value of economic profit created by limiting the number of licenses.

d) If a monopolist could get ALL the licenses at once and then act like a monopolist, he would be willing to pay even more than the sum of the profit above, since as a monopolist he could get even more profit by controlling all the supply and maximizing monopoly profit. We would then have an even higher price than P' and fewer rides than T'.

8. ANS: No, even if all costs are fixed, marginal cost need not be zero. For example, if a firm is operating at full capacity and is unable to produce more output its marginal costs are effectively infinitely large (at no finite cost can an extra unit of output be produced).

9. ANS: If all plants are in the same area, they face similar costs. If the industry is in equilibrium, then a wide range of plant sizes indicates that the AC curve has a flat section over a wide range of output. If plants are located in different countries, they’re likely to face difference costs, so that all one can conclude is that the efficient-scale plant may vary considerable depending on cost conditions.

10. Since the market demand curve is \(X^D = 100 - P\), the market own price elasticity of demand is:

\[
\frac{dX^D}{dP_x} \cdot \frac{P_x}{X^D} = -1 \cdot \frac{(100 - X)}{X} = 1 - \frac{100}{X}
\]

Since the supply curve of the individual
firms is \( x^s = P \) and there are 50 identical firms in the market, the market supply is \( X^s = 50P \). That implies the competitive eq is where \( X^D = X^s \) or where \( 100 - p^* = 50p^* \) or at \( p^* = 1.96 \), which means \( x^* = 1.96 \) by the firm’s supply function. The residual demand curve for a particular firm would be: 
\[ X^{RD} = 100 - 50P \] and the residual own price demand elasticity facing one firm at the competitive equilibrium price and quantity is: 
\[-50\left(\frac{P}{x}\right) = -50\left(\frac{1.96}{1.96}\right) = -50.\]