Chapter 5

Answer 1a) The production function is

\[ Q = F(K, L) = K^{\frac{3}{4}}L^{\frac{1}{4}} \]

The average product of labor, \( AP_L \), is:

\[ \frac{Q}{L} = \frac{F(K, L)}{L} = \frac{K^{\frac{3}{4}}L^{\frac{1}{4}}}{L} = K^{\frac{3}{4}}L^{-\frac{3}{4}} \]

The \( AP_L \) when \( L \) and \( K \) are 16 each is:

\[ \frac{Q}{L} = 16^{\frac{3}{4}}16^{-\frac{3}{4}} = \frac{8}{8} = 1 \]

\( AP_L \) when \( L \) is 81 units and \( K \) is 16 units:

\[ \frac{Q}{L} = 16^{\frac{3}{4}}81^{-\frac{3}{4}} = \frac{8}{27} \]

b) The expression for the marginal product of labor when \( K \) is fixed at 16 units:

\[ MP_L = \frac{\partial Q}{\partial L} = \frac{1}{4}K^{\frac{3}{4}}L^{-\frac{3}{4}} = \frac{1}{4}(8)L^{-\frac{3}{4}} \]

\[ MP_L = 2L^{-\frac{3}{4}} \]

When \( L \) is 16 units:

\[ MP_L = 2(16)^{-\frac{3}{4}} = \frac{2}{8} = \frac{1}{4} \]

When \( L \) is 81 units:
\[ MP_L = 2(81)^{-\frac{3}{4}} = \frac{2}{27} \]

c) Capital is fixed at 16 units. Selling price is $100 and wage rate is $25. We use the following formula to solve for this:

\[ P \times MP_L = w \]

\[ 100 \times 2L^{-\frac{3}{4}} = 25 \]

\[ L^{-\frac{3}{4}} = \frac{1}{8} \]

\[ L = 16 \]

16 units should be hired.

a) The wages paid to labor are the fixed inputs and the rents paid for capital are the variable inputs.

b) Firms fixed costs are 20 hours of labor at $15 per hour, which is $300.

c) If 6 units of capital are used to produce 475 units of capital at $75 per hour, it will cost

\[ 6 \times 75 = $450. \]

d) To maximize profits, \( P \times MP_K = r \), \( \Rightarrow 2 \times MP_K = 75 \rightarrow MP_K = 37.5 \).

This is between 5 and 6 units of capital (We ignore the earlier one as we need the \( MP_K \) in the downward sloping portion).

e) The maximum profit earned is around $225.

f) There are increasing marginal returns from 0 to 3 units.

g) There are decreasing marginal returns from 4 to 11 units.

h) There are negative marginal returns from 7 to 11 units.

Answer 5)
In order to use a cost-minimizing combination of labor and capital:

\[ p \cdot MP_L = w \]

\[ p \cdot MP_K = r \]

\[ \frac{MP_L}{MP_K} = \frac{w}{r} \]

\[ \frac{50}{75} \neq \frac{6}{12} \]

Therefore, \( \frac{MP_L}{MP_K} > \frac{w}{r} \) → labor is a better deal than capital. Firm should use more labor and less capital in order to minimize costs. Therefore, the firm should decrease the amount of capital as \( \frac{MP_L}{w} > \frac{MP_K}{r} \).

Answer 6)

<table>
<thead>
<tr>
<th>Q</th>
<th>FC</th>
<th>VC</th>
<th>TC</th>
<th>AFC</th>
<th>AVC</th>
<th>ATC</th>
<th>MC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10000</td>
<td>0</td>
<td>10000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>100</td>
<td>10000</td>
<td>10000</td>
<td>20000</td>
<td>100</td>
<td>100</td>
<td>200</td>
<td>10000</td>
</tr>
<tr>
<td>200</td>
<td>10000</td>
<td>15000</td>
<td>25000</td>
<td>50</td>
<td>75</td>
<td>125</td>
<td>5000</td>
</tr>
<tr>
<td>300</td>
<td>10000</td>
<td>30000</td>
<td>40000</td>
<td>33.33</td>
<td>100</td>
<td>133.33</td>
<td>15000</td>
</tr>
<tr>
<td>400</td>
<td>10000</td>
<td>50000</td>
<td>60000</td>
<td>25</td>
<td>125</td>
<td>150</td>
<td>20000</td>
</tr>
<tr>
<td>500</td>
<td>10000</td>
<td>90000</td>
<td>100000</td>
<td>20</td>
<td>180</td>
<td>200</td>
<td>40000</td>
</tr>
<tr>
<td>600</td>
<td>10000</td>
<td>140000</td>
<td>150000</td>
<td>16.67</td>
<td>233.33</td>
<td>250</td>
<td>50000</td>
</tr>
</tbody>
</table>

