

Given name:\_\_\_\_\_ Family name:\_\_\_\_\_

Student number:\_\_\_\_\_ Signature:\_\_\_\_\_

**UNIVERSITY OF TORONTO**  
**Faculty of Arts and Science**

**ECO362H1F (Economic Growth)**

Instructor: Kripa Freitas

**MIDTERM**  
**October 19, 2011**

**Duration: 110 minutes**

**Non-programmable calculator allowed**

This examination paper consists of ?? pages and ?? questions. Please bring any discrepancy to the attention of an invigilator. The number in brackets at the start of each question is the number of points the question is worth.

Answer all questions.

**This is a closed book, closed notes exam. Please put away all notes and cell phones before the exam. All diagrams need to be clearly labeled for full credit.**

1. Solow model with a constant population growth rate. The production function is given by  $Y_t = AK_t^\alpha L_t^{1-\alpha}$  where  $\alpha = 1/3$ . The economy invests a constant proportion ( $\gamma$ ) of total income. The depreciation rate ( $\delta$ ) productivity ( $A$ ) and population growth rate ( $n$ ) are also constant.
  - (a) [2] Suppose we have competitive markets for factors, so factors are paid their marginal product. What is the price/rental rate of capital in equation form for this economy?

- (b) [4] Starting from the capital accumulation equation  $K_{t+1} = (1 - \delta) K_t + I_t$ , derive the equation for the evolution of the capital labor ratio  $\left(k_t = \frac{K_t}{L_t}\right)$ . Show all your steps and working clearly for full credit.

- (c) [6] On a graph of  $k_t$  against  $k_{t+1}$  show graphically how the economy would evolve from any starting point. Make sure your diagram is clear and well labeled for full credit.

- (d) [4] Derive the equation for per-capita income as a function of the capital-labor ratio. Show all your steps and working clearly for full credit.

(e) [4] In this model, what is the growth rate of per capita income and what is the growth rate of total output?

(f) [4] Derive the equation for the steady state *per capita income*. Show all your steps and working clearly for full credit.

- (g) [10] Suppose 2 countries have the same depreciation rate ( $\delta = 0.05$ ) productivity, and investment rate ( $\gamma = 0.05$ ). They have different population growth rates. Country X has a population growth rate of 2% while country Y has no population growth. Calculate the ratio of per capita incomes in these two countries in the steady state. Show all your steps and working clearly for full credit.

- (h) [10] Suppose that you are in charge of the World Bank and are considering making a loan to country A. The aid would be a one time payment of  $B$ . This is a one time injection of cash into the economy. Suppose that all the money gets used to increase the *amount of investment* in that period *alone*. What would be the effects on the economy when the aid is used this way? Specifically describe the effects on the capital-labor ratio ( $k$ ) and per capita income ( $y$ ) in words and in diagrams. Make sure your diagrams are clearly labeled for full credit.

- (i) [10] Suppose now that instead of using the aid of  $B$  as described in part (h), country A is somehow able to use it to raise the *investment rate* in the economy. the new investment rate  $\hat{\gamma}$  is higher than the old investment rate  $\gamma$  ( $\hat{\gamma} > \gamma$ ). What would be the effects on the economy when the aid is used this way? Specifically describe the effects on the capital-labor ratio ( $k$ ) and per capita income ( $y$ ) in words and in diagrams. Make sure your diagrams are clearly labeled for full credit.

- (j) [4] If you were to make a recommendation as to how the aid money would be used (i.e. as in part (h) or part(i)) which one would you choose and why?

2. Demographics. Answer the following short answer questions, *briefly* ( 150 words or less)

- (a) [5] What is the mortality transition and list 3 reasons why it could have taken place?



- (b) [5] Briefly, what are 2 reasons why fertility falls as a country's income per-capita increases.

- (c) [4] Based on the mortality and fertility transition why do poor countries have higher population growth rates than rich countries?

### 3. Human Capital

- (a) [8] Consider a diagram of per capita income versus health in an economy. Plot one curve for health as a function of income  $[h(y)]$  and another for income as a function of health  $[y(h)]$ . The economy is currently at the intersection of those two curves. Suppose now that an effective vaccine against malaria is invented. Using your diagram explain in words and pictures the effect on health and income in the economy.

**End of examination**

**Total pages: ??**

**Total marks: 80**