國立中山大學102學年度碩士暨碩士專班招生考試試題

科目名稱：個體經濟學【經濟所碩士班】　　題號：403001

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1. (10pts) Suppose that three investments have the same three payoffs, but the probability associated with each payoff differs, as illustrated in the table below:

Payoff	Probability (Investment A)	Probability (Investment B)	Probability (Investment C)
$500	0.10	0.30	0.40
$250	0.80	0.30	0.10
$100	0.10	0.40	0.50

   a. Find the expected return of each investment. (3pts)
   b. Eddie has the utility function $U=5Y$, where Y denotes the payoff. Which investment will he choose? (1pts)
   c. Rebecca has the utility function $U=\sqrt{5Y}$. Which investment will she choose? (3pts)
   d. John has the utility function $U=5Y^2$. Which investment will he choose? (3pts)

2. (5pts) Which of the following utility functions are consistent with convex indifference curves?
   a. $U(X,Y) = 2X + 5Y$
   b. $U(X,Y) = \sqrt{XY}$
   c. $U(X,Y) = Min(X,Y)$
   d. $U(X,Y) = \log(X) + \log(Y)$

3. (15pts) Consider a perfectly competitive market of product x with 10,000 identical firms. Cost structure of each firm is $TC = q^2/8 - 9q/4 + 10$. There are 10,000 consumers with the same utility function $u(q,r) = \log(q \cdot r)$, where q is the quantity of product x and r is the quantity of other products. Each consumer has an income of 5 and faces the price $p_q = 0.25$ and $p_r = 1$.
   a. Find the market's supply function of x; (8pts)
   b. Find the market's demand function for x. (7pts)

4. (10pts) A firm's production function is $y = \min\{ax_1, bx_2\}$, where y is output, and x_1 and x_2 are factor inputs with prices w_1 and w_1 respectively. Find the firm's cost function.

5. (10pts) Answer the following questions:
   a. What is the meaning of the second theorem of welfare economics? (5pts)
   b. Discuss its implications. (5pts)

6. (15分) 兩位候選人在競選中針對某一議題進行辯論，誰能在此議題中得到較多選民的認同則可於選戰中勝出。假設選民的意見於[0,1]之空間中呈現連續均勻分配，且選民將投票給意見與自己較接近之候選人，試問兩候選人應該如何在[0,1]中選擇其在辯論中的意見立場？（答案5分；推導10分）

7. (10分) 候選人在選舉中勝出成為執政者後經常必須面對公共財的提供問題。假設在一僅有兩人的經濟體中公共財的生產函數為 $f(x_1,x_2)=4x_1x_2$，其中x_i是i在生產公共財上所下的功夫，其成本對i=1,2而言為$c(x_i)=x_i$，如果x_i的最大值為1，試問在沒有政府干預下，均衡公共財產量為何？（4分）兩人投入公共財生產的努力程度分別為何？（6分）

8. (10分) 承上題，若政府進入統籌公共財的生產，其目標為極大化「公共財產量減去其生產成本」，若假設此二人的投入生產公共財的努力程度是可被政府掌握的，試問最適公共財產量為何？（4分）個人被要求的投入努力程度為何？（6分）

9. (15分) 公共財的提供問題出在「搭便車」的行為，我們試著以簡單的單期賽局方式說明。在

國立中山大學102學年度碩士暨碩士專班招生考試試題

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一僅有兩消費者的經濟體中，假設享受公共財所帶來的好處為10，而購買此公共財的成本為15，將產生下面的單期賽局：

		消費者 乙	
		購買	不購買
消費者 甲	購買	-5, -5	-5, 10
	不購買	10, -5	0, 0

請問納許均衡（Nash equilibrium）為那個策略組合？（7分）此賽局中有嚴格優勢策略（strictly dominant strategy）嗎？如果有，請列出。（8分）

國立中山大學102學年度碩士暨碩士專班招生考試試題

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請依序橫寫，在答案卷作答. 5題共100分.

1. (20%)
The amount of gasolines sold daily at a service station is uniformly distributed with a minimum of 2,000 gallons and a maximum of 5,000 gallons.
(a). Find the probability that daily sales will fall between 2,500 and 3,000 gallons.
(b). What is the probability that the service station will sell at least 4,000 gallons ?

2. (20%)
Given the independent random variables X_1, X_2 and X_3 with the probability density

$$f_1(x_1) = \begin{cases} e^{-x_1} & for\ x_1 > 0 \\ 0 & elsewhere \end{cases},$$

$$f_2(x_2) = \begin{cases} 2e^{-2x_2} & for\ x_2 > 0 \\ 0 & elsewhere \end{cases},$$

$$f_3(x_3) = \begin{cases} 3e^{-3x_3} & for\ x_3 > 0 \\ 0 & elsewhere \end{cases}.$$

Find the probability $P(X_1 + X_2 \leq 1, X_3 > 1)$.

