Department of Agricultural & Applied Economics
Microeconomics Qualifying Exam
July 30, 2018
9:00 a.m. to 2:00 p.m.

Your **810 Code #** ________________________

Please provide complete answers to all questions. You have 5 hours to complete the exam; allocate your time accordingly. Please follow all instructions listed below:

- Number your responses to the questions clearly.
- Write the last 4 digits of your Student ID number at the top right of each response page.
- Write the page number in the lower right hand corner of each response page.
- Write your answers legibly and orderly. Illegible writing may cause your answers to not be correctly credited.
- Write only on one side of paper with a blue or black pen.
- Clearly box all final answers to numerical and algebraic problems

Question 1

Consider the function $f(p_1, p_2, u) = \frac{8}{3}\left(\frac{3}{5}\right)^{\left(\frac{5}{8}\right)} p_1^{\beta} p_2^{\left(\frac{3}{8}\right)} u$ where p_1 and p_2 are prices and u is some minimally desired level of utility.

(1.1) Use the homogeneity property for an expenditure function that represents a continuous strictly convex, and locally nonsatiated preference relation $\succsim$ on $\Re^2_+$ to determine the value of β that makes this function a valid expenditure function.

(1.2) Derive the Hicksian demand for commodity 1 using this expenditure function

(1.3) Use duality to find an indirect utility function that is consistent with this expenditure function.

Question 2

(2.1) You are the teaching assistant for an intermediate undergraduate microeconomics course. A student asks you to explain the difference between *compensating variation (CV)* and *equivalent variation (EV)*. Intuitively explain, at an undergraduate level, the difference. Supplement your discussion using a figure with two goods (x, y) when the price of x rises (*one page max)*.

(2.2) Now demonstrate the difference by solving the following: a consumer's utility function is defined by $U(x,y) = xy$ subject to the budget constraint $I = p_x x + p_y y$. Let income $I = 18$, $p_x = 1$ and $p_y = 1$. Suppose p_x increases to 3. What is the CV and EV due to this price change?

Question 3

Consider a firm that has a monopoly position in two related goods. On the advice of consumer advocacy groups the government is considering breaking up the firm into two separate companies. The question is, are two monopolies better than one? Rather than looking at a stylized model, consider the following more explicit case. Suppose that there are two firms (1 and 2), each producing a good x_i at constant marginal cost c_i. Each firm has monopoly power in the production of its good. Assume the goods are perfect complements, and the demand for each good by the representative consumer is $x_i = (p_1 + p_2)^{-2}, i = 1,2$ where p_i is the price charge for one unit of x_i.

(3.1) Assuming the two firms act independently to maximize their own profit and the decisions occur in the following sequence. Firm 1 moves first and chooses p_1. Firm 2 moves second and chooses p_2 after observing p_1. Find the profit-maximizing prices p_1^* and p_2^*.

(3.2) Assume the two firms are merged into a single firm. The integrated firm maximizes profit over the sale of both goods. Set up and solve the appropriate optimization problem for the integrated firm (*hint: due to the nature of the two goods, solve for the price of the composite good* $\overline{p} = p_1 + p_2$).

(3.3) Compare the total profit of the two firms in part 1 and the profit of the integrated firm in part 2. Is integration beneficial to the firms? Why or why not?

(3.4) Define an appropriate welfare metric to answer the question of whether consumers are better off with two monopolies (part 1) or an integrated monopoly (part 2).

(3.5) For this explicit model, it was assumed the two goods are perfect complements. What role did this assumption play, i.e., how would the results have changed if demand functions for each good only depended upon its own price (e.g., $x_1(p_1)$ and $x_2(p_2)$)?

Question 4 – Part A

Consider a pure exchange economy consisting of two consumers (denoted A and B) and two goods (denoted x_1 and x_2). Preferences and initial endowments for each consumer are given by

$$U^A(x_1^A, x_2^A) = \min(2x_1^A, x_2^A) \qquad (e_1^A, e_2^A) = (2,1)$$
$$U^B(x_1^B, x_2^B) = \min(x_1^B, x_2^B) \qquad (e_1^B, e_2^B) = (2,3)$$

(4.1) Draw an Edgeworth box with the following: (a) at least two indifference curves for each consumer noting the direction of increasing utility, (b) the set of Pareto efficient allocations for this economy, (c) core of this economy, and (d) the Walrasian equilibrium.

Question 4 – Part B

Consider an economy consisting of a single consumer and a single firm that is owned by the consumer. The consumer is endowed with zero units of the consumption good and has 6 units of time. The consumer's time is divisible and may be allocated towards leisure activities or labor employed by the firm. The consumer's preferences are represented by the following utility function $u(\ell, x_2) = \min(x, \ell)$ where ℓ denotes the time consumer allocates to leisure and x is the consumption good. The firm produces the output good using labor according to the following production technology: $f(L) = L$. Negative consumption of goods or leisure is not permitted in this economy. Let p and w denote, respectively, the price of the consumption good and the wage rate, and normalize the price of the consumption good to one for the entire problem.

(4.1) What type of returns to scale does the production technology reflect? Solve for the firm's demand for labor, supply function, and profit function *(hint: all three should be piecewise functions due to the nature of the production technology).*

(4.2) Solve for the consumer's demand function for the consumption good and the supply function for labor.

(4.3) Find the competitive equilibrium for this economy.

Question 5

Consider the following card game involving two players. At the beginning of the game, both players put \$1 into the "pot" that will be given to the winner of the game. Player 1 draws a card from a deck. With probability r the card is red, with probability $1-r$ the card is black (*DO NOT ASSUME $r=0.5$ for this problem).* Player 1 looks at the card to see what color it is, but does not show the card to player 2. Player 1 has a decision to make, she can either *Raise* or *Check.* If Player 1 *Checks*, the game is over. Player 1 wins the pot if the card is red, Player 2 wins the pot if the card is black. If Player 1 *Raises*, Player 2 has a decision to make, she can either *Meet* or she can *Pass*. If Player 2 *Passes*, the game ends and Player 1 wins the pot if the card is red, Player 2 wins the pot if the card is black. If Player 2 *Meets*, then each player puts an additional \$1 into the pot. The game ends, and Player 1 wins the pot if the card is red, Player 2 wins the pot if the card is black.

(5.1) Show the game in extensive form.

(5.2) Describe the expected payoffs for the normal form of the game.

(5.3) For what values of r is there a pure strategy Nash Equilibrium?

(5.4) Find a Nash equilibrium of the game in mixed strategies.