Problems on Perfect Competition & Monopoly

1. **True and False questions.** Indicate whether each of the following statements is true or false and why.
   
   (a) In long-run equilibrium, every firm in a perfectly competitive industry earns an economic profit.
   
   (b) Pure competition exists in a market when firms are price makers as opposed to price takers.
   
   (c) Downward-sloping industry demand curves characterize monopoly markets; horizontal demand curves characterize perfectly competitive markets.
   
   (d) Market structure describes the competitive environment in the market for any good or service.
   
   (e) A pure monopoly does not have to worry about suffering losses because it has the power to set its price at any level it desires.
   
   (f) Assuming a linear demand curve, a firm that wants to maximize its revenue will charge a lower price than a firm that wants to maximize its profits.
   
   (g) If $P > AVC$, a firm's total fixed cost will be greater than its loss.
   
   (h) When a firm is able to set its price, its price will always be less than its MR.

2. A firm its output in a perfectly competitive market. The firm's total cost function is given in the following schedule:

<table>
<thead>
<tr>
<th>Output (units)</th>
<th>Total cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>10</td>
<td>120</td>
</tr>
<tr>
<td>20</td>
<td>170</td>
</tr>
<tr>
<td>30</td>
<td>210</td>
</tr>
<tr>
<td>40</td>
<td>260</td>
</tr>
<tr>
<td>50</td>
<td>330</td>
</tr>
<tr>
<td>60</td>
<td>430</td>
</tr>
</tbody>
</table>

   The prevailing market price is $7 per unit.
   
   (a) What is the firm's profit maximizing output level?
   
   (b) Is the industry in long-run equilibrium? Justify your answer.

3. A company operating in a perfectly competitive is faced with the following total costs per ton ($Q$) of its output:

   \[ TC = 500,000 + 400Q + 0.04Q^2 \]

   (a) Calculate the industry price necessary to induce short-run firm supply of 5,000, 10,000, and 15,000 tons of output. Assume that $MC > AVC$ at every point along the firm's marginal cost curve and that total costs include a normal profit.
   
   (b) Calculate short-run firm supply at industry prices of $400, $1,000, and $2,000 per ton.
4. A firm operating in perfectly competitive market (PCM) has the following total cost function:
\[ TC = 6000 + 400Q - 20Q^2 + Q^3 \]
(a) What is the lowest (or minimum) price at which the firm will shut down in the short run?
(b) If the market price is $310, what would be the profit maximizing output? What is the total profit (loss)? Should the firm produce at this price?

5. A manufacturer of electronics products is considering entering the telephone equipment business. It estimates that if it were to begin production, its short run cost function would be as follows:

<table>
<thead>
<tr>
<th>Q (1000)</th>
<th>AVC</th>
<th>AC</th>
<th>MC</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>41.10</td>
<td>52.21</td>
<td>30.70</td>
</tr>
<tr>
<td>10</td>
<td>40.00</td>
<td>50.00</td>
<td>30.10</td>
</tr>
<tr>
<td>11</td>
<td>39.10</td>
<td>48.19</td>
<td>30.10</td>
</tr>
<tr>
<td>12</td>
<td>38.40</td>
<td>46.73</td>
<td>30.70</td>
</tr>
<tr>
<td>13</td>
<td>37.90</td>
<td>45.59</td>
<td>31.90</td>
</tr>
<tr>
<td>14</td>
<td>37.60</td>
<td>44.74</td>
<td>33.70</td>
</tr>
<tr>
<td>15</td>
<td>37.50</td>
<td>44.17</td>
<td>36.10</td>
</tr>
<tr>
<td>16</td>
<td>37.60</td>
<td>43.85</td>
<td>39.10</td>
</tr>
<tr>
<td>17</td>
<td>37.90</td>
<td>43.78</td>
<td>42.70</td>
</tr>
<tr>
<td>18</td>
<td>38.40</td>
<td>43.96</td>
<td>46.90</td>
</tr>
<tr>
<td>19</td>
<td>39.10</td>
<td>44.36</td>
<td>51.70</td>
</tr>
<tr>
<td>20</td>
<td>40.00</td>
<td>45.00</td>
<td>57.10</td>
</tr>
</tbody>
</table>

