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ECON 603
Macroeconomic Theory **17 January 2011**
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Final

1. (**50 points**) Suppose that people have two period economic lives in overlapping-generations framework and do not care about future generations (there are no bequests). We represent the young-hood by subscript Y and the old-hood by O. We define the overall utility function of the representative consumer in cohort t/period t as $U = u(c_{t,Y}) + \frac{1}{1+\rho}u(c_{t+1,O})$ where $c_{t,Y}$ is the real consumption of the representative consumer in cohort t when she/he is young and $(c_{t+1,O})$ is the real consumption of the same consumer when she/he is old. As before, ρ is the subjective rate of discount. We assume that each consumer supplies one unit of labor inelastically. We continue to assume that utility function is $U(c) = \frac{c^{1-\theta}-1}{1-\theta}$ where θ is *elasticity of marginal utility*. We presume that the consumer generates only labor income in the young-hood and only interest income in the old-hood. Solve the competitive equilibrium and social planner's solution of this basic overlapping-generations model and comment on them.

2. (**20 points**) Suppose the economy's production function is $Y = AK + B$, where A is a productivity parameter and B is a constant number. For simplicity, suppose that population is constant and normalized to one in the economy. We also assume that capital does not depreciate, $\delta = 0$. By using the social planner's approach, solve the problem and find the steady state values of capital, output, and consumption, if possible. In what economically significant way the results differ from the original $Y = AK$ model that we did solve in the class?
Hint 1: We assume that $A > \rho$.
Hint 2: Follow exactly the same line of reasoning we did in $Y = AK$ to solve the problem.

3. (**30 points**) Suppose the economy is characterized by a production function in the form $Y_t = K_t^{\alpha}(A_t L_t)^{1-\alpha}$, 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 $u(\cdot)$ belongs to the constant elasticity of intertemporal substitution (CIES) class: $u(c_t) = \frac{c^{1-\theta}-1}{1-\theta}$, $\theta > 0$.

a. (**10 points**) Solve the household's intertemporal utility maximization problem.

b. (**10 points**) Solve the firm's profit maximization problem.

c. (**10 points**) Solve the model at the steady state and find the equilibrium values of capital per capita, output per capita, and consumption per capita.