Delhi School of Economics
Department of Economics

Entrance Examination for M. Phil./Ph. D. Economics
June 26, 2010

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. Anyone breaking the seal prematurely will be evicted from the examination hall and his/her candidature will be cancelled.
- Fill in your Name and Roll Number on the detachable slip below.
- 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 to the invigilator.

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Marks tally

Part	Marks
I	
II.26	
II.27	
II.28	
Total	

Part I

Instructions.

- Check that this booklet has pages 1 through 22. Also check that the bottom of each page is marked with *EEE 2010 MPhil/PhD.*
- Part I consists of 25 multiple-choice questions. Each question is followed by four possible answers, at least one of which is correct. If more than one choice is correct, 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 by circling the appropriate choice.
- 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 $-2/3$ marks for that question.
- You may use the blank pages at the end of this booklet, marked Rough work, to do rough calculations, drawings, etc. However, your "Rough work" will not be read or checked.

You may begin now. Good luck!

The next four questions are based on the following information. *Consider an economy with an aggregate production function $Y = \alpha K + \beta L$, where α and β are positive constants, K is capital, L is labour and Y is output. K is fixed in the short run. Perfectly competitive producers take the nominal wage rate W and the price level P as given, and employ labour so as to maximize profit. This generates the labour demand schedule. The labour supply schedule is $L^S = -\gamma + \delta W/P$, where γ and δ are positive constants. Producers and workers have perfect information about P and W.*

QUESTION 1. The labour market will clear if and only if

(a) $\beta > \gamma/\delta$
(b) $\beta < \gamma/\delta$
(c) $\beta > \delta/\gamma$
(d) $\beta < \delta/\gamma$

QUESTION 2. Assume that the required parametric condition of the previous question holds and that the nominal wage rate is fixed. The short run aggregate supply schedule

for this economy, with P along the vertical axis and Y along the horizontal axis, will look as follows:

(a) for high values of P it will be horizontal; for some mid-range values of P it will be downward sloping; for low values of P it will be horizontal again

(b) for high values of P it will be horizontal; for some mid-range values of P it will be upward sloping; for low values of P it will be horizontal again

(c) for high values of P it will be vertical; for some mid-range values of P it will be downward sloping; for low values of P it will be vertical again

(d) for high values of P it will be vertical; for some mid-range values of P it will be upward sloping; for low values of P it will be vertical again

QUESTION 3. If there is a one shot increase in the fixed stock of the capital stock, then the short run aggregate supply schedule will

(a) shift up

(b) shift down

(c) shift to the left

(d) shift to the right

QUESTION 4. If there is a one shot increase in the fixed nominal wage rate, then the short run aggregate supply schedule will

(a) shift up

(b) shift down

(c) shift to the left

(d) shift to the right

The next four questions are based on the following information. *Consider a closed economy simple Keynesian model of the goods market, where prices are fixed and output in equilibrium is determined by aggregate demand. Investment is fixed at I^*. There is no government sector. Suppose there are two groups of households, called A and B, and the total income Y is distributed among these two groups in such a way that group A gets $Y^A = \lambda Y$, and group B gets $Y^B = (1-\lambda)Y$, where $\lambda \in (0,1)$ is a constant. The consumption function of group A is $C^A = c + c_A Y^A$ and the consumption function of group B is $C^B = c + c_B Y^B$, where $0 < c_A < c_B < 1$, i.e., the two groups have different consumption propensities.*

QUESTION 5. The value of the investment multiplier in this economy is given by

(a) $\frac{1}{1-\lambda c_A - \lambda c_B}$

(b) $\frac{1}{1-(1-\lambda)c_A-(1-\lambda)c_B}$

(a) 16/37
(b) 21/37
(c) 25/37
(d) 1

QUESTION 16. Events A and B are
(a) not independent
(b) independent
(c) conditionally independent
(d) unconditionally independent

The next four questions are based on the following data. *Consider an exchange economy with agents 1 and 2 and goods x and y. Agent 1's endowment is $(0,1)$ (i.e., no good x and 1 unit of good y) and agent 2's endowment is $(2,0)$ (i.e., 2 units of good x and no good y). The agents can consume only nonnegative amounts of x and y.*

QUESTION 17. Suppose agent 1 lexicographically prefers x to y, i.e., between any two bundles of goods, she strictly prefers the bundle containing more of x, and if the bundles contain equal amounts of x, then she strictly prefers the bundle with more of y. Suppose agent 2 treats x and y as perfect substitutes, i.e., between any two bundles (x,y) and (x',y'), she strictly prefers (x,y) if and only if $x+y>x'+y'$.

The competitive equilibrium allocation for this economy is
(a) 1 gets (0,1) and 2 gets (2,0)
(b) 1 gets (2,0) and 2 gets (0,1)
(c) 1 gets (3/2,0) and 2 gets (1/2,1)
(d) 1 gets (1,0) and 2 gets (1,1)

QUESTION 18. Suppose agents 1 and 2 have the preferences described above. The set of all possible competitive equilibrium prices consists of all $p_x>0$ and $p_y>0$ such that
(a) $p_x/p_y=1$
(b) $p_x/p_y\geq 1$
(c) $p_x/p_y\leq 1$
(d) $p_x/p_y>0$

QUESTION 19. Now suppose agent 1 lexicographically prefers y to x and agent 2 treats x and y as perfect substitutes. The set of all possible competitive equilibrium prices consists of all $p_x>0$ and $p_y>0$ such that
(a) $p_x/p_y=1$
(b) $p_x/p_y\geq 1$