3. (20%)
Given a random sample of size N from a population having the density

$$f(x;\theta) = \begin{cases} e^{-(x-\theta)} & for\ x > \theta \\ 0 & elsewhere \end{cases}.$$

Find the maximum likelihood estimator for the parameter θ.

4. (20%)
Suppose the weight X_1, height X_2, and age X_3 of a randomly chosen male have a multivariate normal distribution with means 170, 68, and 40 and variances 400, 16, and 256, and with covariance $Cov(X_1, X_2) = 64$, $Cov(X_1, X_3) = 128$, and $Cov(X_2, X_3) = 0$. Find the conditional expectation of X_1 given $X_2 = 72$ and $X_3 = 24$, i.e., $E(X_1 \mid X_2 = 72, X_3 = 24) = ?$

5. (20%)
A paint manufacturer wants to determine the average drying time of a new interior wall paint. If for 12 test areas of equal size he obtained an average drying time of 66.3 minutes and a standard deviation of 8.4 minutes. Construct a 95% confidence interval for the true mean μ.
(Note that if Z is a standard normal, $Prob(Z \leq z) = 0.95$ when $z = 1.64$, and $Prob(Z \leq z) = 0.975$ when $z = 1.96$. If U has a student t distribution with k degree of freedom, then $Prob(U \leq t) = 0.975$ when $t = 2.201$ and $k = 11$. $Prob(U \leq t) = 0.975$ when $t = 2.179$ and $k = 12$.)

國立中山大學102學年度碩士暨碩士專班招生考試試題

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Please answer the following questions on answer sheets

A. Consider the following model (30%)

Lucas supply curve:

$$\Delta y_t = a \times (p_t - p_t^e) + \varepsilon_{1,t} \quad (1)$$

Aggregate demand curve:

$$\Delta y_t = b \times (m_t - p_t) + \varepsilon_{2,t} \quad (2)$$

Monetary rule:

$$m_t = \bar{m} + \varepsilon_{m,t} \quad (3)$$

where, y, p and m are output, price level and money supply. $p_t^e = E(p_t \mid I_{t-1})$ in which $E(.|.)$ is the conditional expectation operator and I_{t-1} is the information set at time t-1. $\Delta y_t = y_t - y_{t-1}$. a and b are parameters, and $\bar{m}$ is the mean of m_t. $\varepsilon_{1,t}$, $\varepsilon_{2,t}$ and $\varepsilon_{m,t}$ are disturbances which are identically and independently distributed.

(1) Please derive the effect of an expected monetary increase on price level and output. (10%).
(2) Please derive the effect of an unexpected monetary increase on price level and output. (10%).
(3) What is the policy ineffectiveness argument? Does the above model support the policy ineffectiveness argument? (10%).

B. Solow Growth model: (40%)

$Y=C+I$,

$Y=F(L, K)$, $F_L > 0 > F_{LL}$, $F_K > 0 > F_{KK}$, $\lim_{K\to\infty} F_K = \lim_{L\to\infty} F_L = 0$, $\lim_{L\to\infty} F_L = \lim_{K\to\infty} F_K = 0$,

F is a constant return to scale production function.

$\dot{K} = I - \delta K$,

$S=aY$,

$\dot{L} = nL$,

where, F_j, j=K,L is the partial derivative of F with respect to j and F_{jj} is the partial derivative of F_j with respect to j. Y, K, L, I and S are output, capital, labor, investment and saving, respectively. F(.), a, n and δ are the production function, the saving rate, the labor growth rate and the depreciation rate, respectively.

(1) Please derive the condition for determining the steady state capital stock (10%)
(2) Given that the production function is Cob-Douglas ($AK^{\alpha}L^{1-\alpha}$), please solve for the steady state capital stock (5%).
(3) Please derive the condition for determining the golden rule capital stock (10%)
(4) Given that the production function is Cob-Douglas ($AK^{\alpha}L^{1-\alpha}$), please solve for the golden rule capita stock (5%)
(5) What is the dynamic inefficiency? Does the Solow model appear dynamic inefficiency? Why? (10%)

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C. Please explain the following (30%)

1. permanent income hypothesis (6%)
2. Lucas critique (6%)
3. long-run Phillips curve (6%)
4. uncovered interest parity (6%)
5. open market operation (6%)