Delhi School of Economics
Department of Economics

500104

Entrance Examination for M. Phil. / Ph. D Economics
June 25, 2011

Time. 3 hours — Maximum marks. 100

General instructions. Please read the following instructions carefully.

- Do not break the seal on this booklet until instructed to do so by the invigilator.
- This exam is in two parts, each worth 50 marks. Part I consists of 25 multiple choice questions, to be answered on the bubble-sheet accompanying this booklet. Part II has 3 longer questions, of which you must answer 2, in answer booklets that you will be given.
- Immediately on receipt of this booklet, fill in your Signature, Name, Roll number and Answer sheet number (see the top left-hand-side of the bubble-sheet) in the space provided below.
- Part I will be checked by a machine. **Therefore, it is very important that you follow the instructions on the bubble-sheet.**
- Fill in the required information in Boxes 1, 2, 4, 5 and 6 on the bubble-sheet. The invigilator will sign in Box 3.
- Fill in your name, roll number, and exam in the relevant space in the answer booklets provided for Part II.
- Do not disturb your neighbours at any time.
- Make sure you do not have calculators, mobile telephones, papers, books, etc., on your person. **Anyone engaging in illegal examination practices will be immediately evicted and that person's candidature will be cancelled.**
- When you finish the examination, hand in this booklet, the bubble-sheet, and the answer booklets to the invigilator.

Signature _____

Name _____

Roll number _____

Answer sheet number _____

Part I

Instructions.

- Check that this booklet has pages 1 through 14. Also check that the bottom of each page is marked with *EEE 2011 Mphil-PhD.*
- This part of the examination consists of 25 multiple-choice questions. Each question is followed by four possible answers, at least one of which is correct. In rare cases, more than one choice may be correct; then choose only the best one. Among the correct answers, the best answer is the one that implies (or includes) the other correct answer(s). Indicate your chosen best answer on the bubble-sheet by shading the appropriate bubble.
- For each question, you will get 2 marks if you choose only the best answer. If you choose none of the answers, then you will get 0 for that question. **However, if you choose something other than the best answer or multiple answers, then you will get −2/3 mark for that question.**
- You may use the blank pages at the end of this booklet, marked **Rough work**, to do your calculations and drawings. Your "Rough work" will not be read or checked.

You may begin now. Good luck!

QUESTION 1. A consumer has utility function $u(x_1, x_2) = \min\{2x_1 + x_2, x_1 + 2x_2\}$. Her income is $y = 100$, the prices are $p_1 = 20$ and $p_2 = 30$. The amount of x_1 in the utility maximizing bundle is

(a) 7
(b) 5
(c) 2
(d) 0

QUESTION 2. A consumer spends Rs. 100 on only two goods, A and B. Assume non satiation, i.e., more of any good is preferred to less. Suppose the price of B is fixed at Rs. 20. When the price of A is Rs. 10, the consumer buys 3 units of B. When the price of A is Rs. 20, she buys 5 units of A. From this we can conclude that for the relevant price range

(a) A is an inferior good.
(b) B is a complement of A.
(c) A is a Giffen good.
(d) All of the above.

QUESTION 3. Consider a firm using two inputs to produce its output. It is known that greater use of both inputs increases output. Moreover, for any combination of positive input prices, the firm employs an input combination of the form $(x, \alpha x)$ where $\alpha > 0$ is a constant. Which of the following functions represents this firm's technology?

(a) $f(x,y) = \min\{x^{\alpha}, y\}$

(b) $f(x,y) = \min\{\alpha x, y\}$

(c) $f(x,y) = \min\{x, \alpha y\}$

(d) $f(x,y) = \min\{x, y^{\alpha}\}$

QUESTION 4. Consider an exchange economy with two agents, 1 and 2, and two goods, X and Y. There are 6 units of X and 4 units of Y available. An allocation is denoted by $(x_1, y_1), (x_2, y_2)$, where (x_1, y_1) is agent 1's consumption bundle, (x_2, y_2) is agent 2's consumption bundle, $x_1 + x_2 = 6$ and $y_1 + y_2 = 4$. Agent 1 has the utility function $u_1(x_1, y_1) = \min\{x_1, y_1\}$ and agent 2 has the utility function $u_2(x_2, y_2) = \min\{x_2, y_2\}$. Which of the following allocations is not Pareto efficient?