(c) $p_x/p_y \leq 1$
(d) $p_x/p_y > 0$

QUESTION 20. Now suppose agent 1 lexicographically prefers y to x and agent 2 treats x and y as perfect complements. The set of competitive equilibrium allocations
(a) includes the allocation $(1,0)$ for agent 1 and $(1,1)$ for agent 2
(b) includes the allocation $(0,1)$ for agent 1 and $(2,0)$ for agent 2
(c) is empty
(d) includes all allocations $(x,1)$ for agent 1 and $(2-x,0)$ for agent 2, where $x \in [0,2]$

QUESTION 21. Consider an economy with two agents, A and B, and two goods, x_1 and x_2. Both agents treat x_1 and x_2 as perfect complements. Suppose the total endowment of x_1 is 4 and the total endowment of x_2 is 2. Which of the following allocations is not Pareto optimal? (Note that a bundle (a,b) represents a units of x_1 and b units of x_2.)
(a) A gets $(1,1)$ and B gets $(1,1)$
(b) A gets $(2,1)$ and B gets $(3/2,1)$
(c) A gets $(1/2,3/2)$ and B gets $(3,1/2)$
(d) A gets $(3,2)$ and B gets $(0,0)$

QUESTION 22. A consumer has the utility function $u(x,y) = xy$. Suppose the consumer demands bundle (x^*, y^*). Now suppose the seller of good x offers a "buy one, get one free" scheme: for each unit of good x purchased, the consumer gets another unit of x for free. Given this scheme, suppose the consumer buys bundle (x_d, y_d) and gets an additional x_d for free. Which one of the following statements must be true?
(a) $x_d > x^*$ and $y_d > y^*$
(b) $x_d > x^*$ and $y_d = y^*$
(c) $x_d > x^*$ and $y_d < y^*$
(d) $x_d = x^*$ and $y_d = y^*$

QUESTION 23. Consider a Bertrand duopoly with firms 1 and 2 that produce a homogeneous good and set prices p_1 and p_2 respectively. Suppose p_1 and p_2 have to be positive integers. If $p_1 < p_2$ (resp. $p_1 > p_2$), then firm 1 (resp. firm 2) sells $5 - p_1$ (resp. $5 - p_2$) and the other firm sells nothing. If $p_1 = p_2$, then each firm sells $(5 - p_1)/2$. Firm 1 has a constant average cost 5/2 and firm 2 has a constant average cost 3/2. In equilibrium
(a) $p_1 = 2 = p_2$
(b) $p_1 = 3 = p_2$
(c) $p_1 = 3$ and $p_2 = 2$
(d) $p_1 = 3$ and p_2 is 2 or 3

QUESTION 24. Consider a Stackelberg duopoly with firm 1 as the leader and firm 2 as the follower. If $(q_1; q_2)$ is the Stackelberg equilibrium, then

(a) firm 1's optimal isoprofit curve and firm 2's reaction curve intersect at (q_1, q_2) and are tangential at (q_1, q_2)

(b) firm 2's optimal isoprofit curve and firm 1's reaction curve intersect at (q_1, q_2) and are tangential at (q_1, q_2)

(c) isoprofit curves of the two firms intersect at $(q_1; q_2)$ and are tangential at (q_1, q_2)

(d) reaction curves of the two firms intersect at (q_1, q_2)

QUESTION 25. Firm 1 is the potential entrant into a market in which firm 2 is the incumbent monopolist. Firm 1 moves first and chooses to "enter" or "not enter". If it does "not enter", then firm 1 gets profit 0 and firm 2 gets the monopoly profit 10. If firm 1 "enters", then firm 2 chooses to "fight" or "not fight". If firm 2 fights, then firm 1's profit is -2 and firm 2's profit is 6. If firm 2 does "not fight", then firm 1's profit is 2 and firm 2's profit is 8. Firm 2's strategy of "fight" is best interpreted as

(a) a commitment

(b) a non-credible threat

(c) a punitive action

(d) acquiescence

End of Part I.

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

Part II

Instructions.

- Answer any two out of Questions 26, 27 and 28 in the space following the relevant question. No other paper will be provided for this purpose. You may use the blank pages at the end of this booklet, marked Rough work, to do rough calculations, drawings, etc. However, your "Rough work" will not be read or checked.
- Each question is worth 25 marks.

QUESTION 26. (A) Suppose that $X_1, \ldots X_n$ form a random sample from an exponential distribution for which the value of the mean of the distribution is unknown. Derive the maximum likelihood estimator for the median of the distribution.

(B) We would like to estimate the prevalence p of a new disease in the population on a particular date. We sample 20 people and test them with a perfect test. Let Y denote the number who test positive for the disease. We would like to test the hypothesis that 20% of the population has the disease against the alternative that either more or less than 20% have it. We define a critical region by values of Y such that $Y \geq 7$ or $Y \leq 1$. Sketch the power function of the test and determine the size of the test. Clearly mark on your diagram the values taken by the power function at $p \in \{0.2, 0.4, 0.6, 0.8\}$. Explain why the power function takes the shape that it does.

Answer.

QUESTION 27. A consumer has a direct utility function $U(x_1, x_2) = f(x_1) + x_2$. Good 1 is a discrete good; the only possible levels of consumption of good 1 are $x_1 = 0$ and $x_1 = 1$. Assume that $f(0) = 0$ and $p_2 = 1$ (p_i is the price of good i for $i = 1, 2$).

(A) What restriction must p_1 satisfy so that $x_1 = 1$ in equilibrium?

(B) Derive the algebraic form of the indirect utility function.

Answer.

)N 28. (A) Set up a growth model in continuous time for an economy with an
ducing sector and a technology producing sector where technology is non-rival
tion growth and rate of growth of capital accumulation are constant through

hy would growth be endogenous in such a model?
es such a model explain why long run growth would slow down?
n cross-country income differences be explained by this model, especially when
is non-rival?