Midterm Examination

Instructions: This is a 75 minute examination worth 100 total points. Each question is worth 25 points. Choose FOUR out of the following FIVE questions. DO NOT ANSWER MORE THAN FOUR QUESTIONS. If you do, your grade will be based on the LOWEST four questions.

In order to get full credit, you must give a clear, concise, and correct answer, including all necessary calculations. Notes and books will not be permitted. Explain your answers clearly and use graphs when helpful.

1. Consider a government that must fund a given level of spending $G$, but does not have access to lump-sum taxes.

(a) The government imposes a proportional income tax $\tau$ on the representative consumer, so after-tax income is $(1-\tau)[wN + rK + \pi]$. What effect does this have on the competitive equilibrium, compared to the case of lump-sum taxes?

(b) The government instead imposes a consumption tax $t$, increasing the effective cost of consumption goods from 1 to $(1 + t)$. What effect does this have on the competitive equilibrium, compared to the case of lump-sum taxes?

(c) The government must decide whether to impose an income tax or a consumption tax. In either case, total tax receipts must equal $G$. Does the representative consumer prefer one tax to the other? Explain.

2. Consider the problem of how to eat a birthday cake. You are given a cake of size $y$ on your birthday in the first period (and nothing on the next day). The only way to eat cake tomorrow is to save some of it, however part of the cake goes stale between today and tomorrow. So if you eat $c$ in the first period, saving an amount $s = y - c$ for tomorrow, when tomorrow comes you can only consume $c' = (1-x)s$, where $x > 0$ is the spoilage rate. You have standard preferences:

$$u(c) + \beta u(c')$$

over your consumption of cake today ($c$) and tomorrow ($c'$), and $0 < \beta < 1$.

(a) Write down your decision problem and find the first order conditions for your optimal choice of cake consumption.

(b) Do you decide to eat more cake today or tomorrow?
3. Suppose that instead of simply being a waste of output, government purchases are used for infrastructure which increases current productivity. In particular, suppose that the government increases its current purchases ($G$ increases) and that this in turn increases total factor productivity ($z$ increases). The government funds the higher expenditure by lump sum taxes. Using the static general equilibrium model from class (and diagrams when possible), discuss the effects this policy change will have on the equilibrium levels of output, employment, and consumption. Be sure to consider income and substitution effects.

4. Suppose the representative household has preferences over consumption $c$ and leisure $l$ (with $h$ total hours in the day) given by:

$$u(c, l) = c - \frac{(h - l)^2}{2}.$$ 

The representative firm produces according to:

$$Y = zK^\alpha N^{1-\alpha}$$

where $z$ is total factor productivity and $K$ is a given fixed amount. Suppose that there is no government spending, so the household budget constraint is:

$$c = rK + wN.$$ 

The goods market clearing condition is thus:

$$Y = c$$

(a) Find the household’s labor supply function. How does it vary with the wage $w$?

(b) Solve for the equilibrium levels of output, labor, and consumption.

5. Consider a two period model in which the government runs a loan program. Loans are made to consumers in the first period of the model at the market interest rate $r$, with the total quantity of loans denoted $L$. The government loans are financed via lump sum taxes on consumers in the first period, and government spending is zero in both periods. In the second period, when the loans are repaid, the government rebates this amount as lump-sum transfers to consumers.

(a) Write down the budget constraints of the government in the first and second periods, and then derive its present value budget constraint.

(b) What is the effect of this program on the consumption and savings decisions of households? Explain your answer.