(a) $(2,2), (4,2)$

(b) $(3,2), (3,2)$

(c) $(3,1), (3,3)$

(d) $(1,2), (5,2)$

QUESTION 5. Consider an exchange economy with two agents and two goods. The agents have the same preferences as in the previous question! Agent 1's endowment is $(0, \alpha)$ and agent 2's endowment is $(\beta, 0)$. What is generally true?

(a) Any allocation in which each agent gets equal amounts of the two goods is an equilibrium allocation.

(b) If $\beta < \alpha$, then the price of X is 0.

(c) If $\beta > \alpha$, then the price of X is 0.

(d) Any allocation in which agent 2 gets none of good Y is an equilibrium allocation.

QUESTION 6. Consider an exchange economy with two agents and two goods. Agent 2's utility is as above. The equilibrium allocation is $(x_1, y_1) = (6,1)$ and $(x_2, y_2) = (4,4)$. The equilibrium prices are $(1,1)$. What could be the endowment?

(a) Agent 1's endowment is $(2,5)$ and agent 2's endowment is $(8,0)$.

(b) Agent 1's endowment is $(7,0)$ and agent 2's endowment is $(3,5)$.

(c) Both (a) and (b).

(d) Neither (a) nor (b).

QUESTION 7. A firm has an order to supply 20 units of output. It can divide its production across two different plants, 1 and 2, with cost functions $c_1(q_1) = q_1^2$ and $c_2(q_2) =$

$3q_2^2$ respectively. The total order must be produced, i.e., $q_1 + q_2 = 20$. To meet the total production-target at minimum cost, the amount of output the firm should produce in its first plant is

(a) 20 units.

(b) 15 units.

(c) 10 units.

(d) 5 units.

QUESTION 8. Consider the following two games in strategic form.

$$\begin{array}{c} \\ \text{Enter} \\ \text{Not enter} \end{array} \begin{array}{c} \text{Hawk} \\ \begin{pmatrix} -1,1 \\ 0,6 \end{pmatrix} \end{array} \quad \text{and} \quad \begin{array}{c} \\ \text{Enter} \\ \text{Not enter} \end{array} \begin{array}{c} \text{Hawk} \quad \text{Dove} \\ \begin{pmatrix} -1,1 & 3,3 \\ 0,6 & 0,7 \end{pmatrix} \end{array}$$

Compute the Nash equilibria of the two games. What general lesson can be drawn from these equilibria?

(a) Eliminating a strategic option may be beneficial.

(b) Having extra strategic options is not beneficial.

(c) Having extra strategic options is beneficial.

(d) Eliminating a strategic option is beneficial.

The next nine questions are based on the following information. *Consider an economy in which aggregate output is produced by using 2 factors, capital K and labour L. Aggregate production technology is given by the production function:*

$Y_t = A(K_t)^{\alpha}(L_t)^{1-\alpha}$. Here $A > 0$ and $0 < \alpha < 1$. At each instant t, both factors are fully employed. A constant proportion s of total output is saved and invested in every period, which augments the capital stock in the next period. There is no depreciation of capital. Labour force grows at a constant rate n. Let $A = 20$, $\alpha = \frac{1}{2}$, $s = \frac{1}{4}$, $n = \frac{1}{10}$. Then

QUESTION 9. The steady state level of output per worker is

(a) 50

(b) 1000

(c) 2500

(d) 5000

QUESTION 10. The rate of growth of aggregate output in the steady state is

(a) 0

(b) $\frac{1}{4}$

(c) $\frac{1}{2}$

(d) $\frac{1}{10}$

QUESTION 11. The golden rule value of capital per worker is

(a) 25

(b) 2500

(c) 5000

(d) 10000

QUESTION 12. The golden rule level of consumption per worker is

(a) 500

(b) 1000

(c) 250

(d) 25

QUESTION 13. An increase in the value of the parameter A from its current value

(a) will increase the steady state level of output per worker and increase the growth rate of aggregate output in the steady state.

