

**INSTRUCTIONS:**

1. Answer **ONLY** the specified number of questions from the options provided in each section. Do not answer more than the required number of questions. Each section takes one hour.
2. Your answers must be on the paper provided. No more than one answer per page. Do not answer two questions on the same sheet of paper.
3. If you use more than one sheet of paper for a question, write "Page 1 of 2" and "Page 2 of 2."
4. Write **ONLY** on one side of each sheet. Use only pen. Answers in pencil will be disqualified.
5. Write ----- **END** ----- at the end of each answer.
6. Write your exam identification number in the upper right-hand corner of each sheet of paper.
7. Write the question number in the upper right-hand corner of each sheet of paper.

**Section 1: Microeconomic Theory—Answer Any Two Questions.**

**1A.** (Hajikhameneh & Rietz) Answer the following questions for a consumer with utility function  $U(x,y) = x^{1/4}y^{3/4}$  and total income  $I$ , when  $p_x$  is the price of good  $x$  and  $p_y$  is the price of good  $y$ .

- a. What is the marginal utility of  $x$ ? of  $y$ ?
- b. In one to two sentences, define the economic meaning of the term "marginal utility."
- c. What is the marginal rate of substitution for the given utility function?
- d. In one to two sentences define the economic meaning of the term "marginal rate of substitution."
- e. Using the Lagrange multiplier method, find the (Marshallian) demand curves for  $x$  and  $y$ . Use lambda  $\lambda$  as the Lagrange multiplier.
- f. In a sentence or two, define the economic meaning of the Lagrange multiplier.

(over)

**1B.** (Hajikhameneh & Rietz) Studies show that young married couples (in their early 20's) attend many more movies than older couples (in their 30's and 40's). Use budget lines and indifference curves between movies (depict on the horizontal axis [**X**]) and all other goods (depict on the vertical axis [**Y**]) to show how each of the following could explain this difference in consumption patterns:

- a. Incomes tend to increase with age, and movies are an inferior good.
- b. The incomes of old and young are about the same, but their preferences differ.
- c. Movie-going is a time-intensive activity, and older people have higher values of time.

**Note:** Draw a separate diagram for each part, taking care to distinguish the indifference curves, budget constraints, and optima of the young vs. the old.

**1C.** (Liu) By selling  $x$  tons of one commodity the firm gets a price per ton by  $p = 24 - x$ . By selling  $y$  tons of another commodity the price per ton is  $q = 42 - y$ . The cost of producing and selling  $x$  tons of the first commodity and  $y$  tons of the second commodity is given by

$$C(x, y) = x^2 + xy + y^2. :$$

- a. Write down the firm's profit function  $P(x, y)$ .
- b. Compute the first-order partial derivatives of  $P(x, y)$ , and find its only critical/stationary point.
- c. Suppose that firm's production activity causes so much pollution that the authorities limit its output to no more than 10 tons of total output. Solve for the optimal levels of  $x$  and  $y$  that maximize the profit.