國立臺灣大學 103 學年度碩士班招生考試試題

※所有題目請於「非選擇題作答區」依題號順序作答

Part I: 選擇題（共35分，一題5分。選擇題為單選題，不必提供理由及過程。）

1. Which of the following utility functions best represents the idea that two goods, x and y, are perfect substitutes?

   a. $U(x,y) = x^{1/3}y^{2/3}$.

   b. $U(x,y) = 2x + 3y$

   c. $U(x,y) = (x-1)^2 + (y-2)^2$.

   d. $U(x,y) = \min(x, 2y)$.

2. Which of the following statement is *false*?

   a. Indifference curves are convex (to the origin) if the utility function is quasi-concave.

   b. If an individual's utility function is quasi-concave, his or her MRS will always depend only on the ratio of x to y.

   c. If an individual's indifference curve map obeys the assumption of a diminishing MRS, then tangencies of indifference curves to the budget constraint are points of utility maximization.

   d. If the demand for a good exhibits Giffen's Paradox, then the good must be an inferior good.

3. Suppose a person's utility of wealth is given by

$$U(W) = \sqrt{W}$$

and his or her initial wealth is 900. What is the maximum amount he or she would pay for insurance against a 50 percent chance of losing 324?

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a. 738

b. 729

c. 171

d. 27

4. If a price-taking firm's production function is given by

$$q = \frac{1}{3}\sqrt{l}$$

its supply and profit function are given by

a. $q = \frac{p}{6w}$, $\pi = \frac{p^2}{18w}$

b. $q = \frac{p}{6w}$, $\pi = \frac{p^2}{36w}$

c. $q = \frac{p}{18w}$, $\pi = \frac{p^2}{18w}$

d. $q = \frac{p}{18w}$, $\pi = \frac{p^2}{36w}$

5. If the price of an input rises, a firm would decrease the use of that input for two reasons:

a. The input is now less productive, and the firm can replace this input with other relatively cheaper inputs.

b. The input is now less productive, and overall production costs are now higher, meaning a firm may choose to decrease production.

c. Overall production costs are now higher and the firm can replace this input with other relatively cheaper inputs.

d. Overall production costs are now higher and the firm will have less of other inputs to use with the one in question.

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6. Suppose we have fixed amount of labor (l) and capital (k) to produce two goods x and y. x is produced by using labor and capital in fixed proportions, so the production function for x is given by $x = \min(2l_x, k_x)$. The production function for y is given by $y = l_y + k_y$.

Total endowments of labor and capital in the economy are 100 and 150, respectively. We define that an input combination (l_x, k_x) for the production of x - hence $(l_y, k_y) = (100 - l_x, 150 - k_x)$ – is *efficient* if there is no other combination (l_x', k_x') at which the economy can produce more of, say, good x without reducing the production of good y, or vice versa, than at the former combination. Which input combination is efficient for this two-input two-good economy?

a. $(l_x, k_x) = (0,0)$

b. $(l_x, k_x) = (40,60)$

c. $(l_x, k_x) = (60,40)$

d. $(l_x, k_x) = (100,150)$

7. Consider again two-input two-good economy in the previous question 6. Suppose that good x is initially produced by employing 80 units of labor and 50 units of capital (hence y is produced by employing 20 units of labor and 100 units of capital). Suppose further that Bob will get good x produced and Ann will get good y produced, and that both of them want to use labor and capital inputs efficiently in producing the goods and to get at least as much of good x and y, respectively, as they get at the initial input combination $(l_x, k_x) = (80,50)$.

Which input combination is *not* acceptable by both of them?

a. $(l_x, k_x) = (30,60)$

b. $(l_x, k_x) = (35,70)$

c. $(l_x, k_x) = (40,80)$

d. $(l_x, k_x) = (45,90)$

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Part II: 問答題(請提供理由及過程)

1. Mr. A derives utility from martinis (m) in proportion to the number he drinks:

$$U(m) = m.$$

Mr. A is particular about his martinis, however: He only enjoys them made in the exact proportion of two parts gin (g) to one part vermouth (v). Hence we can rewrite Mr. A's utility function as

$$U(m) = U(g, v) = \min\left(\frac{g}{2}, v\right).$$

(a) [5 points] Calculate the demand functions for g and v (i.e., express the demand for g and v in terms of the prices p and q of gin and vermouth, respectively, and income I).

(b) [5 points] Obtain the expression for this individual's expenditure function, i.e., the minimum level of spending to achieve a fixed utility level V (the expenditure E must be expressed as a function of prices p, q and utility V).

(c) [5 points] Using the demand functions in part (a), calculate the own price elasticity and income elasticity of demand for gin (g).

2. [10 points] Panda Airline is the only one company operating the flight from Happy Island to Panda Island on Christmas. The airplane owned by Panda Airline has 75 seats of economy class and 25 seats of business class. The quality Q of business class is 1600, and the quality Q of economy class is 900. The company faces two types of consumers:

The utility function of a type I consumer over the quality of the flight (Q) and money left at hand (m) can be expressed as $2\sqrt{Q} + m$

The utility function of a type II consumer over the quality of the flight (Q) and money left at hand (m) can be expressed as $\sqrt{Q} + m$

All consumers have income 300.

Panda Airline knows that there are 30 type I consumers and 70 type II consumers in the market. However, Panda Airline **does not** know the specific type of any consumer. What is the best pricing strategy of the Panda Airline?

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3. Wendy and Sara share a room. Wendy and Sara have the same utility function over private good (c) and public good (G) U(c, G) = cG. The provision of public good is financed by the sum of private contributions from Wendy and Sara. In this case, each of them has to decide how much money she would like to spend on her own private good and how much money she would like to contribute to finance the public good. Wendy has income 3000 and Sara has income 1800. The prices of both the private good and the public good are the same and equal to 1.

(a) [5 points] In the Nash equilibrium, what is the amount of public good (G) Wendy and Sara will consume?

(b) [5 points] Suppose that Wendy and Sara's parents decide to contribute 100 units of public good (G). What is the amount of public good (G) Wendy and Sara will consume in the equilibrium?

(c) [5 points]How many units of public good the parents should contribute to make the allocation of public good and private good be efficient?

4. In a small island, there are two automobiles firms: one is owned by Michael, and the other by Sara. These two firms have the same total cost function: $TC(y) = 10y$

(a) [5 points] Suppose that the cars made by two firms are identical. The market demand for cars is $Q = 20 - \frac{1}{2}P$, where Q is the quantity and P is the price. Please find the prices under Cournot equilibrium and Bertrand equilibrium.

(b) [5points] Suppose now Sara changes the design of the car but does not change the cost function of it. Now consumers view cars from Sara's firm and Michael's firm as differentiated products. Let Ps be the price of a car from Sara's firm, and Pm be the price of a car from Michael's firm. The market demand for Sara's cars can be expressed as

$$Qs = 10 - \frac{2}{3}Ps + \frac{1}{3}Pm$$

The market demand for Michael's cars can be expressed as

$$Qm = 10 + \frac{1}{3}Ps - \frac{2}{3}Pm$$

Two firms compete as Bertrand price competitors. Please derive the price reaction function for each firm. What are the prices charged by each firm in the equilibrium?

(c) [5 points] Following (b), suppose that now two firms compete as Cournot competitors rather than Bertrand competitors. Please derive the quantity reaction function for each firm.

(d) [10 points] Following (c), suppose that Sara and Michael decide to get married and two firms are now merged as one firm, named Sara-Michael company. How much profit does the company make?