(b) will decrease the steady state level of output per worker and increase the growth rate of aggregate output in the steady state.

(c) will increase the steady state level of output per worker and leave unchanged the growth rate of aggregate output in the steady state.

(d) will decrease the steady state level of output per worker and leave unchanged the growth rate of aggregate output in the steady state.

QUESTION 14. An increase in the value of the parameter n from its current value

(a) will increase the steady state level of output per worker and increase the growth rate of aggregate output in the steady state.

(b) will decrease the steady state level of output per worker and increase the growth rate of aggregate output in the steady state.

(c) will increase the steady state level of output per worker and leave unchanged the growth rate of aggregate output in the steady state.

(d) will decrease the steady state level of output per worker and leave unchanged the growth rate of aggregate output in the steady state.

Now suppose the aggregate production function changes such that $\alpha = 1$ (while the rest of the parameters remain at their earlier values $A = 20$, $s = \frac{1}{4}$, $n = \frac{1}{10}$).

QUESTION 15. Under the new production condition,

(a) aggregate output increases at a constant rate which is the same as the rate of growth of capital stock.

(b) aggregate output increases at a constant rate which is the same as the rate of growth of the labour force.

(c) aggregate output increases at a constant rate given by A.

(d) aggregate output remains constant over time.

QUESTION 16. Under the new production condition, an increase in the value of the parameter A from its current value

(a) will increase the growth rate of output per worker and increase the growth rate of aggregate output.

(b) will decrease the growth rate of output per worker and increase the growth rate of aggregate output.

(c) will increase the growth rate of output per worker and leave unchanged the growth rate of aggregate output.

(d) will decrease the growth rate of output per worker and leave unchanged the growth rate of aggregate output.

QUESTION 17. Under the new production condition, an increase in the value of the parameter n from its current value

(a) will increase the growth rate of output per worker and increase the growth rate of aggregate output.

(b) will decrease the growth rate of output per worker and increase the growth rate of aggregate output.

(c) will increase the growth rate of output per worker and leave unchanged the growth rate of aggregate output.

(d) will decrease the growth rate of output per worker and leave unchanged the growth rate of aggregate output.

The next two questions are based on the following information. *Suppose X and Y are two random variables. X can take values -1 and 1. Y can take integer values between 1 and 6. The following is the joint probability distribution of X and Y.*

	$Y=1$	$Y=2$	$Y=3$	$Y=4$	$Y=5$	$Y=6$
$X=-1$	0.1	a	0.3	0	0	0
$X=1$	0	0	b	0.1	0.1	0.1

It is known that the expectations of the two random variables are $E(X) = -0.2$ and $E(Y) = 3.2$. Then

QUESTION 18. The value 'a' in the table equals

(a) 0

(b) 0.1

(c) 0.2

(d) 0.3

QUESTION 19. The value 'b' in the table equals

(a) 0

(b) 0.1

(c) 0.2

(d) 0.3

The next two questions are based on the following data. *Suppose X and Y are independent random variables that follow the uniform distribution on the interval* $[0, 1]$. *Let* $Z = \min\{X, Y\}$.

QUESTION 20. $\Pr(Z < 0.5)$ (the probability that Z is less than 0.5) equals

(a) 0.25

(b) 0.5

(c) 0.625

(d) 0.75

QUESTION 21. $\Pr(Z < 0.5|X = 0.75)$ is

(a) 0.25

(b) 0.5

(c) 0.625

(d) undefined.

QUESTION 22. What is the "adjusted R^2 " adjusted for?

(a) The number of predictors only.

(b) The sample size only.

