※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. (Short-answer Questions) Answer the following questions in brief. Expect a deduction of points for unduly lengthy answer.

a. (2 points) What is Taylor's rule?

b. (2 points) What is a yield curve?

c. (2 points) Name the Laureates of the 2018 Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel (aka Nobel Prize in Economics). What are their main contributions?

d. (2 points) Explain why emerging market countries such as Taiwan, South Korea and China have accumulated substantial foreign reserves.

e. (2 points) What is macroprudential policy?

2. (Investment Adjustment Costs) Consider an infinitely lived firm that chooses investment i_t at every period t, and discounts future profits at a constant rate r. At each period, the firm produces with the stock of capital k_{t+1} and makes the investment decision through the following law of motion of capital formation

$$k_{t+1} = i_t$$

where we are assuming that capital fully depreciates within the period.

The firm's profits are given by

$$\pi_t = A_t f(k_t) - q_t i_t - c(i_t)$$

where A_t is technology shock, $f(k_t) = k_t^{\alpha}$, $\alpha < 1$, is a production function, and q_t is the purchasing price of a unit of investment (in terms of output, of which price is normalized to one). Moreover, assume that the firm faces an adjustment cost, that is, for every unit of investment made, the firm loses $c(i_t)$ units of output as a cost of installing the new capital. Assume that the adjustment cost function is

$$c(i_t) = \frac{\phi}{2} i_t^2, \quad \phi > 0$$

a. (5 points) Denote the value of the firm at date t by V_t. Express the value of the firm in recursive form.

b. (5 points) Write down the problem of the firm, and find the first-order condition (FOC) with respect to k_{t+1}.

c. (5 points) Based on this FOC, use a graph to show how the optimal capital stock k_{t+1} is determined for the firm.

d. (5 points) How does ϕ affect capital accumulation of the firm?

3. (Social Security) Consider an economy that lasts for two periods 1 and 2. The economy is populated by two types of individuals, S and L, who are both born in period 1. The individuals of type S live only for the first period. The individuals of type L live for both periods. There is a fraction θ of types S and a fraction $1-\theta$ of types L. Type S has preferences $u(c_1') = \log c_1'$ and has an endowment of income y. Type L has preferences $u(c_1, c_2) = \log c_1 + \beta \log c_2$ and endowments of income y in each of the two periods. Households can buy a one-period bond, b, in period 1. The net interest rate is fixed at r.

The government implements a social security system as follows. In period 1, it taxes all households at rate τ, and then uses the tax revenues to buy a one-period bond, b^G. The net interest rate for b^G is r^G. In period 2, it pays back the capitalized tax revenues to all the old households alive in that period using a lump-sum transfer TF.

a. (5 points) Write down the government budget constraints at periods 1 and 2. Write down the intertemporal government budget constraint.

b. (15 points) Assume that $\theta = 0$ and $r^G = r$. Write down the period-by-period budget constraints for households.

   Solve the household problem and determine consumption allocations (c_1, c_2) for type L. Does the social security system affect the household's choice?

c. (10 points) Assume that $\theta = 0$ and $r^G < r$. That is, the government is bad at managing funds. Does the social security system affect the household's choice?

d. (15 points) Now assume that $r^G = r$ but $\theta \neq 0$. Write down the intertemporal government budget constraint, and solve the household problem for both types of individuals. What are the effects of the social security system on households of types S and L?

4. (Search Model with Tax on Wage) Consider an economy where workers are risk neutral, live two periods, and have discount factor $\beta \in (0,1)$. An unemployed worker starts off the first period unemployed, searches and receives a job offer for sure. In each period, the worker receives a job offer of wage w_L with probability θ and an offer of w_H with probability $1-\theta$. The worker either accepts the offer, or he/she rejects it and gets an unemployment compensation of b. A worker who accepts the offer remains employed and receives the same wage in the second period. If the job offer is rejected in period 1, the worker will search again in period 2. However, the wages in both periods are taxed at rate τ. Assume that

$$w_L < \frac{b}{1-\tau} < w_H.$$

Let y_t denote the income either from work or unemployment benefits, and $E(\cdot)$ refer to the expected value. The worker seeks to maximize the discounted lifetime utility:

$$u(y_1) + \beta E(u(y_2)), \qquad 0 < \beta < 1,$$

a. (5 points) Given that the worker is risk neutral, rewrite the worker's discounted lifetime utility.

b. (10 points) Let the reservation wage be defined as the wage such that the individual is indifferent between accepting and rejecting an offer. Let $\bar{w}_1$ and $\bar{w}_2$ denote the reservation wages in periods 1 and 2, respectively. Find $\bar{w}_1$ and $\bar{w}_2$.

c. (10 points) Calculate how the reservation wage in period 1 changes with τ. Explain your results.