國立臺灣大學 107 學年度碩士班招生考試試題

※ 注意：請用 2B 鉛筆作答於答案卡，並先詳閱答案卡上之「畫記說明」。

複選題16小題, 每小題全對才得分; 各小題分數請見標示。

1. (7 pts.) Consider a pure exchange economy with two traders and two goods. Trader 1 has an endowment consisting of 2 units of good 1 and none of good 2; trader 2 has an endowment consisting of none of good 1 and 2 units of good 2.

   Suppose both good 1 and good 2 are available in nonnegative amounts. Trader 1's utility from consuming c_{11} units of good 1 and c_{12} units of good 2 is:

   $$\sqrt{c_{11}} + c_{12}.$$

   Trader 2's utility from consuming c_{21} units of good 1 and c_{22} units of good 2 is:

   $$\sqrt{c_{21}} + c_{22}.$$

   (A) There is a Pareto efficient allocation in which trader 1 consumes 1 unit of good 1.

   (B) There is a Pareto efficient allocation in which trader 2 consumes $\sqrt{2}$ units of good 2.

   (C) There are multiple competitive equilibria.

   (D) There is a unique competitive equilibrium.

   (E) There is a competitive equilibrium in which trader 1 consumes 2 units of good 1.

2. (8 pts.) Consider the same environment as in Problem 1, but now suppose both good 1 and good 2 are *available only in integer amounts.*

   (A) There is a Pareto efficient allocation in which trader 1 consumes 1 unit of good 1.

   (B) There is a Pareto efficient allocation in which trader 2 consumes 2 units of good 2.

   (C) There are multiple competitive equilibria.

   (D) There is a unique competitive equilibrium.

   (E) There is a competitive equilibrium in which trader 1 consumes 2 units of good 1.

3. (10 pts.) There are four producers, a, b, c, d, and four consumers, e, f, g, h, in the market of an indivisible good X. Each producer can produce one unit of X for sale, and their unit costs are shown in Table 1. Each consumer demands at most one unit of X and receives utility as shown in Table 1.

   Table 1:

	a	b	c	d
Cost from producing a unit of X	13	7	10	3

	e	f	g	h
Utility from consuming a unit of X	15	11	23	16

   Suppose the market price is p. Denote u_i as consumer i's utility from consumption and w_j as producer j's production cost. A consumer i can trade with a producer j if $u_i - p \geq 0$ and $p - w_j \geq 0$. The above terms $u_i - p$ and $p - w_j$ are respectively the consumer's and producer's surplus from the trade between i and j. The social surplus is defined as the sum of all consumers' and producers' surpluses.

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(A) When the market price is 9, the maximum social surplus can be attained.

(B) When the market price is 12, the maximum social surplus can be attained.

(C) When the maximum social surplus is attained, four units of X are produced.

(D) When the maximum social surplus is attained, three units of X are produced.

(E) None of the above.

4. (10 pts.) Dan consumes good X and good Y in the form of a basket, denoted by (x, y), which contains x units of good X and y units of good Y, where x and y are assumed to be nonnegative.

   Assume Dan's preference can be represented by a utility function $u(x, y)$, and let P_X be the price of X, P_Y be the price of Y, and I be Dan's income. Dan aims to maximize his utility subject to his budget constraint.

   (A) If $u(x, y)$ is strictly increasing and strictly quasi-concave, it must be the case that Dan will choose some basket (x^*, y^*) that satisfies $P_X x^* + P_Y y^* = I$.

   (B) If $u(x, y)$ is strictly increasing and strictly quasi-concave, it must be the case that Dan will choose some basket (x^*, y^*) that satisfies $x^* > 0, y^* > 0$.

   (C) If $u(x, y)$ is strictly increasing and quasi-linear, either X or Y is a Giffen good.

   (D) If $u(x, y)$ is strictly increasing and quasi-linear, both X and Y are not Giffen goods.

   (E) None of the above.

5. (5 pts.) [Continuation of question 4] Let's suppose Dan strictly prefers basket $(2, 2)$ to any other basket and assume $(P_X, P_Y) = (2, 2)$.

