

# AUSTRALIAN NATIONAL UNIVERSITY

*First Semester Examination - 2006*

## PRINCIPLES OF PUBLIC ECONOMICS (ECON8034)

*Study Period : 15 minutes*

*Time Allowed : 3 hours*

*Permitted Material: Calculators – non programmable*

### ANSWER THE FOLLOWING 6 QUESTIONS EACH QUESTION IS WORTH 10 FOR A TOTAL OF 60

#### QUESTION 1

A consumer views two goods as perfect substitutes.

- (a) Sketch the indifference curves of the consumer. (2 points)
- (b) Provide the definition of Pareto efficiency. If an economy is composed of two consumers with these preferences, demonstrate that any allocation is Pareto efficient. (4 points)
- (c) If an economy has one consumer who views its two goods as perfect substitutes and a second that considers each unit of good 1 to be worth 2 units of good 2, find the Pareto efficient allocations. (4 points)

#### QUESTION 2

Consider two individuals ( $A$  and  $B$ ) and two goods ( $X$ , private good, and  $G$ , public good). Individuals' preferences are represented by utility functions:

$$U^A = U(X^A, G), U^B = U(X^B, G).$$

- (a) Derive the condition for the efficient supply of public goods by solving the following maximization problem:

$$\text{Max}_{X^A, X^B, G} W(U^A, U^B) \text{ s.t. } X^A + X^B + c(G) = R,$$

where  $c(G)$  represents the cost of producing  $G$  measured in units of good  $X$  (which is assumed to be the numeraire), and  $R$  is the amount of resources available. (7 points)

- (b) Explain in detail the intuition behind. (3 points)

#### QUESTION 3

- (a) If there is uncertainty over the position of the marginal cost curve, direct controls might be superior to prices. Show graphically a case in which direct controls are superior to prices. (Hint: In an (output, price)-space represent actual marginal cost, which could be either high or low, together with the average position of the marginal cost curve and the marginal benefit) (6 points)
- (b) Why does uncertainty about the position of the marginal benefit curve have no implications for the prices versus quantities debate? (4 points)

#### **QUESTION 4**

Consider an economy with two goods,  $x_1$  and  $x_2$ , with prices  $q_1$  and  $q_2$ , respectively, and an individual with income  $y$  and preferences represented by the following utility function:  $U(x_1, x_2) = x_1 + \ln x_2$ . Assume that initially no taxes or subsidies are imposed and producer prices for both goods are unity (i.e.,  $q_1 = q_2 = 1$ ). Suppose that a tax of a dollar is imposed on good 2 which raises its price to  $q_2' = 2$ . What is the compensating variation and the associated excess burden measure,  $EB_{CV}$ , for this change? What is the equivalent variation and the associated excess burden measure,  $EB_{EV}$ ? In both cases provide a graphical representation. (10 points)

#### **QUESTION 5**

Consider a group of individuals whose income is only from labor: each person is endowed with a specific level of ability which is reflected in his or her market wage  $w$ , and chooses  $l$ , the amount of time he or she works ( $0 \leq l \leq 1$ ). The minimum value of  $w$  in the population is  $\underline{w}$  and the mean value is  $\gamma \underline{w}$ , where  $\gamma > 1$ . The government imposes a tax-transfer scheme such that a person with pre-tax income  $y (=wl)$  has after-tax cash income of  $c = (1-t)y + G$ .

- (a) Interpret the parameters  $t$  and  $G$ . (2 points)
- (b) Assume that everyone has the utility function  $U = \alpha \log c + (1-\alpha) \log (1-l)$ . Find the optimal labor supply by a person with wage  $w$ . (4 points)
- (c) If the distribution has strictly positive density at all non-negative  $w$  and the government has a Rawlsian objective, then

$$\frac{t^2}{(1-t)^2} = \frac{\left(1 + \frac{R_0}{G}\right)}{(1-\alpha)} \frac{1}{[1 - F(w_0)]},$$

where  $R_0$  is the revenue requirement,  $F(\cdot)$  is the distribution function of ability (wages) and  $w_0$  is the threshold level of ability (wage) above which individuals supply positive amounts of labor. Interpret this result. (Note: you do not need to derive the result but explain the intuition) (4 points)

#### **QUESTION 6**

- (a) In the context of the Mirrlees economy, explain both in words and graphically why the first-best solution cannot be attained in the absence of complete information about individual's abilities. (5 points)
- (b) Discuss the role of the self-selection constraints (SSCs) in the second-best problem and provide a graphical representation of the optimal non-linear income tax for the 2-ability case. (5 points)