HOWARD UNIVERSITY
DEPARTMENT OF ECONOMICS

CODE NUMBER---------- **TOTAL NUMBER OF PAGES----------**

DATE----------

COMPREHENSIVE EXAMINATION: Fall 2020 Microeconomics Theory MA

EXAMINERS:

1. **Dr. Omari H. Swinton, Chairperson**
2. **Dr. Deniz Baglan**
3. **Dr. Alexander Henke**

1. **The examination is scheduled between the hours: 9:30 a.m-1.00 pm**

   ALL STUDENTS ARE TO BE ON CAMERA BY 9:25 a.m.
2. **YOU ARE REQUIRED TO ANSWER ONLY FIVE (5) QUESTIONS.**

   Any additional questions answered over the required number from each category will NOT receive credit.
3. **Correct answers to questions NOT asked will receive NO credit.**
4. **Be sure to write the Code Number assigned to you in the TOP LEFT HAND CORNER OF THIS SHEET AND ON EACH ANSWER SHEET. DO NOT WRITE YOUR NAME ON ANY SHEET OF THE EXAMINATION.**
5. **Begin each question on a new page. Number each page used in sequence. Write only on one side of the paper.**
6. **Write clearly and illustrate your answers with graphs whenever and wherever possible.**
7. **USE ONLY BLACK INK PENS.**
8. **At the end of the examination, please indicate the total number of pages being submitted in the space provided in the TOP RIGHT HAND CORNER of this sheet.**
9. **PLEASE SUBMIT A PICTURE OF EACH PAGE TO GPRITCHETT@HOWARD.EDU AND CONFIRM THAT THE PICUTRE WAS RECEIVED BEFORE EXITING THE EXAM.**

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1. **Bring your pens, pencils, calculators and rulers.**
2. **No briefcases, cell phones, book bags or sacks, no handbags larger than 10 x 6 of any form are to be near you when taking the exam.**
3. **No books, notes or other study material are to be near you when taking the exam.**
4. **You can only used an unopened pack of paper that is opened on camera.**
5. **You must show a video of your sitting area before you can be approved to take the exam. This will confirm that the testing area is clear. Your video must remain on the entire time. Turn off any virtual background.**
6. **Use *private* Zoom chat to ask questions of the proctor.**
7. **During the Examination there is to be no communication between or amongst students or anyone for any purpose. All questions must be directed to and channeled through the faculty member conducting the examination.**
8. **Students are not expected to leave their chairs before completing their examination and turning it in to the proctor.**
9. **NO FOOD OR SMOKING is permitted during the exam.**
10. **The student may have a drink with them during the exam.**
11. **If you get disconnected for any reason, please call the proctor. Upon reentry to the test, you must verify that your area is clear again. In the event that you cannot reconnect, please contact the Associate Chair of the department to monitor the remainder of the exam via phone.**
12. **EXAMINATION ZOOM INFORMATION WILL ONLY BE GIVEN TO STUDENTS WHO ARE REGISTERED.**

Revised 8/11/2020

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Honor Code

I agree not to access any material in taking this exam and understand that if I do, I will be given an immediate fail on the exam.

X_____

CODE NUMBER_____

STUDENTS: PLEASE CIRCLE ONLY THE QUESTIONS ANSWERED AND PROVIDE THE PAGE NUMBERS.

QUESTIONS	PAGE NUMBERS
1.	
2.	
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8.	

1. Suppose the quantity demanded is given by $q^d=90-p$ and a monopolist's marginal cost is given by MC=q.
   a. What is the monopolist's marginal revenue curve?
   b. What is the monopolist's profit maximizing quantity of production? What is the optimal price for him to charge? Assuming the monopolist has no fixed costs, what is his maximum profit?
   c. Assuming the monopolist is maximizing his profits, what is consumer surplus (in dollars)?
   d. What is the socially optimal (or efficient) level of production (the level for perfect competition)? What would total surplus be at that level (in dollars)?
   e. What is the dead weight loss from the existence of a monopoly in this market (in dollars)?

2. There is only one firm that produces test solutions, Answer-All. Answer-All faces a linear demand function given by P=320-4Q and has a MC=40.
   a. How many test solutions and what price will Answer –All charge for them?
   b. Teachers seeing the profit that Answer-All is making decide to form a company called Teach-Cheat. Teach-Cheat and Answer-All now are the only companies that provide test solutions. The market demand is $(P=320-4(Q_{AA}+Q_{TC}))$. Answer-All still has MC=40, however Teach-Cheat has a cost advantage with MC=0 (Teachers make the test so they have the answers!). Graph Answer-All and Teach-Cheat reaction (best response) functions. Show output levels for Cournot, Monopoly, and Perfect Competition for each firm. (Hint: The reaction curves are not symmetric.)
   c. Competing in Cournot duopoly fashion, which firm will make the most profit? Explain why? (Hint: You do not have to solve for the profit to answer this question.)

3. Duality
   Let $u(x,y)=x^{0.3}y^{0.7}$ Find the following
   a. the Marshallian demand functions for x and y
   b. the indirect utility function
   c. the compensated (Hicksian) demand functions for x and y
   d. the expenditure function
   e. Use your answers to a and d to derive the Hicksian demand functions for x and y. Compare these to your answers to c. Explain what you are doing.
   f. Use your answers to b and c to derive the Marshallian demand functions. Compare these to your answers for a. Explain what you are doing.
   g. Write the Slutsky equation for this problem.