   (A) To obtain a utility level equal to or greater than $u(3, 1)$, I must be larger than or equal to 8.

   (B) To obtain a utility level equal to or greater than $u(2, 2)$, I must be larger than or equal to 8.

   (C) To obtain a utility level equal to or greater than $u(1, 1)$, I must be larger than or equal to 4.

   (D) To obtain a utility level equal to or greater than $u(2, 3)$, I must be larger than or equal to 10.

   (E) None of the above.

6. (10 pts.) Eileen has two firms, each of which produces one kind of commodity. Firm 1 produces commodity 1, and its production function is:

$$q_1(l_1, k_1) = 3l_1 + 4k_1,$$

   where l_1 is the labor input and k_1 is the capital input. Firm 2 produces commodity 2, and its production function is:

$$q_2(l_2, k_2) = l_2 + 2k_2,$$

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where l_2 and k_2 are the labor and capital inputs, respectively.

No matter what kinds of commodities are produced, labor can be hired at a wage rate of P_L and capital can be rented at a rental rate of P_K. Facing the market price of commodity 1, P_1, and the market price of commodity 2, P_2, Eileen aims to maximize her profit, and she has an initial investment of \$10 in hiring the above factors of production.

(A) There is a price vector (P_1, P_2, P_L, P_K) such that Eileen hires l_1, k_1, k_2 but not l_2.

(B) There is a price vector (P_1, P_2, P_L, P_K) such that Eileen hires l_1, l_2 but not k_1, k_2.

(C) If $(P_1, P_2, P_L, P_K) = (1, 1, 1, 2)$, Eileen does not hire k_1.

(D) If $(P_1, P_2, P_L, P_K) = (1, 3, 1, 2)$, Eileen does not hire k_1.

(E) None of the above.

Please answer problems 7 to 9 based on the following information. A monopolist faces two markets with demand functions given by:

$$\begin{aligned} q_1 &= 200 - 2p_1, \\ q_2 &= 400 - 2p_2, \end{aligned}$$

where q_i is the quantity demanded and p_i is the price in market i, $q_i, p_i \geq 0$, $i = 1, 2$. Let q be the total quantity that he produces, $q = q_1 + q_2$. His total cost is:

$$TC(q) = \frac{q^2}{4}.$$

The monopolist is required by law to set the same price, p, in two markets, and he wishes to maximize total profit from both markets.

7. (5 pts.) Which of the following is (are) true?

   (A) If he only sells in market 2, the price must be no lower than \$100.

   (B) If he only sells in market 2, the marginal revenue is: $MR_2 = 200 - 2q_2$.

   (C) If he only sells in market 2, the marginal revenue is: $MR_2 = 200 - q_2$.

   (D) If he sells in both markets, he faces a market demand curve D which is a straight line: $q = 600 - 4p$, for $p \leq 100$.

   (E) If he sells in both markets, corresponding to the demand curve D, the marginal revenue function $MR = 150 - q$ when $p < 100$.

8. (5 pts.) What is the monopolist's optimal decision?

   (A) The monopolist sells in market 1 only.

   (B) The monopolist sells in market 2 only.

   (C) The monopolist sells 25 units in market 1 and 125 units in market 2.

   (D) The monopolist sells 50 units in market 1 and 100 units in market 2.

   (E) None of the above.

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9. (5 pts.) The law changes and the monopolist could now charge different prices at these two markets and everything else remains the same. What is the monopolist's optimal decision?

   (A) The monopolist sells in market 1 only.

   (B) The monopolist sells in market 2 only.

   (C) The monopolist sells 25 units in market 1 and 125 units in market 2.

   (D) The monopolist sells 50 units in market 1 and 100 units in market 2.

   (E) None of the above.

   Please answer problems 10 and 11 based on the following information. A and B live in a small island. They produce and consume two goods X and Y. Let (X_i, Y_i) denote i's production bundle, $i = A, B$. Their production possibility frontiers are:

$$X_A^2 + Y_A^2 = 50, \quad X_B^2 + Y_B^2 = 200.$$

   X is a public good and Y is a private good. So each person's consumption of Y depends entirely on his own production of Y, while the consumption of X depends on the total production of X. Their utility functions are:

$$U_A = \bar{X} Y_A, \quad U_B = \bar{X}^2 Y_B^2,$$

   where $\bar{X} = X_A + X_B$. Let $MRS_i = |dY_i/d\bar{X}|$ be i's marginal rate of substitution, and let $MRT_i = |dY_i/dX_i|$ be i's marginal rate of transformation, $i = A, B$.

