HAND IN

Answers recorded on exam paper

QUEEN'S UNIVERSITY FINAL EXAMINATION
FACULTY OF ARTS & SCIENCE
DEPARTMENT OF ECONOMICS

ECON 212: Microeconomic Theory
December 15, 2018

Instructors: Art Stewart, Ruqu Wang and Lenin Castillo

INSTRUCTIONS TO STUDENTS:

- This examination is THREE (3) 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 on the exam. You may do rough work on the back of the pages or continue and 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.

PLEASE NOTE:
Proctors are unable to respond to queries about the interpretation of exam questions.
Do your best to answer exam questions as written.

Please write your student number and section of the course in the space below.

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 $STC(q)=1000+20q+10q^2$, where q is the firm's output. Derive the short-run supply function of the firm. Assume there are 2000 identical firms in the industry. Derive the market supply function.

2. A firm produces output with a production function of the form $Q=10L+30K$. The wage rate is \$20/hour and the rental rate is \$50/hour. The firm produces 900 units of output. Determine the firm's cost minimizing bundle of inputs and cost of production.

3. Consider the perfect complements production function Q=Min {2L; 200K}. The firm wishes to produce 2,000 units of output. Find the cost minimizing bundle of inputs for the firm.

4. Inverse market demand is given by P=18,000-40Q. A monopolist has a cost function given by C=1,000+10Q. Determine the profit maximizing level of output and price. Explain how a 10% tax affects the levels of price and output and how the tax is shared between consumers and producers.

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 decreases, the firm will always respond by increasing 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 $Q=L^{1/2}K^{2}$, 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) In the short run the amount of capital is fixed at 10 units. Derive the short run production function, the short run demand for labour, the short run total cost function and the short run supply function (ignore shutdown conditions).

2. The long-run cost function of a firm in a perfectly competitive market (made up of many identical firms) is given by $C(q)=800q-20q^2+.5q^3$, where q is firm output. Market demand is given by $Q^D=40,000-10P$, 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) Assume market demand increases to $Q^D=60,000-10P$. Determine how this alters the equilibrium values from part a).

c) Assume that a firm's long run average cost curve reaches its minimum at an output of 100 units and that the value of long run average cost at this level is 10. Market demand is given by $Q^D=100,000-20P$. Determine the long run equilibrium values of firm output, market output, market price and number of firms.

3. Consider a duopoly that faces a market demand given by $P=50,000-5Q$, 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 $C_1= 2,000q_1$, while firm two has costs given by $C_2=1,000q_2$, 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 one 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.

4. A perfectly competitive market is characterized by a demand function of the form $Q^D=8,000-2P$ and a supply function of the form $Q^S=3,000$, 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 $200 per unit on the good. Explain how the tax is shared between producers and consumers and how the quantity is affected by the tax.

c) Assume the government had offered a $200 per unit subsidy instead of the tax. How would this be shared between producers and consumers?

5. Consider the payoff matrix below, which shows two players each with three strategies. The payoffs are given in the matrix

		Player 2		
		A2	B2	C2
Player 1	A1	12, 6	7, 14	14, 16
	B1	17, 12	11, 11	16, 16
	C1	15, 15	14, 17	12, 14

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.

c) Change the original payoff matrix such that there are no Nash equilibria. Explain why there are no Nash equilibria.