VERY IMPORTANT INSTRUCTIONS: *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. Make sure to read all answer choices before choosing your answer.* GOOD LUCK!

QUESTIONNAIRE A

I. MULTIPLE CHOICE QUESTIONS (2 points each)

1. Over the past 30 years or so, China has experienced very high growth rates. Which of the following statement is clearly <u>not</u> consistent with the prediction of the Solow model?
   (a) As those high growth rates persist into the long run, there is no doubt that China will overtake the USA in terms of output per worker.✓
   (b) China's high growth rates can be explained by the fact that its capital stock per worker is much smaller than its steady-state stock level.
   (c) China's growth rate is likely to decrease as it converges to a steady-state level of its capital stock per worker.
   (d) The fact that rich countries such as Canada and the USA have lower growth rates than China can be explained by the fact that there are decreasing returns to capital per worker.
   (e) All of the above are consistent with the predictions of the Solow model.

2. Suppose an economy in which only two goods are being produced, good B and good C. The two goods are <u>perfect complements</u> in consumption, say because the quantities are consumed in a fixed ratio of 1 to 1. The respective production functions are $Y_B = A_B L_B$ and $Y_C = A_C L_C$, where A_B and A_C are productivity parameters and the labor force sectoral allocation must respect the condition $L_B + L_C = \bar{L}$, $\bar{L}$ being the total size of the labor force. Suppose that the annual growth rate of A_B is 3% while that of A_C is 2%. What is the long run annual growth rate of total output in this economy?
   (a) 0%
   (b) 2%✓
   (c) 2.5%
   (d) 3%
   (e) 5%

3. Suppose an economy with two sectors, a rural sector and an urban sector. Only labor is mobile between those sectors. The government imposes a minimum wage rate in the urban sector which is larger than the pre-existing competitive wage rate. Which of the following is expected to happen as a consequence?
   (a) The value of marginal product of urban workers will exceed that of rural workers.✓
   (b) The values of marginal product of labor will be equalized between sectors.
   (c) All workers will see their wage increase.
   (d) More workers will be employed in the urban sector.
   (e) More workers will be employed in the rural sector at a higher wage.

4. According to table 7.2 in the textbook, productivity in Canada in 2009 was equal to 88% that of the USA. Suppose that efficiency in Canada is equal to that in the USA and that all productivity growth is caused by technological progress. Based on the growth rate of productivity in the USA of 0.54% per year, how large (in years) would the technology gap between Canada and the USA be? (As done in class, assume that $A_t = T_t \times E_t$.)
   (a) 2 years
   (b) 5 years
   (c) 12 years
   (d) 18 years
   (e) 24 years✓

5. Let $y = Ak^\alpha$ denote the output per capita in the domestic economy. Consider the open economy version of the Solow model that we studied in class where the world rental rate of capital is equal to a given value r_w. Which of the following statement is FALSE regarding the domestic economy?
   (a) An increase in the (total factor) productivity parameter A will increase the GDP per worker.
   (b) An increase in the population growth rate will lower the GDP per worker.✓
   (c) An increase in the world capital rental rate will lower the GDP per worker.
   (d) An increase in the world capital rental rate will lower the stock of capital per worker used in the domestic economy.
   (e) An increase in the savings rate will increase the GDP per capita.✓
   I GOOFED. THERE WERE TWO CORRECT ANSWERS HERE. SORRY.

6. Which of the following assertions regarding population growth is clearly FALSE?
   Through the history of today's industrialized countries, population growth has never reached such high levels as observed today in many developing countries partly because
   a) in many developing countries, the mortality rate has fallen *more rapidly* than in the history of industrialized countries.
   b) in many industrialized countries, the fertility rate dropped *before* the drop in the mortality rate.✓
   c) in many developing countries, the fertility rate does not drop *as much* to compensate for the lower mortality rate.
   d) in many industrialized countries, the factors explaining the drop in the mortality rate occurred in sequence.

