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ECON 405

Economic Growth and Development **29 November 2010**

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Midterm Exam

The Solow Model of Economic Growth

1. (40 Points) Suppose the production function of an economy is characterized by $Y = F(K,L) = K^{\alpha} L^{1-\alpha}$.

a. **(5 Points)** What is the intensive form of the production function?

b. **(10 Points)** Find the equation for the steady-state level of k from the fundamental equation of growth, assuming that $\delta > 0$, $n > 0$ and $I = sY$.

c. **(5 Points)** Find consumption per worker, *c*, for this steady state.

d. **(10 Points)**What is the golden rate of saving?

e. **(10 Points)** Suppose $s = 0.24$, $\alpha = 0.25$, $\delta = 0.04$, and $n = 0.02$. Find k_{SS}, y_{SS}, and c_{SS}.

2. **(20 Points)** Explain the Solow model by using the Graphical Approach. Do not forget to discuss (i) main properties of the production function, (ii) how equilibrium is found, (iii) whether the steady state is (globally) stable, (iv) what is the golden rate of capital and how we locate it, etc. In short, tell me all about whatever you know on the graphical approach of Solow model. Hint: Study and derive all information from class discussion plus lecture notes plus Barro and Sala-i-Martin.

3. (15 Points) Let the law of motion for A be given by $\dot{A} = 2 \cdot A^{1-\alpha} M^{\beta} N^{\gamma}$, where $M(t) = e^{mt}$ and $N(t) = e^{nt}$. Find the growth rate of A in the steady state.

4. (10 Points) Suppose that aggregate production function of an economy is characterized by $Y = \left(A \cdot K^{\sigma-1} + B \cdot L^{\sigma-1}\right)^{-\frac{1}{1-\sigma}}$, where Y is output, K is capital, L is labor, and A and B are constants. Show whether this production function features constant, increasing or decreasing returns to scale.

5. (15 Points) Suppose that a country's production function is defined as $Y = K(AL)^{1-\alpha}$, where $A = e^{at}$ and $L = e^{nt}$. Find the steady state value of capital, if possible.