

國立高雄大學九十七學年度研究所碩士班招生考試試題

科目：個體經濟學
考試時間：100 分鐘

系所：
應用經濟學系碩士班
本科原始成績：100 分

是否使用計算機：否

一、名詞解釋 (20%)

- (a) Income effect / Substitution effect 所得效果/替代效果
- (b) Utility 效用
- (c) Marginal rate of technical substitution (MRTS) 邊際技術替代率
- (d) Consumer surplus 消費者剩餘

二、申論 (15%)

Delineate the relation among the competitive equilibrium, Pareto efficiency, and (social) welfare maxima. (15%)

三、Consider a Cournot duopoly where demand is $P = a - Q$, $Q = q_1 + q_2$, but the firms have asymmetric marginal costs: c_1 for firm 1 and c_2 for firm 2.

- (a) Find the Cournot-Nash equilibrium when $2c_i < a + c_j$ for each firm, $i, j = 1, 2$ and $i \neq j$. (5%)
- (b) Find the Cournot-Nash equilibrium when $c_1 < c_2 < a$ but $2c_2 > a + c_1$. Show the graph of the reaction function for this case. (5%)

四、Let the consumer utility function be given by $U(x_1, x_2) = (x_1 - c_1)^\alpha (x_2 - c_2)^{1-\alpha}$, where

$c_1, c_2 > 0$ and $0 < \alpha < 1$. Let the prices of the two goods be p_1 and p_2 and the consumer income be M . Solve for the optimal quantity of x_1 and x_2 . (10%)

五、A firm uses capital K , labor L and land T to produce Q units of a commodity, where $Q = K^{2/3} + L^{1/2} + T^{1/2}$. The price of output is p , the price of capital r , the price of labor w and the price of land q .

- (a) Find the profit maximizing combination of inputs used by the firm. Check the second order conditions. (5%)
- (b) If Q^* denotes the optimal value of output produced by the firm and K^* the optimal amount of capital used, then show that $\partial Q^* / \partial r = -\partial K^* / \partial p$. (5%)

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六、Two persons, A and B, act competitively in a pure exchange economy where there are only two goods, F and M. Their utility functions are given by $U_A = F^{1/2}M^{1/2}$ and $U_B = F + 2M$. Let F be the numeraire good and the price of M be p.

(a) If A is endowed with 100 F and 50 M, and B is endowed with 20 F and 40 M, compute the equilibrium. In your answer, you should include the equilibrium price and quantities of F and M bought and sold by each. (8%)

(b) If there are 120 F and 90 M in the economy to be distributed between them, compute the set of Pareto efficient allocation. Also draw an Edgeworth box to illustrate your solution. (7%)

七、(In this problem, you are required to answer by well-graphed diagrams with description and/or explanation. So be as specific as necessary to make your answer clear and complete.)

Suppose that the life of Lily can be divided into two periods ? working and retirement and that a sensible decision has to be made on her consumption over these two periods ? c_1 and c_2 , both of which are assumed to be normal. She is pretty sure that she is able to make an income of m_1 while working, but she probably needs to save a part of it because she will not have any income in her retirement. Denote the interest rate between two periods by r and assume that her preference is regular.

(a) Show her optimal choice (c_1 , c_2 and the amount saved). Show how her choice changes in response to a change in r . (6%)

(b) She is glad to hear that the government is going to implement the National Annuity Program (國民年金制). Assume that under the new program, she is able to receive m_2 in her retirement without paying any cost (such as premium). Show her optimal choice now and determine whether she would save more or less compared to part a. (8%)

(c) Following part b., will she be better off or worse off if r goes down? (6%)

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Note: You will not get the answers for some problems because statistical tables are not provided. Please lay out the steps as clearly as possible.

1. United Airlines has a regular flight from L.A. to Boston. 100 seats are reserved for passengers from two small towns, Boon and Westbend. The number of passengers from Boon is normally distributed with a mean 35 and a variance 144. The number of passengers from Westbend is also normally distributed with a mean 40 and a variance 100. The number of passengers from these two towns has a correlation of 0.6. What is the probability that all 100 seats on the L.A. flight will be filled? (10 pts)
2. Let X_1, X_2, \dots, X_n be a random sample from a distribution with p.d.f.
 $f(x; \theta) = \theta x^{\theta-1}, 0 < x < 1$ where $\theta > 0$. Is the MLE of θ also an sufficient statistic for θ . (12 pts)
3. Let the independent random variables X_1, X_2 be $N(0,1)$ and $\chi^2(r)$, respectively. Let
 $Y_1 = X_1 / \sqrt{\frac{X_2}{r}}$ and $Y_2 = X_2$
 - (a) Find the joint p.d.f. of Y_1 and Y_2 . (8 pts)
 - (b) Determine the marginal p.d.f. of Y_1 . (8 pts)
4. Bags of a chemical produced by a company have impurity weights that can be represent by a normal distribution with mean 12.2 grams and standard deviation 2.8 grams. A random sample of 400 of these bags is taken. What is the probability that at least 100 of them contain less than 10 grams of impurities? (12 pts)
5. Suppose that in the population Y and X exist the following causal relationship,
 $Y_i = \beta_0 + \beta_1 X_i + \varepsilon_i, i=1 \dots n$
,where Y_i and X_i are variables randomly drawn from a population; ε_i is a error term..
 - (a) Please find the OLS estimators of β_0 and β_1 , which are denoted as $\hat{\beta}_0$ and $\hat{\beta}_1$, respectively. (10 pts)

