Instructions: You have 180 minutes to complete the exam. The exam is designed to take 150 minutes. Blue books will be distributed 15 minutes into the exam. Read all questions completely, and answer each one in the blue books provided. Points will be awarded in proportion to the minutes suggested for each problem. Good Luck.

1. **Blue Book I Short answer** (60 minutes)

   (a) In Cooley and Hansen’s paper “The Inflation Tax in a Real Business Cycle Model” the welfare cost of a steady ten percent inflation is estimated at 0.5 percent of consumption when the period is taken to be one quarter, but only 0.15 when the period is taken to be one month. Why is this?

   (b) The U.S. Bureau of Labor Statistics measures unemployment by asking individuals if they are currently employed and if they are actively seeking work. Those who answer “no” to the first question and “yes” to the second are classified as “unemployed.” Are there unemployed workers in this sense in Gary Hansen’s indivisible labor model?

   (c) An unemployed worker comes to a fork in the road. Down one road is a town, Eduardoville; down the other is Tonytown. In both towns, unemployed workers receive one wage offer, $w$, per period to work at a randomly drawn wage. Each wage offer in Eduardoville is independently drawn from the distribution, $\text{Prob}(w_i \leq w) = F(w)$, while each wage offer in Tonytown is independently drawn from the distribution, $\text{Prob}(w_i \leq w) = G(w)$. The mean of the two distributions are equal but the variance of the wage distribution in Tonytown is twice that of Eduardoville. In both towns, the worker has the option of rejecting a wage offer, in which case she receives $c$ this period in unemployment compensation and waits until next period to draw another wage offer. If the worker accepts the offer to work at $w$ she receives $w$ each period forever. There is no recall of past offers. The unemployed worker wishes to maximize $\sum_{t=0}^{\infty} \beta^t y_t$, where $y_t$ is her income in period $t$.

   Will the worker have the same reservation wage in both towns? Which road should the worker take? Explain.

   (d) In Mortensen and Pissarides’ paper “Job Creation and Job Destruction in the Theory of Unemployment” if a worker receives a job offer will he/she ever reject it? Explain. Over the lifetime of a match do wages rise, on average, with tenure?

   (e) How do Barro and Gordon in their paper “Rules, Discretion and Reputation in a Model of Monetary Policy” “solve” the government’s credibility problem (of wishing to make a decision sooner than it must)?
2. **Blue Book II Do your credit crunches** (50 minutes)

Consider an economy with a continuum of *ex ante* identical agents (mass 1) each of whom maximizes:

$$E \sum_{t=0}^{\infty} \beta^t u(c_t), \quad 0 < \beta < 1,$$

subject to $a_{t+1} = R_t a_t + y_t - c_t$ with $a_0 = 0$ given. Here $c_t$ is the consumption of an agent at time $t$, $y_t$ is the agent’s labor income, $a_t$ is the amount of a single earning asset valued in units of the consumption good, held at the beginning of period $t$, and $R_t$ is the real gross rate of interest on the asset between dates $t$ and $t+1$. Further assume $u(\cdot)$ is concave, strictly increasing, and twice differentiable.

At each date $t$, an agent receives $y_t = \bar{y} + \delta$ in labor income with probability 1/2 and $y_t = \bar{y} - \delta$ with probability 1/2. Assume $\bar{y} > \delta \neq 0$. This agent specific randomness is distributed identically and independently across agents; there is no aggregate uncertainty in this economy.

While agents are free to borrow and lend among themselves, any individual agent’s borrowing cannot exceed an ad hoc borrowing limit: $a_t > -F$, where $F$ is less than the maximal amount the agent could repay assuming all her future consumption is zero even if all future labor income equals $\bar{y} - \delta$. Thus all borrowing and lending is riskfree.

(a) State the agent’s Bellman equation.

(b) Define a stationary equilibrium from this economy.

(c) What is aggregate savings in this economy?

(d) Is the equilibrium interest rate less than, equal to, or greater than $\beta^{-1}$? Explain.

Now consider a change in $F$. That is consider a different economy which is identical to the one described above except that in this new economy the borrowing constraint, $F'$ is tighter than in the previous economy (i.e. $F' < F$).

(e) How does this tightening of the borrowing constraint affect:

i. aggregate savings,

ii. the interest rate,

iii. mean consumption,

iv. the variance of consumption, and

v. expected utility?

Explain the economic intuition behind your answers.
3. **Blue Book III Is a beer in Friedman’s bar a credit good?** (40 minutes)

Consider a consumer living in a cash-in-advance economy like the one presented in class. Her preferences are:

\[ E \sum_{t=0}^{\infty} \left( \frac{1}{1+\rho} \right)^t \ln(c_{1t} \cdot c_{2t}), \]

where \( c_{1t} \) is her consumption of cash goods and \( c_{2t} \) is her consumption of credit goods. The money supply grows at a constant rate \( \pi \) and the resource constraint is \( c_{1t} + c_{2t} = y(s_t) \), where \( s_t \) can take on \( n \) possible discrete values and follows a Markov chain. Cash goods are subject to a cash-in-advance constraint.

(a) If the consumer is behaving optimally, to what magnitude does she equate the marginal rate of substitution between cash and credit goods? [State both sides of the equation, so I know how you are defining the MRS. Define all terms you need to introduce.]

(b) Show that an expected inflation rate of \( \frac{-\rho}{1+\rho} \) maximizes current period utility at date \( t \). Explain the intuition behind this result.