7. Which of the following assertions is clearly FALSE.
   a) For Malthus, the best way to improve living standards in the long run is through increased land productivity.✓
   b) Before the 1700s, humans generally lived at the subsistence level without much differences through time and places.
   c) The Malthus model does a pretty good job at explaining long run per capita economic growth before the 1700s.
   d) In Ireland, the introduction of the potato crop from the Americas has not contributed to improving the standards of living in the long run, as predicted by the Malthus model.

8. Suppose that there are only two goods produced in the world: computers and ice cream. Computers are traded on world markets but ice cream is not. The following table provides information about output quantities and prices for countries A and B.

Country	computers output per capita	ice cream output per capita	price computers local currency	price ice cream local currency
A	2	6	2$A	4$A
B	1	3	3$B	1$B

What should the *market* exchange rate be between the two countries?
(a) 0.25$B/$A
(b) 0.66$B/$A
(c) 1.5$B/$A✓
(d) 2$B/$A
(e) 4$B/$A

9. Based on the information provided in question 8, what is the *PPA* (purchasing power adjusted) exchange rate between the two countries?
   (a) 0.43$B/$A✓
   (b) 0.5$B/$A
   (c) 0.66$B/$A
   (d) 2$B/$A
   (e) 2.33$B/$A

10. A German government bond with two year maturity that promises to pay €500 in two years from now (with no other payment) can be bought today at the price of €400. A French government bond with one year maturity that promises to pay €500 in one year from now (with no other payment) can be bought today at the price of €450. What is the expected price for the German government bond one year from now. (assume no uncertainty)
    (a) €444.4✓
    (b) €450
    (c) €466.6
    (d) €482.3
    (e) €500

11. Suppose that a government bond with two year maturity offers an average return of 5% per year while a government bond with one year maturity today offers a return of 3%. What is the expected return on one year maturity bond for next year? (assume no uncertainty)
    (a) 2%
    (b) 3%
    (c) 4%
    (d) 5%
    (e) 7%✓

12. You have an investment project which requires the building of a factory at a cost of $1 million today. From this project, you expect to receive a net profit of $600,000.00 one year from now and $700,000.00 two years from now. After that, the factory is closed and no additional cost or benefit is incurred. Among the following, which is the maximum return per year on government bonds that would make this project still worth undertaking?
    (a) 8%
    (b) 11.5%
    (c) 15%
    (d) 18%✓
    (e) 20%

13. Assume that the economy can be represented by the Solow model with the following output function $Y = K^\alpha(eL)^{1-\alpha}$, where each variable is defined as seen in class. Suppose the investment rate is $\gamma = 10\%$, the depreciation rate is $\delta = 5\%$, the growth of the labor force size is $n = 2\%$ per year and the rate of technological progress is $\hat{e} = 3\%$ per year. What will be the long-run, steady-state growth rate of *output per worker*?
   (a) 0%
   (b) 10%
   (c) 5%
   (d) 3%✓
   (e) 2%

14. In the situation described in question 13 above, which of the following best describes the long-run effect of a sudden and permanent increase in population growth to 3% per year compared to an unchanged population growth rate at 2%?
   (a) Such a small increase in population growth is unlikely to have any effect in the long run.
   (b) Since the long-run growth rate of income per capita will remain the same, there will not be any effect on future per capita income levels.
   (c) The long-run growth rate of income per capita will remain the same. However, future per capita income levels will be lower.✓
   (d) The long-run growth rate of income per capita will drop, thereby reducing future per capita income levels.
   (e) The long-run growth rate of income per capita will drop. However, future per capita income levels will remain the same.

15. Calculate the Solow residual $\hat{A}$ for the 10 year period based on the following information for a country: (Assume Cobb-Douglas production function $Y = AK^\alpha L^{1-\alpha}$, where $\alpha = 1/3$.)

Year	2000	2010
Capital stock K	225	324
Labor size L	400	484
Output Y	360	535

   (a) 1.23%
   (b) 1.52%✓
   (c) 2.23%
   (d) 2.57%
   (e) 3.56%

You may go to the washroom before picking up the essay questions.

