NATIONAL UNIVERSITY OF SINGAPORE

**EC3101 MICROECONOMIC ANALYSIS II**

(SEMESTER I : AY2009-2010)

Time Allowed : 2 Hours

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**INSTRUCTIONS TO CANDIDATES**

1. Do NOT start reading the questions until you are told to do so.

2. This is a CLOSED BOOK exam.

3. There are altogether 5 pages in your question booklet, including this front page. Make sure you have all 5 pages before beginning.

4. This exam consists of 5 questions; all of them are compulsory questions, worth a total of 100 points.

5. Write your answers in the answer booklets provided only.

6. Write your matriculation number on the answer booklet provided. Do NOT write your name. If you used more than one answer booklet, write your matriculation number on all the booklets used, and number them.

7. Write down the order in which the questions were attempted on the front page of your first answer booklet.

**Question 1** (15 points)

Consider a consumer with utility function $U = x_1 + \alpha x_2$, $\alpha > 1$, where $x_1$ and $x_2$ denote the quantities of consumption goods 1 and 2 respectively. Let $p_1$ and $p_2$ be the prices of consumption goods 1 and 2 respectively. This consumer has income $Y$. Explain in detail how the consumer will decide how much of these two consumption goods to purchase. Remember to cover all cases.

**Question 2** (20 points)

Consider a pure exchange economy with two goods, $x$ and $y$, and two agents, Mr A and Mr B. Mr $j$'s utility function is $u(x_j, y_j) = \ln(x_j) + \ln(y_j)$, and Mr $j$'s endowment of good $i$ is $\omega_j^i > 0$, $j \in \{A, B\}$, $i \in \{x, y\}$.

($i$) Set up Mr $j$'s optimization problem as a Lagrangian and derive the First Order Conditions. (8 points)

($ii$) Now suppose that

$$\begin{aligned} \omega_A^x &= 2, \omega_A^y = 8, \text{ and} \\ \omega_B^x &= 8, \omega_B^y = 2. \end{aligned}$$

Solve for the competitive equilibrium. (12 points)

**Question 3** (15 points)

Consider an economy with 3 agents, $A$, $B$, and $C$. There is a decision to be made on whether to provide a public good which costs 100. It has been decided that the Groves-Clark tax scheme would be used. Denote each agent $i$'s valuation of the public good as $v_i$, and denote the assigned cost each agent faces in paying for the public good as $k_i$, $i \in \{A, B, C\}$.

($i$) Let the following table represent the agents' valuations of the public good.

$$\begin{aligned} v_A &= 40 \\ v_B &= 45 \\ v_C &= 20 \end{aligned}$$

Let the cost of paying for the public good if it is provided be assigned in the following way.

$$\begin{aligned} k_A &= 30 \\ k_B &= 30 \\ k_C &= 40 \end{aligned}$$

If each agent truthfully reports his valuations, calculate each agent's net payoff. (7.5 points)

($ii$) Now let the following table represent the agents' valuations of the public good.

$$\begin{aligned} v_A &= 40 \\ v_B &= 30 \\ v_C &= 10 \end{aligned}$$

Let the cost of paying for the public good if it is provided be assigned in the following way.

$$\begin{aligned} k_A &= 30 \\ k_B &= 30 \\ k_C &= 40 \end{aligned}$$

If each agent truthfully reports his valuations, calculate each agent's net payoff. (7.5 points)

**Question 4** (35 points)

Consider the following simultaneous-move two-person game, represented as:

| | | *Player 2* | |
|---|---|---|---|
| | | $d$ | $e$ |
| *Player 1* | $a$ | $3,3$ | $2,2$ |
| | $b$ | $3,4$ | $3,4$ |
| | $c$ | $2,0$ | $1,1$ |

($i$) What are the players' strategy sets? What are the Nash equilibria of the game? (5 points)

Now suppose that this game is played **sequentially** instead with player 1 moving first, and then player 2 moves after having observed how Player 1 has moved.

($ii$) What are the players' strategy sets? (10 points)

($iii$) What are the Nash equilibria of the game? (Hint: draw the normal form representation of this game first.) (10 points)

($iv$) What are the subgame perfect Nash equilibria of the game? (Hint: draw the extensive form representation of this game first.) (10 points)

**Question 5** (15 points)

Suppose there is a $1/3$ probability that a risk averse individual with a current wealth of $\$10,000$ will suffer a loss of $\$3,000$. Assume the individual's utility function is $U(x)$, $U' > 0$, $U'' < 0$, where $x$ is the level of wealth. There there are 2 insurance policies available:

Policy 1: A fair policy with coverage of $\$3,000$, i.e., the insurance company pays the individual $\$3,000$ if the loss occurs.

Policy 2: A fair policy with coverage of $\$6,000$, i.e., the insurance company pays the individual $\$6,000$ if the loss occurs.

Which policy would the individual prefer to buy? Prove what you claim with the aid of a diagram if necessary.

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