

## Macroeconomics I

**Final Exam**

**Instructions:** Answer both questions time allowed 2 hours:

- (1) Describe the neoclassical model of economic growth. (That is, list the assumptions grouped by theme, e.g. demography etc.).

Show that solving the Social Planner's problem by using calculus and dynamic programming lead to the same pair of first-order difference equations.

What other conditions are needed to rule out time paths that do not lead to the saddle-path stable steady-state?

Suppose that due to an unforeseen conversion from Christianity to Buddhism the representative household's discount rate falls permanently. Starting from a steady-state prior to the conversion show graphically the path for the economy predicted by the model. Show the implied graph of consumption and the capital stock against time. (You can draw it as a continuous graph.)

Now suppose the conversion had been anticipated. That is if the conversion was to happen on Jan. 1st everyone became aware that it was going to happen on November 1st (but remained Christian until December 31st). What would the model predict in this case as to the time paths of consumption and the capital stock? Again show the graphs of each against time starting from just prior to Nov. 1 and extending beyond Jan. 1.

(2) Consider the following model of search with "promotion".

**Time:** Discrete, infinite horizon.

**Demography:** Single worker who lives for ever.

**Preferences:** The worker is risk-neutral (i.e.  $u(x) = x$ ). He discounts the future at the rate  $r$ .

**Endowments:** The worker receives income  $b$  per period when unemployed. Also, with probability  $\alpha$  he gets to sample a wage from the continuous distribution  $F$  with support  $(0, \bar{w}]$  where  $\bar{w} > b$ .

When employed at wage  $w$ , he receives that wage every period. Also with probability  $\lambda$  he gets laid-off (returns to unemployment) but with probability  $\gamma$  he gets promoted. Promotion means that the wage is increased by the factor  $\phi > 1$ . (That is the new wage is  $\phi w$ ). Promotion does not affect the probability of getting laid-off. (Ignore the possibility that both events could occur in the same period.)

- (1) Write down the relevant value functions (or asset value equations) and show that the worker will always like to be promoted. (Use end of period discounting with next period's uncertainty resolved at the end of this period, i.e. the standard search set-up.)
- (2) Suppose now that we could observe a continuum (of mass 1) of such individuals. Draw a diagram showing the flow rates of individuals across states. Derive a system of equations that can be solved for the steady state proportions of the population that are in each state.
- (3) Derive an implicit equation for the critical value of  $\gamma$  such that the reservation wage,  $w^* = b$ .