

**Instructions:** This exam consists of 7 pages; please check your examination booklet. The total number of points is 100.

Good luck!

**PART I MULTIPLE CHOICE QUESTIONS**

**Instructions:** This part consists of 20 multiple-choice questions, each of which is worth 3 points. Circle one and *only* one answer.

1. Suppose that a government spends $200 on goods and services, pays $50 as transfer payments to individuals, and runs a budget surplus of $100. Then, the tax revenue of the government must be
   (a) $150
   (b) $350
   (c) $50
   (d) $250

2. Assuming that real wages are measured on the vertical axis and employment on the horizontal axis, which of the following events will lead to a decrease in the equilibrium real wage and an increase in employment?
   (a) An increase in female labor force participation.
   (b) An increase in the rental rate of capital, which must be used in addition to labor in the production process.
   (c) A decrease in the rental rate of capital, which must be used in addition to labor in the production process.
   (d) An increase in the tax rate that negatively affects people’s desire to work.

3. For an individual who tries to optimally choose between consumption and leisure, the budget constraint indicates
   (a) the maximum output that can be produced with a given amount of labor.
   (b) the total expenditure on goods that can be supported by wage earnings.
   (c) the maximum utility that can be reached by consumption and work.
   (d) the difference between total revenue and total cost of production.
4. Which of the following is a true statement about the Laffer Curve?
   (a) The Laffer curve is a linear line that shows a positive relationship between
       the income tax rate and the government’s tax revenue.
   (b) The Laffer curve is a linear line that shows a negative relationship
       between the income tax rate and the government’s tax revenue.
   (c) The Laffer Curve shows a non-linear relationship between the income tax
       rate and government’s income tax revenue.
   (d) None of the above.

5. In the U.S, private consumption expenditures on goods and services constitute
   (a) 60-70% of GDP.
   (b) 20% of GDP.
   (c) 10% of GDP.
   (d) 40% of GDP.

6. In an open economy if private savings are smaller than private investment,
   (a) the government may borrow money from the rest of the world to
       compensate for the extra investment demand.
   (b) the economy may run a trade deficit.
   (c) the economy may run a trade surplus.
   (d) Both (a) and (b).

7. If the equilibrium real wage is 2, aggregate demand for goods is 8, the total stock
   of money is $36 and the propensity to hold money is 0.5, then the nominal wage
   is
   (a) $2.5.
   (b) $36.
   (c) $24
   (d) $18.

8. Which of the following is a not true about the U.S economy?
   (a) Private consumption expenditures are the biggest component of GDP.
   (b) Private investment expenditures are the most volatile component of GDP.
   (c) The foreign sector runs a trade surplus.
   (d) Private savings are not enough to cover private investment demand.

9. The labor supply function
   (a) shows the amount of labor firms are willing to employ at each real wage.
   (b) shows the fraction of time households devote to work at each nominal
       wage.
   (c) is positively sloped if the substitution effect dominates the wealth effect.
   (d) is positively sloped if the wealth effect dominates the income effect.
10. Which of the following is *not* true about the velocity of money?  
(a) It is defined as the number of times a dollar bill changes hands.  
(b) It is defined as the fraction of total consumption expenditures that an individual holds as cash. 
(c) Its value changes over time.  
(d) Both (b) and (c).

11. Which of the following is a part of the U.S’s GDP?  
(a) The value of salsa consumed by Americans that is produced in Mexico.  
(b) The value of Japanese cars that are produced in the U.S and sold in Japan.  
(c) The value of Japanese cars that are produced in Japan and sold in the U.S.  
(d) The value of American cars that are produced and sold in Mexico.

12. Which of the following is a flow variable?  
(a) Wealth.  
(b) Debt.  
(c) Investment.  
(d) Capital.

13. The marginal product of labor is  
(a) the change in total output produced when one more unit of labor is hired  
(b) the derivative of the production function with respect to labor input.  
(c) increases as more labor is hired if the production function exhibits decreasing returns to scale.  
(d) Both (a) and (b).

14. Periods in which national output is below its long-run growth trend are called  
(a) booms  
(b) recessions  
(c) staginations  
(d) expansions

15. Suppose that a firm produces its output by using labor according to the technology \( Y = L^{1/2} \). Then, the labor demand function for this firm will be  
(a) \( L = \left( \frac{2w}{p} \right)^{-1/2} \)  
(b) \( L = 2 \left( \frac{w}{p} \right)^{-1/2} \)  
(c) \( L = \frac{1}{4} \left( \frac{w}{p} \right)^{-2} \)  
(d) \( L = 4 \left( \frac{w}{p} \right)^{-2} \)
16. The value-added by a firm is the difference between
   (a) total revenue and total cost.
   (b) total value of output sold and the value of intermediate inputs of
       production purchased from other firms.
   (c) total profits and the value of intermediate inputs.
   (d) total profits and total cost.

17. Which of the following is a consumption good?
   (a) A refrigerator purchased by a household to store food.
   (b) An oven purchased by a restaurant.
   (c) A laptop purchased by an individual who runs a private internet business
       from his home-office.
   (d) (a) and (c).

