ECO2143 Macroeconomic Theory II First mid-term examination: July 3rd 2014 University of Ottawa Professor: Louis Hotte Time allotted: 1h 30min

Attention: Not all questionnaires are the same. This is questionnaire A. On the answer sheet, you must indicate the letter of your questionnaire with the course's number as follows: ECO2143A. You must answer according to the material seen in this course. Read all answer choices before choosing your answer. Calculator permitted. GOOD LUCK!

## QUESTIONNAIRE A I. MULTIPLE CHOICE QUESTIONS (2 points each)

1. Suppose that there are only two goods produced and consumed in the world: guns and roses. Guns are tradeable on world markets but not roses. The following table provides information about output quantities and prices for two countries: *Peace* and *Love*. The currency unit in Peace is the dollar \$ and in Love it is the euro  $\in$ .

	guns	roses	price	price
	output	output	guns	roses
Country	per capita	per capita	local currency	local currency
Peace	2	10	\$3	\$3
Love	1	5	€2	€1

Assume that the market exchange rate is determined by the law of one price. Use this market exchange rate in order to calculate the GDP ratio between the two countries, i.e.,  $GDP_{Peace}/GDP_{Love}$ . This ratio is equal to:

- (a) 2.00
- (b) 3.43 ✓
- (c) 4.00
- (d) 5.14
- (e) The law of one price cannot be used in this example because roses are not tradeable.
- 2. In problem (1), the exchange rate adjusted for the parity of purchasing power should be equal to
  - (a) 1.00 \$/€
  - (b) 1.50 \$/€
  - (c) 2.00 \$/€
  - (d) 2.57  $\neq 0$
  - (e) 5.14 \$/€

- $\mathbf{2}$
- 3. Which of the following is generally FALSE. Assuming that the investment rate equals the savings rates, then, according to the basic Solow model, an increase in the savings rate
  - a) increases the long-run income level.
  - b) has no impact on the long-run income growth rate.
  - c) always increases the long-run consumption level.  $\checkmark$
  - d) increases the short-run income growth rate.
  - e) has an ambiguous effect on the long-run growth of consumption level.
- 4. Suppose that national output depends only on the number of workers and the stock of (physical) capital. Which of the following property of the national output function implies that we can represent income per worker in terms of the capital/labour ratio only?
  - (a) Rivalry in the use of capital
  - (b) Decreasing marginal product of capital
  - (c) Decreasing marginal product of labour
  - (d) Capital depreciation
  - (e) None of the above  $\checkmark$
- 5. The *Human Development Index* is considered a good measure of the welfare of the citizens of a country. According to the HDI measure discussed in class, which of the following is clearly FALSE?
  - (a) The HDI is not perfectly correlated with per-capita income levels.
  - (b) The HDI accounts directly for life expectancy, education and standards of living.
  - (c) The HDI accounts directly for decreasing marginal utility of income.
  - (d) The HDI does not directly account for the happiness measure.
  - (e) The HDI accounts directly for the pollution level.  $\checkmark$
- 6. Assume that China's GDP grows at a rate of 7% annually, and the USA's at 2%. Suppose that in 2010 the GDP of the two countries were 6 trillion and 14 trillion respectively. At these growth rates, in what year can we expect to see China's GDP equal that of the USA?
  - (a) 2028 ✓
  - (b) 2032
  - (c) 2035
  - (d) 2040
  - (e) 2055
- 7. Suppose a country's economy can be represented by the following Cobb-Douglas production function for per capita output:  $y = k^{\alpha}$  where  $\alpha = 1/3$ . The depreciation and investment rates are respectively  $\delta = 5\%$  and  $\gamma = 26.21\%$ . Suppose that capital per worker at period 0 is  $k_0 = 12$ . What is the percent change in the level of income per worker between period 0 and period 1?
  - (a) Remains unchanged  $\checkmark$
  - (b) Increases by 5.4%
  - (c) Decreases by 2.4%
  - (d) Increases by 7.4%
  - (e) Increases by 1.7%

8. Muhamar and Margaret are the only two citizens living in country A. Nicolas and Angela are the only two citizens in country B. Their respective PPP adjusted incomes in years 1980 and 2000 are given by the following table:

