Part A: Multiple Choice Questions (2 pts. each, total 40 pts.)

1. Profits are maximized at the output at which marginal cost equals marginal revenue. If the market price falls below the minimum average variable cost:
   A. the firm should shut down.
   B. the firm should produce more.
   C. the firm should produce less.
   D. None of the above.

2. A monopolist sells 4 units of output for £6 each and 5 units of output at £5 each. The marginal revenue associated with the 5th unit is:
   A. 1
   B. 3
   C. 25
   D. 15

3. For a perfectly competitive firm operating in the short run, in order to maximize profits it should produce output where:
   A. marginal cost equals average total cost.
   B. marginal cost equals average variable cost.
   C. marginal cost equals price.
   D. total cost equals total revenue.

4. Which of the following statement about a long-run cost curve is true?
   A. The minimum is always below the minimum point reached by a short-run cost curve.
   B. There are always decreasing returns to scale.
   C. It shows the minimum average cost to produce a given output when all inputs can be varied.
   D. All the above.
5. Referring to the figure above, the following statements are correct except:
   A. To the left of point E marginal cost exceeds marginal revenue.
   B. At point E marginal cost equals marginal revenue.
   C. To the right of point E marginal revenue is less than marginal cost.
   D. Output $Q_1$ is the most profitable output.

6. In which of the following market structures do firms have no control over the price of their product?
   A. Pure monopoly
   B. Perfect competition
   C. Monopolistic competition
   D. Oligopoly

7. In perfect competition, the marginal revenue of an individual firm
   A. is zero.
   B. is positive but less than the price of the product.
   C. equals the price of the product.
   D. exceeds the price of the product.

8. If marginal revenue is higher than marginal cost then:
   A. producing one extra unit will increase total profit.
   B. total revenues are larger than total costs.
   C. the firm is maximizing its profits.
   D. All the above.

9. Collusion means that:
   A. a monopolistic firm uses illegal means to maximize its profits.
   B. a large number of monopolistically competitive firms decide to keep the price high to maximize collective profits.
   C. two monopolistically competitive firms agree to keep their price lower than their competitors.
   D. two or more oligopolistic firms act as if they were a monopoly.

10. The marginal cost curve will shift up if:
    A. a new technological improvement is introduced.
    B. the cost of one variable input in the production increases.
    C. demand increases.
    D. production increases.
11. The table above shows that:
   A. total cost increases as output increases.
   B. marginal cost falls over some range of output and then increases.
   C. average cost declines and then increases.
   D. All the above.

12. A firm's break-even point is the quantity and price at which the firm's total revenue just equals its
   A. total cost.
   B. total variable cost.
   C. total fixed cost.
   D. marginal cost.

13. As output increases, marginal cost will eventually
   A. increase because of the law of increasing returns.
   B. increase because of the law of diminishing returns.
   C. decrease because of the law of diminishing returns.
   D. decrease because of the law of increasing returns.

14. In a perfectly competitive market, __________.
   A. there are restrictions on entry into the industry
   B. firms in the industry have advantages over firms that plan to enter the industry
   C. one firm can decide to change the market price
   D. there are many firms that sell identical products

15. Which of the following is always true for a perfectly competitive firm?
   A. P = MR
   B. P = ATC
   C. MR = ATC
   D. P = AVC

16. Which of the following is true for a single-price monopolist?
   A. P > MR
   B. P < MR
   C. P = MR
   D. P = elasticity of demand
17. Economic efficiency necessarily occurs when the firm……………………………
   A. produces a given output at least cost.
   B. produces a given output by using the least inputs.
   C. earns a normal profit.
   D. earns an economic profit.

18. Which of the following is characteristic of the long run?
   A. It must be equal to 12 months in length.
   B. The firm’s plant is fixed.
   C. All resources can be varied.
   D. All of the above answers are correct.

19. Suppose that the five firms that make up the invisible goldfish industry formally sign a contract to
   establish product price; essentially they have:
   A. established a dominant firm to serve as the industry’s price leader.
   B. established a monopolistically competitive industry.
   C. formed a cartel.
   D. entered into an implicit agreement.

20. In the figure above, the short-run supply curve is:
   A. the SMC curve.
   B. the points between AD.
   C. the SMC curve above A.
   D. the points between AC.
Part B: Essay Questions (70 pts.)

