6E:204 Macroeconomics
Assignment 9

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1. A worker maximizes
$$E_0 \sum_{t=0}^{\infty} \left(\frac{1}{1+r} \right)^t (c_t - a_t),$$
where $r > 0$, c_t is consumption, and a_t is effort in searching for work. If the worker is unemployed at the beginning of period t, he or she receives an unemployment insurance benefit of b units of consumption goods. If he or she expends zero effort in searching for work, then a job offer is received with probability π_1. Alternatively, if he or she expends γ units of effort, then a job offer is received with probability π_2. Assume that $0 < \pi_1 < \pi_2 < 1$ and $\gamma > 0$. An employed worker receives a real wage of $w > 0$, and is separated from his or her job with probability δ, where $0 < \delta < 1$.

   (a) Determine conditions under which an unemployed worker will expend γ units of search effort and will accept any job offer, and determine the steady state unemployment rate in this case.

   (b) Determine conditions under which an unemployed worker will expend zero units of search effort and will accept any job offer, and determine the steady state unemployment rate in this case.

   (c) Determine conditions under which an unemployed worker will expend zero units of search effort and will not accept any job offer, and determine the steady state unemployment rate in this case.

   (d) Show how the unemployment benefit b affects the steady state unemployment rate.

   (e) Explain your results in parts (a)-(d).

2. Consider a search model with a continuum of agents with unit mass, and let γ_t denote the fraction of agents who are employed in period t. Each agent has preferences given by

$$E_0 \sum_{t=0}^{\infty} \left(\frac{1}{1+r} \right)^t (u(c_t) - a_t),$$

where $r > 0$, c_t is consumption, a_t is labor effort, and $u(\cdot)$ is a strictly increasing function. An unemployed agent is searching for a production opportunity. There is a congestion externality, in that production opportunities arrive with probability $\theta\gamma_t$, where $\theta > 0$. That is, the more employed agents there are (and therefore the fewer unemployed agents there are) the more frequently production opportunities arrive. A production opportunity gives an unemployed agent the ability to produce y units of consumption goods at a cost of α units of labor. Assume that $u(y) > \alpha > 0$. Once an agent produces, he or she becomes employed, and searches for a trading partner (one cannot consume one's own output). An employed agent meets a trading partner with probability $b\gamma_t$, where $b > 0$. When two employed agents meet, they exchange goods, consume, and then become unemployed.

(a) Solve for all of the steady state equilibria.

(b) If there are multiple equilibria, can these be Pareto-ranked?

(c) Explain your results in parts (a) and (b).