Person	Country	1980	2000
Muhamar	А	2,500	5,000
Margaret	А	$5,\!000$	15,000
Nicolas	В	$1,\!000$	2,000
Angela	В	$2,\!000$	6,000

Suppose that income inequality between citizens is measured by the ratio of the average income of the richest 50% to the average income of the poorest 50%. The numbers in the above table indicate that between 1980 and 2000,

- (a) world inequalities have increased mainly because of an increase in inequalities between countries.
- (b) world inequalities have increased mainly because of an increase in inequalities within countries.  $\checkmark$
- (c) world inequalities have decreased mainly because of a decrease in inequalities between countries.
- (d) world inequalities have decreased mainly because of a decrease in inequalities within countries.
- (e) world inequalities have remained the same.
- 9. Which of the following is clearly FALSE? According to the facts discussed in class,
  - (a) Around 1945, the per-capita income level of Japan placed it among the group of rich countries of the world.  $\checkmark$
  - (b) Around 1910, the per-capita income level of Argentina placed it among the group of rich countries of the world.
  - (c) Around 1960, South Korea was considered a poor country.
  - (d) During the 20th century, life expectancy in most developing countries has been increasing quite consistently.
  - (e) In terms of real income level, the typical worker in the USA much better off today than he/she was in the 1950s.
- 10. Which of the following statement does not correspond well to the Development Trap argument:
  - (a) A major jump in development aid efforts may be quite effective in the long run despite the fact that past, smaller development aid efforts have not been very effective.
  - (b) For any economy, there can exist more than one long run steady-sate equilibrium with positive output levels.
  - (c) Initial conditions are an important determinant of the long run steady-state equilibrium.
  - (d) Rich and poor countries are fundamentally different.
  - (e) Any small amount of development aid will help a poor country become richer in the long run.  $\checkmark$

## NAME AND ID:

## II. PROBLEM

You must answer the following questions within the space provided. Your answers must be accompanied with clear explanations. Graphs and equations without explanations will not get you far.

## 1. The Solow model and climate change (30 points)

A country's economy is represented by the basic Solow model, with a production function of y = f(k), where k is capital per worker and there is a diminishing marginal product of capital. The investment rate  $(\gamma)$  is constant throughout. Suppose that because of more severe weather conditions, climate change increases the depreciation rate of capital. We want to analyze the possible effect on the economy with the help of the Solow model.

**1.a)** (20) Assume that the effect of climate change takes the form of a sudden increase in the depreciation rate of capital, say from  $\delta_1$  to  $\delta_2$ , with  $\delta_2 > \delta_1$ , which occurs at year 2000. With the help of graphical analysis, discuss the short-run and long-run effects of this sudden increase in the depreciation rate. Use two graphical representations: one that depicts output, investment and depreciation as functions of capital; another that depicts output as a function of time. Explain the graphics and interpret your results.



**1.b)** (10) Assume now that output is represented by the Cobb-Douglas function  $y = k^{\alpha}$ . Derive the expression for the steady-state consumption level  $(c^{ss})$  as function of the investment and depreciation rates. (Make sure to show all the steps with a short explanation.) With the help of a graph that plots  $c^{ss}$  as a function of  $\gamma$ , show how the curve changes when the depreciation rate increases from  $\delta_1$  to  $\delta_2$ .





2. A theory of intertemporal choice (20 points) Suppose that Ronaldo lives for two periods only,  $t \in \{1, 2\}$ .  $Y_{dt}$  is his disposable income at period t and  $W_1$  is his initial wealth at period 1. He can save or borrow at interest rate r and cannot leave a bequest or unpaid debt after period 2.  $C_t$  is his consumption level at period t and  $S_1$  represents the savings level in period 1. Ronaldo's indifference curves between the two period's consumption levels are convex.

With the help of graphical analysis, illustrate a case in which a drop in the initial wealth leads Ronaldo to go from being a net saver to a net borrower. Denote the high and low initial wealths as  $W_1^H$  and  $W_1^L$  respectively. Make sure to explain your steps clearly, both graphical and mathematical.