1. The table below sets out the total product plan of a firm operating in a perfectly competitive market. (35 pts.)

<table>
<thead>
<tr>
<th>Labor (Workers per week)</th>
<th>Output (Q) (units)</th>
<th>Fixed Cost ($)</th>
<th>Variable Cost ($)</th>
<th>Total Cost ($)</th>
<th>Average Variable Cost ($)</th>
<th>Average Total Cost ($)</th>
<th>Marginal Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>1000</td>
<td>0</td>
<td>1000</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>40</td>
<td>1000</td>
<td>700</td>
<td>1700</td>
<td>17.5</td>
<td>42.5</td>
<td>20.0</td>
</tr>
<tr>
<td>2</td>
<td>80</td>
<td>1000</td>
<td>1400</td>
<td>2400</td>
<td>17.5</td>
<td>30.0</td>
<td>15.6</td>
</tr>
<tr>
<td>3</td>
<td>130</td>
<td>1000</td>
<td>2100</td>
<td>3100</td>
<td>16.2</td>
<td>23.8</td>
<td>14.0</td>
</tr>
<tr>
<td>4</td>
<td>170</td>
<td>1000</td>
<td>2800</td>
<td>3800</td>
<td>16.5</td>
<td>22.4</td>
<td>17.5</td>
</tr>
<tr>
<td>5</td>
<td>200</td>
<td>1000</td>
<td>3500</td>
<td>4500</td>
<td>17.5</td>
<td>22.5</td>
<td>23.3</td>
</tr>
<tr>
<td>6</td>
<td>220</td>
<td>1000</td>
<td>4200</td>
<td>5200</td>
<td>19.1</td>
<td>23.6</td>
<td>35.0</td>
</tr>
<tr>
<td>7</td>
<td>230</td>
<td>1000</td>
<td>4900</td>
<td>5900</td>
<td>21.3</td>
<td>25.7</td>
<td>70.0</td>
</tr>
</tbody>
</table>

If the firm hires workers at $700 a week and its total fixed cost is $1000 a week;

A. Fill in the table above by calculating the cost functions of the firm. (2+10 pts.)

**Answer:** Answers are in the table above in bold fonts.

B. Given your answer to part A, is the firm operating in the short-run or long-run? Why? (2 pts.)

**Answer:** Given that the firm’s total production plan has a fixed cost, it is operating in the short-run.

C. Plot the average variable cost, average total cost, and marginal cost curves of the firm. (9 pts.)

Note: Don’t forget to label the diagram and curves appropriately.

[Diagram with corrections: 42.5 (not 48.6) and 17.5 (not 20)]
D. Show on the graph above the supply curve of the firm. Briefly explain. (3 pts.)

Answer: The firm's short-run supply curve is the portion of the MC curve above the point where the AVC and the MC curves intersect.

E. If the price of the good is $35, how much would the firm be producing? Is the firm making a profit or loss? Calculate how much the profit/loss. (2+2+Bonus 5 pts.)

Answer: Given that this is a perfectly competitive market, which makes the firm as a price taker, P=MR. The firm would be producing 210 units of the good in order to maximize its profit when the market price is 35. This is the midpoint between the output levels 200 and 220 where the P=MC.

At the profit-maximizing output level, the table above shows that the ATC of the firm is equal to $23.1 (midpoint between $22.5 and $23.6). Given that the market price is above the ATC, the firm makes a profit which is equal to:

\[
\text{Profit} = \text{TR} - \text{TC} = (P - \text{ATC})\cdot Q = (35 - 23.1)\cdot 210 = $2,499
\]

Note that if ATC and profit maximizing output levels are used as the end points, i.e. 23.6 and 220, respectively, profit would be calculated as $$2,508, which can also be considered as a correct answer.

2. Consider the following table showing the long-run total cost function of a single firm. (13 pts.)

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Long-run Total Cost ($)</th>
<th>Long-run Average Total Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45</td>
<td>45.0</td>
</tr>
<tr>
<td>2</td>
<td>32</td>
<td>16.0</td>
</tr>
<tr>
<td>3</td>
<td>25</td>
<td>8.3</td>
</tr>
<tr>
<td>4</td>
<td>25</td>
<td>6.3</td>
</tr>
<tr>
<td>5</td>
<td>30</td>
<td>6.0</td>
</tr>
<tr>
<td>6</td>
<td>40</td>
<td>6.7</td>
</tr>
<tr>
<td>7</td>
<td>50</td>
<td>7.1</td>
</tr>
</tbody>
</table>

A. Calculate on the table above the long-run average total cost (LAC) curve of the firm. (3.5 pts.)

Answer: Answers are in the table above in bold fonts.

B. Plot the LAC curve on the grid below. (3.5 pts.)

Note: Don’t forget to label the diagram and the curve appropriately.
C. Show on the same diagram the proportions of output where the firm is experiencing (i) economies of scale, (ii) constant returns to scale, and (iii) decreasing returns to scale. (6 pts.)

Answer: See the graph above.

3. The graph below shows the market demand, marginal revenue, and marginal cost curves of a single-price monopoly. (22 pts.)
A. What are the profit-maximizing output and price of the monopoly? (3 pts.)

**Answer:** The monopoly maximizes its profit at the output level where the MR=MC. This point is shown on the graph above as point A. As we can see from the graph, the profit-maximizing output and price are 2 and $30, respectively.

B. If it were a perfectly competitive market, what would be the profit-maximizing output and price? (3 pts.)

**Answer:** In a perfectly competitive market, the firm would be maximizing its profit at the point where the demand curve (MR) is equal to the MC. At this point the profit maximizing output and price are equal to 3 and 20, respectively.

C. Compare the output and price levels of the perfectly competitive and monopolistic markets? (2 pts.)

**Answer:** As we can from the graph and explanations above, the monopoly leads to a lower output (2 vs. 3) and higher price (30 vs. 20)

D. What is the assumption which makes this comparison possible? (Bonus 5 pts.)

**Answer:** The comparison is based on the assumption that the cost structure of the monopoly and the perfectly competitive market is the same.

E. Shade on the graph above the areas of consumer surplus, producer surplus, and the dead-weight loss created by the monopoly? (9 pts.)

**Answer:** See the graph above.