(a) Suppose the average wholesale price of this a wireless phone currently $50. Do you think this company should enter the market? Explain. What is the amount of profit (or loss) earned by the firm at the optimal level of production?
(b) Suppose the firm does enter the market and that competition causes the price of the telephones to fall to $35. What impact will this have on the firm's production levels and profit? Explain. What would you advice this firm to do?

6. This same manufacturer of electronics products has developed a handheld computer, for which the cost of production is given below. Also given are quantities and prices that the firm believes it will be able to sell.

<table>
<thead>
<tr>
<th>Q (1000)</th>
<th>Price</th>
<th>MR</th>
<th>AVC</th>
<th>AC</th>
<th>MC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1650</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1570</td>
<td>1570</td>
<td>1281</td>
<td>2281</td>
<td>1281</td>
</tr>
<tr>
<td>2</td>
<td>1490</td>
<td>1410</td>
<td>1134</td>
<td>1634</td>
<td>987</td>
</tr>
<tr>
<td>3</td>
<td>1410</td>
<td>1250</td>
<td>1009</td>
<td>1342.33</td>
<td>759</td>
</tr>
<tr>
<td>4</td>
<td>1330</td>
<td>1090</td>
<td>906</td>
<td>1156</td>
<td>597</td>
</tr>
<tr>
<td>5</td>
<td>1250</td>
<td>930</td>
<td>825</td>
<td>1025</td>
<td>501</td>
</tr>
<tr>
<td>6</td>
<td>117</td>
<td>770</td>
<td>766</td>
<td>932.67</td>
<td>471</td>
</tr>
<tr>
<td>7</td>
<td>1090</td>
<td>610</td>
<td>729</td>
<td>871.86</td>
<td>507</td>
</tr>
<tr>
<td>8</td>
<td>1010</td>
<td>450</td>
<td>714</td>
<td>839</td>
<td>609</td>
</tr>
<tr>
<td>9</td>
<td>930</td>
<td>290</td>
<td>721</td>
<td>832.11</td>
<td>777</td>
</tr>
<tr>
<td>10</td>
<td>850</td>
<td>130</td>
<td>750</td>
<td>850</td>
<td>1011</td>
</tr>
</tbody>
</table>
(a) What price should the firm charge if it wants to maximize profit in the short run?
(b) What arguments can be made for charging a price higher than this price? If a higher price is indeed established, what amount would you recommend? Explain.
(c) What arguments can be made for charging a price lower than the profit maximizing level? If a lower is indeed established, what amount would you recommend? Explain.

**MCQs**

7. In long-run equilibrium, monopoly prices are set a level where:
   (a) price exceeds marginal revenue.
   (b) industry demand equals industry supply.
   (c) industry demand is less than industry supply.
   (d) price exceeds average revenue.

8. At the profit maximizing level of output for a monopolist:
   (a) \( P = AR \) and \( AR = AC \)
   (b) \( P = MC \) and \( MR > MC \)
   (c) \( P > MC \) and \( MR = MC \)
   (d) \( P = MR \) and \( AC = MC \)

9. Above-normal profits in a perfectly competitive market are caused by:
   (a) increases in demand that are successfully anticipated.
   (b) decreases in cost that are successfully anticipated.
   (c) increases in productivity that are successfully anticipated.
   (d) pure luck.

10. A firm will earn normal profits when price:
    (a) equals average total cost.
    (b) equals average variable cost.
    (c) equals marginal cost.
    (d) exceeds minimum average total cost.

11. In the short run, a perfectly competitive firm will shut down and produce nothing if:
    (a) excess profits equal zero.
    (b) total cost exceeds total revenue.
    (c) total variable cost exceeds total revenue.
    (d) the market price falls below the minimum average total cost.

