ECO2143 Macroeconomic Theory II
2nd mid-term examination: March 4 2013
University of Ottawa
Professor: Louis Hotte
Time allotted: 1h 20min

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.* GOOD LUCK!

QUESTIONNAIRE A

I. MULTIPLE CHOICE QUESTIONS (4 points each)

1. Which of the following best describes the relationship between health and income?
   (a) Better health causes higher income.
   (b) There is no causal relationship between health and income.
   (c) Higher income causes better health.
   (d) Better health causes higher income *and* higher income causes better health.
   (e) There is no correlation between health and income.

2. Suppose that Country A has a higher output level and a higher level of factor accumulation than Country B. Which country has a higher level of productivity?
   (a) Country B
   (b) Country A
   (c) They both have the same level of productivity.
   (d) More information is required in order to answer that question.
   (e) Productivity cannot be estimated.

3. The fact that there are positive externalities to education suggests that
   (a) governments should not subsidize education.
   (b) education is a positively external business.
   (c) people tend to receive too much education.
   (d) less educated farmers are made worse off by their more educated neighbors.
   (e) the returns to education based on salaries provide an underestimate of its true total social return.

4. Which of the following is TRUE?
   (a) According to the Malthusian model of population and economic growth, a technological improvement leads to higher standards of living in the long run.
   (b) The Malthusian model of population and economic growth is useful to explain increases in standards of living in the industrialized world over the last 200 years.
   (c) A drop in the mortality rate can lead to lower fertility through the effect of increased incentives to invest in a child's education.
   (d) A drop in the mortality rate can only lead to higher population growth in the long run.
   (e) Better access to contraceptives is the leading explanation for lower population growth in today's developed world.

5. Suppose that the yearly returns to education are the following: 13.4% for grades 1 to 4, 10.1% for grades 5 to 8, and 6.8% beyond 8 years. What fraction of wages is due to human capital for a worker who has nine years of education?
   (a) 25.5%
   (b) 40.5%
   (c) 50.5%
   (d) 61.5%
   (e) None of the above is anywhere close to the real value.

6. Regarding growth over the past 35 years or so, which of the following statement most closely corresponds to observations?
   (a) Compared to factor accumulation, productivity growth explains a larger share of income growth differences between countries.
   (b) Compared to productivity growth, factor accumulation explains a larger share of income growth differences between countries.
   (c) Factor accumulation does not explain a very important part of income growth differences between countries.
   (d) Productivity growth does not explain a very important part of income growth differences between countries.
   (e) Factor accumulation and productivity growth explain roughly equally growth differences between countries.

7. Suppose that in a country one-quarter of all females born die at age 28, and three-quarter live past age 50. Women bear one child at age 25, one child at age 32, and one child at age 35. One-half of children are girls. The total fertility rate for this country is:
   (a) 0.75
   (b) 1
   (c) 1.25
   (d) 2.5
   (e) 3

8. Which of the following is FALSE?
   (a) In the past 200 years or so in the UK, it has been estimated that better nutrition accounts for a significant share of overall growth in income.
   (b) In developed economies, payments to education explain a larger share of total national income than payments to physical capital.
   (c) In developing economies, payments to education explain a smaller share of total national income than payments to physical capital.
   (d) In a country like Canada, one of the most important part of the costs of education takes the form of the opportunity cost of students' time.
   (e) Variations in education between countries explain some of the variation in income per worker among countries.

9. Suppose that two countries, A and B, have the same rates of investment and depreciation, the same levels of productivity, and the same levels of output per worker today. Population growth is however greater in country A than B. Which of the following is true according to the Solow model:
   (a) Country B has more capital per worker than country A.
   (b) Country A has more capital per worker than country B.
   (c) The present growth rate of output per worker is larger in country B than A.
   (d) The present growth rate of output per worker is larger in country A than B.

10. Which of the following statement is clearly FALSE?
   (a) One reason why governments subsidize education is because it is suspected to generate positive externalities.
   (b) Using "number of years of education" as a measure of human capital differences between countries tends to understate the true differences between poor and rich countries when one considers that quality of education differs also.
   (c) Between countries of the world today, there is a negative correlation between GDP per capita and average years of schooling.
   (d) Introducing human capital into the Solow model significantly improves the model's ability to predict income-level differences between countries of the world today.

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.

Growth accounting (30 points) As seen in class, suppose that output per worker is given by the following expression: $y_t = A_t k_t^{\alpha} h_t^{1-\alpha}$, where $\alpha = 1/3$ and subscript t denotes the year. We have the following data for the 25 years between 1975 and 2000: $y_{1975} = 1000$, $y_{2000} = 5000$, $k_{1975} = 5000$, $k_{2000} = 15000$, $h_{1975} = 1000$, $h_{2000} = 2000$.

(1a) (20 points) Calculate the share of total per capita income growth which can be attributed to productivity growth. Begin by writing down the equation which links total per capita income growth to productivity growth and factor growth. (No need to derive it. Just write it down.)

(1b) (10 points) In 1957, Robert Solow was ignoring the role of human capital accumulation in explaining output growth. Discuss how this omission would have affected your result in (a).

2. Population growth in the Solow model (30 points) Suppose that there are two countries, B and C, that differ in both their rates of investment and their population growth rates. GDP in country i is given by the following Cobb-Douglas function: $Y_i = AK_i^{\alpha}L_i^{1-\alpha}$, $i \in \{B, C\}$, $\alpha = 1/3$. In country B, investment is 20% of GDP and the population grows at 0% per year. In country C, investment is 5% of GDP and the population grows at 4% per year. The two countries have the same level of productivity, A. In both countries, the rate of depreciation, δ, is 5%.

(2a) (15 points) Based on the Solow model, derive the general expression for the steady state output per capita. Briefly but clearly explain each step in your derivation.

(2b) (15 points) Calculate the ratio of steady-state output per capita between the countries and discuss the effect of population growth on income. Discuss and justify how a more realistic value of α would affect this result.