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- (b) What is the necessary condition needed to ensure that $\hat{\beta}_1$ is unbiased? Why? (5 pts)
- (c) If the condition in part (b) is held and ε_i is normal distributed with mean 0 and variance σ^2 , find the variance of $\hat{\beta}_1$. (5 pts)
- (d) Suppose that σ^2 is unknown. Please find the 95% confidence interval of β_1 ? (10 pts)
6. A researcher is interested in the effect of class size on the test score. He or she collected a data set, ran a regression and found the following results,

$$\begin{aligned} \hat{sat} = & 1028.10 + 19.30 \text{ hisze} - 2.19 \text{ hsize}^2 - 45.09 \text{ female} - 169.81 \text{ black} \\ & (6.29) \quad (3.83) \quad (0.53) \quad (4.29) \quad (12.71) \\ & n = 4137, R^2 = 0.0858 \end{aligned}$$

The numbers in the parenthesis represent the standard errors. The variable *sat* is the combined SAT score, *hsize* is the size of the student high school graduating class, in hundreds, *female* is a gender dummy variable equal one for females and zero otherwise, and *black* is a race dummy variable equal one for blacks and zero otherwise.

- (a) What is the marginal effect of an increase of one hundred students in the test score? What is the optimal size of the class size? (6 pts)
- (b) What is the estimated difference in SAT score between nonblack males and black males? Test the null hypothesis that there is no difference between their scores, against the alternative that there is a difference at 5% significance level. (6 pts)
- (Note: $Z_{0.025}=1.96$, $Z_{0.05}=1.645$, $Z_{0.1}=1.28$, $t_{\infty,0.025}=1.96$, $t_{\infty,0.05}=1.645$, $t_{\infty,0.1}=1.28$)
- (c) If you want to know whether there is a difference in SAT score between nonblack females and black females, how would you respecify the model to test whether the difference is statistically significant? (8 pts)

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1. The Mundell-Fleming Model (26%)

The central bank of a small open economy with perfect capital mobility wants to carry out an expansionary monetary policy to stimulate the economy. Answer the following questions.

- Suppose the economy is under a floating-exchange-rate regime. Use a proper diagram to analyze the impact of this monetary policy on aggregate income (Y), the exchange rate (e), and the trade balance (NX). (8%) (Here, the exchange rate e is defined as the amount of foreign currency that one unit of domestic currency can buy.)
- Ignore (a). Suppose now the economy is under a fixed-exchange-rate regime. Use a proper diagram to analyze the impact of this policy on aggregate income (Y), the exchange rate (e), and the trade balance (NX). (8%)
- What is the possible trinity? Use the results you obtain from (a) and (b) to illustrate your answer. (10%)

2. IS-LM and AS-AD (24%)

Consider an economy that is hit by two shocks: a collapse in the subprime mortgage market and a dramatic increase in oil price. Answer the following questions.

- Use the IS-LM diagram to show the impact of the collapse in mortgage market on aggregate demand (AD) curve. (6%)
- Follow (a). Use the AS-AD diagram to analyze the impact of these two shocks on aggregate income and the price level in the short run. (6%)
- If the policymakers of the economy want to counteract the impact of the shocks on aggregate income (in other words, they want to keep the level of aggregate income unchanged), what kinds of macroeconomic policies (monetary and/or fiscal policies) should they adopt? Briefly explain your answer. (6%)
- If the policymakers of the economy want to counteract the impact of the shocks on the price level, what kinds of macroeconomic policies (monetary and/or fiscal policies) should they adopt? Briefly explain your answer. (6%)

3. Short Essay Questions (24%)

- Use the policy implications of the Phillips Curve to explain the Lucas Critique? (12%)
- John Keynes and Irving Fisher have different viewpoints about how people make intertemporal choices on consumption. Whose theory is in better accord with the idea of Ricardian Equivalence? Explain your answer. (12%)

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4. The Solow Growth Model (26%)

Consider an economy that can be well described by the Solow growth model with population growth but not technological progress. Suppose the economy has the following production function: $Y = K^{0.5} L^{0.5}$, where Y is the output level, K is the level of capital stock, and L is the number of workers. The production function can also be written as the following per-worker form: $y = k^{0.5}$, where $k \equiv K/L$ and $y \equiv Y/L$. Assume the depreciation rate is $\delta = 0.1$ and the population growth rate is $n = 0.05$. The saving rate of the economy is $s = 0.6$. Answer the following questions.

- At a certain moment, we observe that $K = 1000$ and $L = 40$ in the economy. Is the economy in the steady state at that moment? Why or why not? What is the wage rate (real wage per worker) in the economy at the moment? (8%)
- Ignore (a). Suppose the economy is currently in the steady state (associated with $s = 0.6$). If people in the economy want to increase the steady-state level of consumption per worker (in other words, they want to move to a steady state with a higher level of consumption per worker), should they increase or decrease their saving rate? Briefly explain your answer. (6%)
- Ignore (a) and (b). Suppose, again, the economy is currently in the steady state. If people in this economy want to increase the economic growth rate in the long run (in other words, they want to move to a steady state with a higher rate of economic growth), should they increase or decrease their saving rate? Briefly explain your answer. (Economic growth rate is defined here as the growth rate of output per worker.) (6%)
- Would your answer in (c) be different if we add technological progress to the Solow model? Explain your answer. (6%)