Note:

- Total Cost = Fixed Cost + Variable Cost
- Average Total Cost = Total Cost / Quantity
- Average Fixed Cost = Fixed Cost / Quantity
- Average Variable Cost = Variable Cost / Quantity
- Average Total Cost = Average Fixed Cost + Average Variable Cost
Chapter 6

Answer 3a) Contract
   b) Vertical Integration
   c) Spot Exchange
   d) Spot Exchange

Answer 4)
   Vertical Integration: Firm has complete control over its input and shuns its suppliers. Does not have to rely on other firms in order to produce the inputs. Toyota producing its own engines has more control over the quality of the engine produced.

   Spot exchange or Contract: It can acquire the mirrors without losing its specializations. It would be too costly to install facilities that produce mirrors as Toyota does not specialize in mirrors. Buying from a distributor is much more cost efficient. Transaction costs are not that high.

Answer 6)
   When the manager shirks he is reducing the profits a firm could earn as he is forgoing revenue generating activities for leisure. If the manager is paid a fixed amount without any incentives he may reduce the amount worked as lower profits may not affect his own income. However, when incentive contracts are included, the manager may have to allocate the number of hours he shirks differently in order to maximize his satisfaction. With compensation dependent upon performance, the manager will not only raise his own income but also the profits of the firm. So instead of shirking for the whole time on the job, the manager will work for a seven hours and shirk for three hours.

Answer 7)
   Advantages:
   - Provide an incentive for individuals to perform better.
   - Workers do not know when they are being "spot checked" as the process can be random.
   - Check whether the work quality and effort are satisfactory

   Disadvantages:
   Needs to occur frequently in order to be effective
   May create some psychological effects that could be negative.

Answer 8)
   a) Benefits from specialization:
   - Firms "skip the middleman" by producing its own imports.
   - Mitigates transaction costs by eliminating the market.
b) Bureaucracy costs

Bureaucratic costs associated with a large organization. Firm has to manage the production of the inputs as well as the production of the final product produced with those inputs.

c) Opportunism on either side of the transaction

The buyer or the seller may attempt to capitalize on the "sunk" nature of the investment by engaging in opportunism. Suppose the buyer has to spend $10 on inspecting a product and does so by inspecting a random seller’s product. The seller can "hold up" the buyer into purchasing the product by offering it at $9 more than the price charged by the other suppliers as the buyer will have to spend $10 in order to inspect another seller’s product.

d) Specialized investments

Relationship-specific exchange. For instance, if Boeing purchases engines from GE, it may have to install machinery that specializes in installing GE engines on its aircrafts, while GE will have to produce engines specific to Boeing’s needs. Thus, there is a relationship created which would lead to opportunism by both, the buyer and the supplier.

e) Unspeakable events

There can be many instances that occur for which a firm may not be prepared. This could lead to problems in writing up contracts between the buyers and the sellers. For instance, if the vineyards face an unusually wet summer, they will not be able to supply the contractually agreed amount of grapes to the wineries and therefore lead to penalties and costs. Such events can be considered unspeakable on contracts.

f) Bargaining costs

Under specialized investments both the supplier and the buyer know their bargaining positions. They require each other’s goods or services and there are no close substitutes available. This leads to a costly bargaining process as a "market" may not exist for their goods or services. The buyer or the supplier are tied to each other. Transaction costs are created as prices are negotiated.

Note: Essay answers provided here are generally very basic. You should elaborate the answers to make it more meaningful.