HAND IN

Economics 212
Microeconomic Theory
Final Exam

December 20, 2017

Faculty of Arts and Sciences
Queen's University

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Instructions

- The exam is three hours in length.
- CALCULATORS ALLOWED: Casio 991
- The exam consists of two sections: Section A has five short answer questions and is worth 25 marks and Section B has five problems and is worth 75 marks.
- Please write your answers in the space provided in this booklet. You may do rough work on the back of the pages or continue an answer there if you run out of space. Please indicate that your answer continues on the back of the page.
- For full marks you must correctly derive your answers and show all work.
- Proctors are unable to respond to queries about the interpretation of exam questions. Do your best to answer the exam questions as written.
- Please write your student number and section of the course in the space below.
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STUDENT NUMBER:
SECTION:

Section A: Five questions, each worth 5 marks, for a total of 25 marks.

1. The short-run total cost of a perfectly competitive firm is given by $STC(q)=2000+q+4q^2$, where q is the firm's output. Derive the short-run supply function of the firm. Assume there are 1000 identical firms in the industry. Derive the market supply function.

2. Assume there are 1000 identical firms, each with a short run supply function given by q=P-4. Market demand is given by $Q^D=8000-200P$. Solve for the equilibrium price and quantity in the market and individual firm output.

3. Consider the perfect complements production function $Q=\text{Min}\{aL; bK\}$. In the short run the level of capital is fixed at K^0. Given a wage rate, w, and a rental rate, r, derive the firm's short run demand for labour and its short run total cost function.

4. A firm produces output, Q, using labour, L, and capital, K, according to the production function $Q=L^{1/3}K$. What proportion of total costs will be spent on each factor of production? Explain.

5. A firm has chosen the amounts of labour and capital that minimize the cost of producing their current output level. If the wage paid by the firm increases, the firm will always respond by reducing the amount of labour it uses for that given output level. True, false or uncertain. Explain. [Hint: think about its different technological options]

Section B: Five problems, each worth 15 marks, for a total of 75 marks. Each part of each question is worth five marks.

1. A perfectly competitive firm has a production function given by $Q=5L^{1/2}K^{1/2}$, where Q is output, L is labour and K is capital. Input prices are given by w (wage) and r (rental rate on capital).

   a) Derive the conditional input demand functions of the firm.

b) Derive the long-run total cost function for the firm.

c) How does the production function $Q=10L^{1/2}K^{1/2}$ differ from the one given in the introduction to the question? Explain.

2. The long-run cost function of a firm in a perfectly competitive market (made up of many identical firms) is given by $C(q)=2000q-20q^2+.2q^3$, where q is firm output. Market demand is given by $Q^D=25{,}000-5P$, where Q is market output and P is price.

   a) Solve for the long-run equilibrium values of price, output per firm, the number of firms and market output.

   b) In the short run, a firm has a short run cost function given by $C^S=400+8q+2q^2$. Derive the short run supply function of the firm, including shutdown conditions.

c) Does the production function $Q=LK$ display economies of scale in its long run average cost function? Explain.

3. Consider a duopoly that faces a market demand given by $P=5{,}000-5Q$, where P is product price and Q is market output. The two firms in the market have cost structures as follows: firm 1 has costs given by $C_1 = 500q_1$, while firm two has costs given by $C_2 = 2000q_2$, where subscripts indicate the respective firms. The output in the market is equal to the sum of the firm outputs.

   a) Solve for the Cournot equilibrium values of price, market output and firm outputs.

b) Suppose firm 2 chooses its output level first and firm 1 follows. Solve for the Stackelberg equilibrium values of price, market output and firm outputs.

c) Assume firm two is a monopolist facing the market demand function given in the introduction to the question. Determine the level of price and quantity in the market. If firm one had been the monopolist would it produce more, less or the same amount as firm two? Explain with reference to the reaction functions derived in part a).

4. A perfectly competitive market is characterized by a demand function of the form $Q^D=18,000-300P$ and a supply function of the form $Q^S= 400P - 3,000$, where P is the price.

   a) Determine the equilibrium values of the price quantity. Calculate the elasticities of supply and demand at the equilibrium.

   b) The government levies a tax at the rate of 10% on the good. Explain how the tax is shared between producers and consumers and how the quantity is affected by the tax.

c) Return to the situation in part a) and explain how a production quota in the amount of 7500 units will affect the market price and quantity. Have producer revenues increased as a result of the quota? Explain with reference to the elasticities calculated in part a).

5. Consider the payoff matrix below, which shows two players each with three strategies. The game is structured such that $10 is divided between the two players according to the payoff matrix entries.

Player 2

	Rock	Paper	Scissors
Rock	5,5	0,10	10,0
Paper	10,0	5,5	0,10
Scissors	0,10	10,0	5,5

Player 1

a) Find all Nash equilibria in pure strategies for this simultaneous choice, one-play game. Explain your reasoning.

b) Draw the game in extended form and solve assuming sequential choice, with player 1 choosing first. Why is there no first mover advantage in this sequential game?

c) Professor X announces that he will auction off $20 in a competition between two students. Bidding is sequential and proceeds in one dollar increments or any multiple of one dollar increments. The highest bidder wins the $20 in exchange for the winning bid amount. The catch is that the loser of the bidding also must pay the amount of his or her bid to Professor X. Use backward induction to demonstrate why the game is likely to be a losing proposition for both players.