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ECON 405
ECONOMIC GROWTH AND DEVELOPMENT **13 January 2012**
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Final

1. (**50 Points**) Suppose the economy is characterized by a production function in the form $Y_t = K_t^{\alpha}\left(A_t L_t\right)^{1-\alpha}$, where $A_t = A_0 e^{at}$, $A_0 = 1$, $a > 0$, and $L_t = L_0 e^{nt}$, $L_0 = 1$, and $n > 0$ and an overall utility function $U(c) = \int_0^{\infty} u(c_t) e^{-(\rho - n)t} dt$, where the instantaneous utility function *u(·)* belongs to the constant elasticity of intertemporal substitution (CIES) class: $u(c_t) = \frac{c^{1-\theta} - 1}{1-\theta}$, $\theta > 0$.

a. <u>Solve</u> the household's intertemporal utility maximization problem.

b. <u>Solve</u> the firm's profit maximization problem.

c. <u>Solve</u> the model at the steady state and find the equilibrium values of capital, output, and consumption.

d. <u>Formulate</u> the same problem by using the social planner's approach.

e. Suppose now that you are given the following parameter values: $\alpha = 0.5$, $\theta = 2$, $\rho = 0.1$, $n = 0.02$, $a = 0.02$, $A_0 = 1$, $L_0 = 1$, $\delta = 0.05$. <u>Calculate</u> the steady state values of capital, output, and consumption.

2. (**20 points**) Suppose that a Social Planner's optimization problem is

$$
\begin{aligned}
U &= \int_0^{\infty} e^{-(\rho - n)t} \frac{\left(h \cdot c^{\gamma}\right)^{1-\theta} - 1}{1-\theta} dt \\
\dot{k} &= k^{\alpha} - c - I_h - (n+\delta)k \qquad \text{(S)} \\
\dot{h} &= I_h^{\varepsilon} - (n+\delta)h
\end{aligned}
$$

Set up the Hamiltonian and indicate the first order conditions (do **NOT** solve the model):

3. (**30 points**) Suppose the economy's production function is $Y = A \cdot K + B \cdot L$, where A is the productivity of physical capital and B is the productivity of labor. For simplicity, assume that *population is constant* and that capital does not depreciate, $\delta = 0$. By using the social planner's approach, <u>solve</u> the optimal control problem and <u>find</u> the steady state values of capital, output, and consumption, if possible. In what economically significant way do results differ from the $Y = AK$ model? <u>Discuss</u>. Hint: We assume that $A > \rho$.