II. PROBLEM

Your answers must be accompanied with clear explanations. Graphs and equations without explanations will not get you far.

1.(20 points) Productivity differences You are given the following observations for Canada and South Korea concerning per capita output, physical capital and human capital (all relative to the USA values). You assume that the output per capita is given by the following relation:

$$y = Ak^\alpha h^{1-\alpha},$$

where $\alpha = 1/3$ and A denotes total factor productivity (TFP).

	y	k	h
Canada	0.75	0.86	1.01
South Korea	0.54	0.73	0.93

(a) Calculate the ratio of TFP between Canada and South Korea.

(b) Calculate what is the most important cause of South Korea's lower income: factor accumulation or productivity? Discuss briefly.

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2. (25 points) Trade and Investment in the National Accounts

The following table provides flows and stocks in the national accounts of a fictitious economy. The various variables are as defined in the text on *Trade and Investment in the National Accounts*. (Y_t^N = GNP; CA_t = current account balance; Q_t = imports)
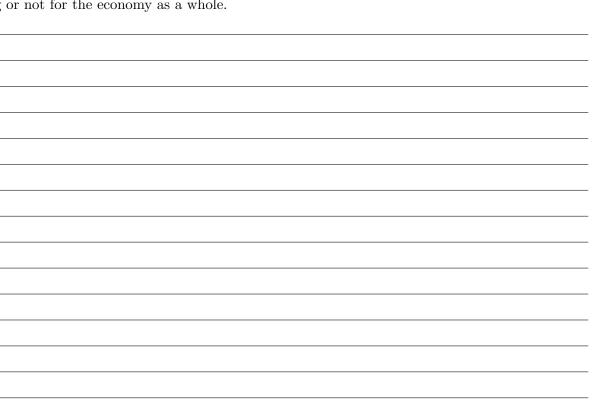
The stock variables denote values at the *beginning* of each period. The return on government bonds (foreign or domestic) is $r = 8\%$ and the depreciation rate on domestic capital is $\delta = 10\%$. Government bonds are the only form of foreign asset holdings and they do not depreciate. The population size and productivity level are assumed constant over time and we abstract from the possibility of human capital accumulation.

year (t)	Y_t	C_t	I_t	X_t	Q_t	NX_t	B_t	rB_t	Y_t^N	CA_t	K_t
2000	100	60	20		10			0			250
2001	99	50	35	30							

(a) (15) Fill in the blanks in the table above by providing a brief explanation for each equation being used for the first time.

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(b) (10) Explain why there is a drop in GDP between 2000 and 2001 and discuss whether it was a bad thing or not for the economy as a whole.

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3. The Solow model (25 points) Suppose that at any period t, the aggregate output of an economy (Y_t) depends on the total amounts of workers (L_t) and (physical) capital (K_t) only. This is represented by function F as follows: $Y = F(K, L)$, where subscripts t are removed for simplicity. (NB Productivity growth and population growth are zero in this problem.)

a) (5 points) Propose a property for function F which allows us to say that the output per worker (y) depends only on the amount of capital per worker (k), that is, $y = f(k)$. Demonstrate why.

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b) (10 points) Suppose that at every period, workers invest a constant proportion $\gamma \in (0, 1)$ of their income into increasing the capital stock but that the capital stock depreciates linearly at constant rate $\delta \in (0, 1)$. With the help of a graphic, describes the mechanism through which the economy will reach a steady-state in the long run. What is the assumption that must be imposed on function $f(k)$ that insures the existence of a steady state?

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c) (10 points) Suppose that up to time $\bar{t}$, the economy was operating at its long-run steady state values corresponding to an investment rate γ_1. At $\bar{t}$, the saving rate suddenly jumps to $\gamma_2 > \gamma_1$. Draw a graphic describing the evolution of income per worker *over time* and discuss the effects on the growth rate.