12. Which of the following is not characteristic of perfect competition?
    (a) a differentiated product.
    (b) no barriers to entry or exit.
    (c) large number of buyers.
    (d) complete knowledge of market price.
13. If a perfectly competitive firm incurs an economic loss, it should:
   (a) shut down immediately.
   (b) try to raise its price.
   (c) shut down in the long run.
   (d) shut down if this loss exceeds fixed cost.

14. When a firm produces at the point where MR = MC, the profit that it is earning is considered to be:
   (a) maximum.
   (b) normal.
   (c) above normal.
   (d) not enough information is provided.

15. When a firm has the power to establish its price:
   (a) P = MR.
   (b) P = MC.
   (c) P > MR.
   (d) P < MR.

16. Assume a profit maximizing firm's short-run cost is TC = 700 + 60Q. If its demand curve is
   P = 300 - 15Q, what should it do in the short run?
   (a) shut down.
   (b) continue operating in the short run even though it is losing money.
   (c) continue operating because it is earning an economic profit.
   (d) Cannot be determined from the above information.

17. The main difference between the price-quantity graph of a perfectly competitive firm and a monopoly is:
   (a) that the competitive firm's demand curve is horizontal, while that of the monopoly is downward sloping.
   (b) that a monopoly always earns an economic profit while a competitive company always earns only normal profit.
   (c) that a monopoly maximizes its profit when marginal revenue is greater than marginal cost.
   (d) that a monopoly does not incur increasing marginal cost.

18. When the slope of the total revenue curve is equal to the slope of the total cost curve:
   (a) monopoly profit is maximized.
   (b) the total revenue is maximum.
   (c) the marginal cost curve intersects the total average cost curve.
   (d) the total cost curve is at its minimum.

ANSWERS:
1. True & false
(a) False. In long-run equilibrium, every firm in a perfectly competitive industry earns zero excess profit. Following a decrease in industry prices, high cost producers will be forced to exit. However, the firms that remain will continue to operate and earn a normal rate of return on investment.

(b) False. Pure competition exists in a market when individual firms have no influence over price. Such firms take industry prices as a given.

(c) False. Downward sloping demand curves follow from the law of diminishing marginal utility and characterize both perfectly competitive and monopoly market structures. Horizontal demand curves characterize perfectly competitive firms.

(d) True. Market structure is typically characterized on the basis of four important industry characteristics: the number and size distribution of active buyers and sellers and potential entrants, the degree to which products are similar or dissimilar, the amount and cost of information about product price and quality, and conditions of entry and exit.

(e) False. Even a pure monopoly has to consider the possibility of demand falling below the level sufficient to earn a profit. (For example, even if Polaroid continues to have a monopoly on cameras that use instant developing film, can they stop the erosion in demand due to the one-hour photo developing machines and cameras that record images electronically on discs?)

(f) True. In order to maximize revenue, a firm will price its product at the point where MR=0. By implication, this must be a lower price than the point where MR=MC.

(g) True. If P>AVC but P<AC, then the company will cover some of its fixed costs; thus, loss will be less than fixed cost (Contribution Margin is positive).

(h) False. Price will be more than MR.

2. Profit-maximizing output level (Q*) occurs where MR = MC, you need to calculate MC:

<table>
<thead>
<tr>
<th>Output (units)</th>
<th>Total cost ($)</th>
<th>MC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>50</td>
<td>--</td>
</tr>
<tr>
<td>10</td>
<td>120</td>
<td>7</td>
</tr>
<tr>
<td>20</td>
<td>170</td>
<td>5</td>
</tr>
<tr>
<td>30</td>
<td>210</td>
<td>4</td>
</tr>
<tr>
<td>40</td>
<td>260</td>
<td>5</td>
</tr>
<tr>
<td>50</td>
<td>330</td>
<td>7</td>
</tr>
<tr>
<td>60</td>
<td>430</td>
<td>10</td>
</tr>
</tbody>
</table>

(a) P = MR = $7

Profit-maximizing output level (Q*) occurs where MR = MC

MC = $7 at Q1 = 10 and Q2 = 50 units.

