ECONOMICS

Master Program Entrance Exam. of Dept. of Transportation and Communication Management, National Cheng Kung University

April 2000

Question 1. (25 points) Suppose that Jonathan drinks coffee and tea. Suppose further that he is different between three cups of coffee and one cup of tea.

(a) (8%) What does Jonathan's preference toward coffee and tea represent? Denote by x one cup of coffee and by y one cup of tea. Write down his utility function.

(b) (2%) Graph two indifference curves with utility levels of 60 and 120.

(c) (10%) Suppose that the price of x is 10, the price of y is 10 and the consumer's income is 100. What are the optimal consumption bundle, denoted by (x_1^*, y_1^*) and the consumer's maximum utility level achieved?

(d) (5%) Find the optimal consumption bundle (x_2^*, y_2^*) when the price of x drops to 2.

Question 2. (25 points) A firm produces one product using two inputs, capital and labor. Suppose that its technology can be described as follows

$$q = f(L, K) = L^{\frac{1}{2}} K^{\frac{1}{2}}$$

where q is the output level of production, and L and K represent the labor and capital usage, respectively. The wage rate w is \$40 per hour and the capital rental rate r is \$10 per hour.

(a) (4%) Determine the return to scale of the firm's technology and explain why it is.

(b) (3%) At the cost-minimizing optimal choice of the firm, it should select the input (L, K) such that

$$MRTS = \frac{w}{r}.$$

What is the economic meaning of this equation?

(c) (8%) Derive the firm's cost-minimizing input functions.

(d) (5%) Derive the firm's total cost function. Determined whether it is of the long run or of the short run and explain why it is.

(e) (5%) Assume that the firm needs to produce 200 unit of the output. What is the firm's optimal input bundle? What is the minimum cost this firm incurred?

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Question 3. (25 points) Consider a very competitive market. There are 100 producers in this market and each firm has a total cost of $TC(q) = 10q^2$, where q is the firm's output level. Suppose that the market demand is $Q = 1000 - 3p$, where Q and p are the market output and price.
(a) (5%) Derive the market supply function.
(b) (5%) What are the competitive equilibrium market output Q^c and price p^c?
(c) (15%) Suppose that the government imposes a per-unit tax of \$30 on the product transacted. Derive the equilibrium market output Q^t, the price paid by consumers p^d, and the price received by producers p^s, after this tax imposed. Calculate Dead Weight Loss (DWL^t) caused by this tax.

Question 4. (25 points) The spreadsheet lists the components of aggregate planned expenditure in Spice Bay. The numbers are in billions of cloves, the currency of the Bay.

	A	B	C	D	E	F	G
1		Y	C	I	G	X	M
2	a	100	110	50	60	60	15
3	b	200	170	50	60	60	30
4	c	300	230	50	60	60	45
5	d	400	290	50	60	60	60
6	e	500	350	50	60	60	75
7	f	600	410	50	60	60	90

In Spice Bay, what is:
(a) (5%) Autonomous expenditure?
(b) (5%) The marginal propensity to consume?
(c) (5%) Aggregate planned expenditure when real GDP is 200 billion cloves?
(d) (3%) Happening to inventories if real GDP is 200 billion cloves?
(e) (2%) Happening to inventories if real GDP is 500 billion cloves?
(f) (5%) The multiplier in Spice Bay?