10. (5 pts.) Which of the following is (are) true?

    (A) If A consumes 3 units of X and 6 units of Y, $MRS_A = 2$.

    (B) If A consumes 3 units of X and 6 units of Y, $MRS_A = 1/2$.

    (C) If A produces 1 unit of X and 7 units of Y, $MRT_A = 7$.

    (D) If A produces 1 unit of X and 7 units of Y, $MRT_A = 1/7$.

    (E) None of the above.

11. (5 pts.) In a Pareto efficient arrangement, which of the following is (are) true?

    (A) $X_B = 2X_A$

    (B) $X_B = 4X_A$

    (C) $X_A + X_B = 10$

    (D) $X_A + X_B = 20$

    (E) None of the above.

    Please answer problems 12 and 13 based on the following payoff matrix which depicts a game played between A and B. A (the row player) has 3 pure strategies: r1, r2 and r3 and B (the column player) has 3 pure strategies: c1, c2 and c3. The first element in the payoff vector is A's payoff and the second element in the payoff vector is B's payoff.

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	c1	c2	c3
r1	1,2	10,2	3,3
r2	1,4	9,6	1,5
r3	2,2	100,0	2,1

12. (5 pts.) Which of the following is (are) true for a Nash equilibrium of this game.

    (A) B does not play c1.

    (B) B does not play c2.

    (C) B does not play c3.

    (D) (r1, c3) is a Nash equilibrium.

    (E) (r2, c2) is a Nash equilibrium.

13. (5 pts.) Which of the following is (are) true for the Nash equilibrium in mixed strategies?

    (A) A plays r1 with probability 1/2.

    (B) A plays r1 with probability 1/3.

    (C) A plays r1 with probability 1/4.

    (D) B plays c1 with probability 1/2.

    (E) B plays c1 with probability 1/3.

14. (5 pts.) A factory creates smoke which makes it harder for its neighboring dry cleaner to clean clothes and increases the cleaner's cost by $500 per year. The factory owner can install an air-cleaning system that costs $600 per year, and the dry cleaner can install a ventilation system that costs $300 per year. Either system will eliminate the smoke damage at the dry cleaner completely. These two business enterprises earned several million dollars a year. Suppose transaction costs are zero and the factory owner is liable for the dry cleaner's damages. According to the Coase Theorem, which of the following will take place?

    (A) The air-cleaning system will be installed at the factory.

    (B) The ventilation system will be installed at the dry cleaner's place.

    (C) Nobody will install a system to prevent the smoke damage.

    (D) The factory owner will pay the dry cleaner $500 per year for the damage.

    (E) None of the above.

15. (5 pts.) Consider a Stackelberg model for 2 firms. Firm 1 is the leader and decides its quantity q_1 first. Observing firm 1's decision, firm 2 will then decide its quantity q_2. The market price p is:

$$p = 100 - (q_1 + q_2).$$

    There is no production or marketing cost, so each firm wishes to maximize its own revenue. How many units will each firm produce? What is the market price?

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(A) $q_1 = 80$

(B) $q_2 = 40$

(C) $p = 50$

(D) $p = 25$

(E) None of the above.

16. (5 pts.) Mr. X has \$120. If he falls ill, he needs to spend \$60 on medical treatment, and the probability that he will fall ill is 1/3. Let w_1 denote his wealth in case he does not fall ill. Let w_2 denote his wealth when he falls ill. His utility function is:

$$u = w_1^2 w_2.$$

There is a medical insurance that charges a fee of \$20 and will cover the medical bill of \$60 when Mr. X falls ill.

(A) Mr. X is risk loving.

(B) Mr. X is risk neutral.

(C) Mr. X is risk averse.

(D) Mr. X will purchase this insurance.

(E) Mr. X will not purchase this insurance.

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