(c) The number of predictors and sample size.

(d) None of the above.

QUESTION 23. Consider the following equation to be estimated using ordinary least squares:

$$Y = a_0 + a_1 X_1 + a_2 X_2 + a_3(X_2 - X_1) + a_4 X_1 X_2 + u$$

Which of the following statements is true?

(a) The parameters a_0, a_1, a_2, a_4 can be estimated, but not a_3.

(b) The parameters a_0 and a_4 can be estimated but not a_1, a_2, a_3.

(c) The parameters a_0, a_1, a_2, a_3 can be estimated, but not a_4.

(d) All parameters can be estimated.

QUESTION 24. A researcher wants to test whether there are gender differences in the rates of immunization for boys and girls, after controlling for parental income, mother's education and access to health care facilities. The easiest way to test this would be to:

(a) Include one dummy variable in the multiple regression.

(b) Include two dummy variables in the multiple regression.

(c) Include interaction dummies in the multiple regression.

(d) Run two separate regressions-one for boys and one for girls.

QUESTION 25. Instead of estimating a production function $y = a_0 + a_1 K + a_2 L + u$, where y is output, K is capital input and L is labour input, a researcher estimates $y = a_0 + a_1 K + u$. It is known that in the true model, $a_2 > 0$, and that K and L are complements. Which of the following is true?

(a) The estimated a_1 will be upwardly biased.

(b) The estimated a_1 will have a downward bias.

(c) The estimated a_1 will be biased, but the direction of bias cannot be determined.

(d) The estimated a_1 will be unbiased, but a_0 will be biased.

End of Part I.

Proceed to Part II of the examination on the next page.

Part II

Instructions.

• Answer any two of the three questions below. Each question is worth 25 marks. Marks for individual parts of some of the questions are indicated next to the relevant part.

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(1) (a) Consider a pure exchange economy with two individuals A and B, and two goods x and y. A's utility function is $U_A = x + y$, and B's utility function is $U_B = \max\{x, y\}$. A and B have identical endowments $(1, 1)$. Find the equilibrium allocation and the equilibrium relationship between prices of x and y. 8

(b) The cost function of a firm is $C = w_1^a w_2^b y$, where w_1, w_2 are factor prices and y stands for output. What restrictions would you impose on a and b? Impose those restrictions and derive the production function and conditional factor demands. 9

(c) Let R stand for a weak preference relation defined over a consumption set X. P stands for a strict preference relation derived from R as follows: For all $x, y \in X$, xPy iff xRy and yRx. Show that transitivity of R implies transitivity of P, but the converse may not hold. 8

(2) Does rational expectation necessarily render monetary policy ineffective? Elaborate your answer with suitable examples and/or counter-examples. 25

(3) Consider the following model estimated by OLS for the US with annual data for 23 years:

HOUSING = −4.759 + 1.873 GNP − 1.229 MORTGAGE

The t-ratios for the constant, GNP and MORTGAGE estimates are, respectively, −1.423, 3.811, and −4.125. $R^2 = 0.586$, $DW = 0.794$.

HOUSING = Logarithm of housing starts. GNP = Logarithm of gross national product. MORTGAGE = Mortgage rate. (Housing starts = number of new residential constructions initiated).

(a) Do the signs of the equation conform to your expectations? Explain. 2

(b) Test for the joint significance of the independent variables at the 5 percent level. 2

(c) Test for serial correlation at the 5 percent level. What do you conclude? 3

(d) If the lagged dependent variable is included in the regression, would the above test be valid? Explain. 2

(e) Describe how you would test for first order serial correlation using the Lagrange Multiplier test. Can this test be used to test for higher orders of serial correlation? Explain. 4

(f) What are the consequences of the presence of serial correlation in the residuals? 4

(g) Describe the Cochrane-Orcutt procedure for estimation in the presence of serial correlation. 4

(h) It is suggested that house prices should be included in the model. Assuming that this is a valid suggestion, what are the consequences of excluding house prices from the above equation? 4