18. Which of the following is true for an open economy?
   (a) Capital is free to move out of the economy.
   (b) Total (private plus public) savings minus total investment is equal to
       government deficit plus net exports.
   (c) The economy always runs a trade surplus.
   (d) All of the above.

For questions 19 and 20, refer to the following box.

Lagerland, an open economy, has two firms and a household who owns the firms. The household provides labor and capital services to the firms. Firms pay wages and rents in return for the household’s services of labor and capital.

Firm A produces leather by using labor and capital. It pays $300 as wages and $400 as rents. It produces $800 worth of leather, which is totally purchased by Firm B that produces shoes.

Firm B uses leather and labor to produce $2,000 worth of shoes. The household spends $600 on shoes. The rest of the output is exported.

The total wage income of the household (from Firm A and Firm B) is $700.

19. What is total profit of Firm A and Firm B?
   (a) $2,000
   (b) $900
   (c) $1,900
   (d) $1,700
20. What is the GDP of Lagerland?

(a) $1,400  
(b) $2,000  
(c) $600  
(d) $1,100

**PART II MODEL SOLVING**

*Instructions:* This part of the exam consists of two questions. Each question is worth 20 points. Show all your calculations.

**Question 1 (20 points) Static classical closed economy**

Consider an economy with a representative firm and a representative household who owns the firm. Preferences of the household are represented by the utility function

\[ U(C, L^s) = \ln C + 0.5 \ln(1 - L^s) \]

where \(C\) is the consumption, \(L^s\) is the labor supplied. The production function is \(Y = \left(L^D\right)^{2/3}\), where \(Y\) is output produced and \(L^D\) is labor input.

(a) (5 pnts) Write down the maximization problem that the household solves. Find the equation of the labor-supply curve.

\[
\begin{align*}
\max_{C,L^s} \left\{ \ln C + 0.5 \ln(1 - L^s) \right\} & \quad \text{subject to } pC = wL^s \\
\max_{L^s} \left\{ \ln \left( \frac{wL^s}{p} \right) + 0.5 \ln(1 - L^s) \right\} & \\
FOMC : \frac{1}{L^s} - 0.5 \frac{1}{1 - L^s} = 0 \Rightarrow L^s = 2/3
\end{align*}
\]
(b) (5 pnts) Write down the maximization problem that the firm solves. Find the equation of the labor demand curve.

$$\max_{Y,L^D} \left\{ pY - wL^D \right\} \quad \text{subject to} \quad Y = \left( L^D \right)^{2/3}$$

$$\Leftrightarrow \max_{\mu^D} \left\{ p \left( L^D \right)^{2/3} - wL^D \right\}$$

$$\text{FOC} : \frac{2}{3} \left( L^D \right)^{-1/3} - w = 0 \Rightarrow L^D = \left( \frac{3}{2} \frac{w}{p} \right)^3$$

(c) (5 pnts) Find the equilibrium real wage and employment. Also, find how much output the firm produces and how much the household consumes.

$$L^D = \left( \frac{3}{2} \frac{w}{p} \right)^3 = L^s = \frac{2}{3} = 0.66$$

$$\Rightarrow \left( \frac{w}{p} \right)^{-3} \left( \frac{3}{2} \right)^{-3} = \frac{2}{3} \Rightarrow \left( \frac{w}{p} \right)^{-3} = \left( \frac{2}{3} \right)^{-2} \Rightarrow \frac{w}{p} = \left( \frac{2}{3} \right)^{2/3} = 0.76$$

$$L^D = L^s = L_e = 2/3 = 0.66$$

$$Y = \left( L^D \right)^{2/3} = 0.76$$

$$C = \frac{w}{p} L^s = 0.76 \times 0.66 = 0.50$$

(d) (5 points) Suppose that the Central Bank supplies $5 to the economy and the household holds $4 of his total consumption expenditures as cash in his pocket. Find the price level ($p$) and the nominal wage ($w$). Then find how much profit the firm makes in equilibrium.

$$P = \frac{M^s}{kC} = \frac{5}{3/4 \times 0.50} = 13.3$$

$$\frac{w}{p} = 0.76 \Rightarrow w = 0.76 \times 13.3 = 10.17$$

$$\pi = pY - wL^D = (13.3)(0.76) - (10.17)(0.66) = 3.39$$
Question 2 (20 points) Labor income taxes and equilibrium

Take the same representative firm and household in Question 1. Suppose that there is also a government in the economy that taxes each dollar of labor income earned by 25%, i.e., \( t=0.25 \). Therefore, the right-hand side of the budget constraint of the individual becomes

\[
pC = wL^s (1 - t) \quad \text{which is equal to} \quad pC = 0.75wL^s.
\]

(a) (8 points) Derive the new labor supply curve for the individual.

(b) (4 points) Will the firm’s problem change as a result of the income tax? Why?

(c) (8 points) Explain the effects of the income tax on the real wage and employment by using the labor-demand and labor supply diagram. (Make sure to indicate which direction each curve shifts and how the equilibrium value of each variable changes.)

THIS IS AN EXERCISE FOR YOU!