4. Rice, an important agricultural products for both the US and other countries, has different demand and supply curves in different regions of the world thanks to difference in technology, geography, climate, etc. Now suppose that the supply and demand curves in the US rice industry are as follows:

   Supply of Rice in the US: $Q_s = 0.3 * P$

   Demand of Rice in the US: $Q_d = 2 - 0.5P$

   a. Draw the supply and demand curve in the US domestic rice market, and find the equilibrium price and quantity.
   b. In 2014, the price of the world rice market was $1.5. Assuming that there is no tariff, show the equilibrium of rice market in the US. Calculate the consumer surplus and producer surplus in the market. (
   c. In Jan. 2015, the US government got through a federal law issuing a tariff of rice of $0.5/pound. Now, draw the new supply and demand curve in the graph you have drawn above, and recalculate the consumer surplus (CS) and producer surplus (PS).
   d. Compare the sum of CS and PS from part d with that in part b, and explain why there is some difference between them, if any. It there are differences, list 2 reasons.

5. Suppose that we have a utility function of the form $U(x,y) = 8x^{1/2} + y^{1/2}$
   a. Find the Marshallian demand for x and y.
   b. Show that Marshallian demand of x is homogeneous of degree 0.
   c. Find the price elasticity of demand e_{x,p_x}; cross-price elasticity of demand e_{x,p_y} income elasticity of demand $e_{x,I}$ and show that $e_{x,p_x} + e_{x,p_y} + e_{x,I} = 0$.
   d. Let I=100, $p_x = p_y = 2$. What is the value of e_{x,p_x} in this case? Is the demand for x elastic with respect to its own price given these values of income and prices? What does this imply about the effect of a small proportional increase in p_x?

6. Suppose that NASA produces missions, q, by combining scientific labor l and capital equipment k according to the production function

$$q = \underline{lk/(l+k)}$$

Denote the price of labor by w and the price of capital by r and suppose that NASA is a price taker in these factor markets.

a. Show whether NASA has increasing, constant, or decreasing returns to scale.
b. Derive NASA's conditional factor demand functions $l_c(w,r,q)$ and $k_c(w,r,q)$.
c. Derive NASA's cost function $C(w,r,q)$.
d. What is NASA's mission supply function $Q^*(w,r,B)$, where B is its budget?
e. If w=1 and r=4 how many missions will NASA supply with a budget of B=36?
f. Suppose labor costs rise to w=9/4. If NASA is to continue to supply the same number of missions as in part D, how big will its budget need to be (in the long run)?

7. The Phillie Phanatic always eats his ballpark franks in a special way- 1 foot-long hot dog together with precisely 1 bun, 1 oz. of mustard, and 2 oz. of pickle relish. His utility is a function only of these four items and any extra amounts of a single item without the other constituents is worthless.

a. What form does PP's utility function for these four goods have?
b. How might we simplify matters by considering PP's utility to be a function of only one good? What is that good?
c. Suppose foot-long hot dogs cost $1, buns cost $.50, mustard costs $.05 per oz, and pickle relish costs $.1 5 per oz. How much does the good defined in part b cost?
d. If the price of foot-long hot dog increases by 50 percent (to $1.50) what is the percentage increase in the price of the good?
e. How would a 50% increase in the price of the bun affect the price of the good? Why is the answer different from part d?
f. If the government wanted to raise $1 in taxes by taxing the goods that PP buys, how should it spread this tax over the four goods so as to minimize the utility cost to PP?

8. Consider Springfield, where the Kwik E. Mart and Costingtons are the only major competitors in the toy market. It's approaching the Christmas season, and Santa's Little Helper dogs are the latest fad again. For the purposes of this exercise, assume that the firms, The Kwik E. Mart and Costingtons, have only two possible prices that they can charge for Santa's Little Helper dogs (Low or High) If both firms advertise low prices, they split the available customer demand and each earns $200,000 off of sales of these dolls. If both advertise high prices, they split the market with lower sales, but their markups end up being large enough to let them each earn $300,000. Finally, if they advertise different prices, then the one advertising a high price gets no customers and earns nothing while the one advertising a low price earns $400,000. That is the payoff matrix is the following: (in hundreds)

		Kwik E. Mart: High	Kwik E. Mart: Low
Costingtons	High	3000,3000	0,4000
	Low	4000,0	2000,2000

a. Does Kwik E. Mart have a dominant strategy? If so, name. Does Costingtons? If so, name.
b. What is the Nash equilibrium of this pricing game?

Now suppose that Apu, the owner of the Kwik E. Mart, is feeling particularly ruthless this Christmas season, and devises a "price matching" policy in an attempt to steal some of Costingtons' market share. The matching strategy entails advertising a high price but promising to match any lower advertised price by a competitor; the Kwik E. Mart then benefits from advertising high if Costingtons does so also, but does not suffer any harm from advertising a high price if the rival advertises a low price. In response, the owner of Costingtons decides to follow the same policy. Their payoff matrix is thus the following:

		Kwik E. Mart: High	Kwik E. Mart: Low
Costingtons	High	3000,3000	2000,2000
	Low	2000,2000	2000,2000

c. What is the new Nash equilibrium or equilibria?