At Q1 = 10 \[ \pi = (P \cdot Q) - TC = 7 \cdot 10 - 100 = -$30 \]

At Q2 = 50 \[ \pi = 7 \cdot 50 - 310 = $40 \]
Therefore \(Q^* = Q_2 = 50\) units

(b) Industry is not in long-run equilibrium since \(MC = MR = P > ATC\) (i.e., above "normal" profits are being earned by one (or more) firms in the industry).

3. (a) The marginal cost curve constitutes the short-run supply curve for firms in perfectly competitive industries provided price exceeds average variable cost. Because \(P = MR\), the price necessary to induce short-run firm supply of a given amount is found by setting \(P = MC\), assuming \(P > AVC\). Here:

\[MC = \frac{\partial TC}{\partial Q} = $400 + $0.08Q\]

Therefore, at:

- \(Q = 5,000: P = MC = $400 + $0.08(5,000) = $800\)
- \(Q = 10,000: P = MC = $400 + $0.08(10,000) = $1,200\)
- \(Q = 15,000: P = MC = $400 + $0.08(15,000) = $1,600\)

(Note: Variable Cost = $400Q + $0.04Q^2, and \(AVC = $400 + $0.04Q\), so \(MC > AVC\) at each point along the firm's short-run supply curve.)

(b) When quantity is expressed as a function of price, the firm's supply curve can be written:

\[P = MC = $400 + $0.08Q\]

\[0.08Q = -400 + P\]

\[Q = -5,000 + 12.5P\]

Therefore, at

- \(P = $400: Q = -5,000 + 12.5($400) = 0\)
- \(P = $1,000: Q = -5,000 + 12.5($1,000) = 7,500\)
- \(P = $2,000: Q = -5,000 + 12.5($2,000) = 20,000\)

4. (a) \(P = $300\) (= Minimum \(AVC\), below which the firm should shutdown)

(b) \(P =$310\), profit maximizing output \(Q^* = 10.5\) units (where \(TR – TC\) is highest, or where \(MR = MC\))

\(Q^* = 10.5\), this firm makes a loss of $5897.625 (substitute \(Q^* = 10.5\) in both \(TR\) & \(TC\) functions).

\(Q^* = 10.5\), \(AVC = $300.5 < P = $310\). The firm should continue production so long it covers its \(AVC\) (contribution margin is positive)

5. (a) Yes. If \(P = $50\), the firm should produce 18 units and earn an economic profit of $108.72.

(b) If \(P = $35\), then the best that the firm could do by operating would be to produce 14 units (i.e., by following the \(MR = MC\) rule). However, this would cause it to lose $136.36, a sum greater than the implied fixed cost of $99.96 (rounded to $100). Thus the firm should shut down.

6. a. \(P^* = $1090\).

b. The above price would enable a firm to earn a maximum amount of total profit in the short run. However, it may want to consider charging a higher price if it wanted to position its product as a "premium" product. It might also want to set a higher price if it suspected that future competition would eventually force all competitors to lower their
price. Without more specific data about these other considerations, it would be difficult to suggest a specific price that is higher than $1090. As a generalization, we can only say that the firm would set a higher price if it gives greater priority to goals mentioned above.

c. The firm would want to consider setting a price lower than $1090 if it wanted to increase its revenue (i.e., market share). As can be seen in the numerical example, if the firm charged $850, its total revenue would be $850,000 (as compared to $763,000 at the price of $1090). In fact, it could continue lowering its price in order to increase its revenue up to the point at which MR=0 (not shown in the table).

There may be other reasons for lowering the price. For example, the firm may wish to use the strategy of “learning curve pricing” (see Chapter 8). It may also choose to be an aggressive price-cutter in an oligopolistic market.

MCQS

7. a
8. c
9. d
10. a
11. c
12. a
13. d
14.d
15.c
16.e
17.a
18.a