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| 考試科目 | 經濟學 | 系所別 | 商學院共同科 | 考試時間 | 2月6日(五)第二節 |
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I. Multiple Choice (1 points each)

Identify the letter of the choice that best completes the statement or answers the question.

- Suppose the introduction of new tariffs on imported ovens not only raises the prices of imported ovens but also those of domestic ovens. We can conclude that imported and domestic ovens are
 - substitutes.
 - complements.
 - unrelated.
 - None of the above is correct.
- According to consumer theory, "if consumers do not buy less of a commodity when their incomes rise, they will
 - surely buy less when the price of the commodity rises."
 - surely buy more when the price of the commodity rises."
 - surely buy less when the price of the commodity falls."
 - either buy more or less when the price of the commodity rises."
- People with hidden health problems are more likely to buy health insurance than are other people. This is an example of
 - moral hazard and makes the cost of health insurance higher than otherwise.
 - moral hazard and makes the cost of health insurance lower than otherwise.
 - adverse selection and makes the cost of health insurance higher than otherwise.
 - adverse selection and makes the cost of health insurance lower than otherwise.
- Ben has a concave utility function $U(W) = W^{0.5}$, where W denotes his wealth. His only asset is shares in a start-up company. Tomorrow he will learn the stock's value. He believes that it is worth \$144 with probability $\frac{1}{2}$ and \$100 with probability $\frac{1}{2}$. What is the risk premium he would pay to avoid bearing this risk?
 - 1
 - 2
 - 10
 - 12
- Which of the following demonstrates the law of demand?
 - Ashlyn buys more apples at \$3 per pound than at \$5 per pound, other things equal.
 - Brian buys fewer croissants at \$1 per croissant than at \$2 per croissant, other things equal.
 - After Charles got a raise at work, he bought more pretzels at \$2 per pretzel than he did before his raise.

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- 作答於試題上者，不予計分。
- 試題請隨卷繳交。

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D. Danny buys fewer Snickers at \$1.5 per bar after the price of Skittles falls to \$1 per bag.

6. In the long run, the toothpaste market is monopolistically competitive, and WhiteMan is one of the firms. WhiteMan's long-run cost function is $c(q) = q^3 - xq^2 + 14q$. The firm faces demand $q = 5 - \frac{1}{2}p$. What is x ?

- A. 3
- B. 4
- C. 5
- D. 6

7. There are four residents $i = 1, 2, 3,$ and 4 in a small village. If resident i donates d_i dollars, total public funding is $D = \sum_{i=1}^4 d_i$. Resident i 's utility is $U_i = m_i - d_i + i \cdot \ln(D)$, where m_i is the money resident i has and $m_i > 6$ for all i . What is the socially optimal level of D ?

- A. 8
- B. 10
- C. 12
- D. 14

8. Demand for bubble tea is $q_d = 42 - 2p$, and supply is $q_s = 0.5p - 2$. Consumption causes an obesity external cost $c_s = 3q^2$. Which policy achieves the social optimum?

- A. Close the bubble tea market.
- B. For every bubble tea consumed, the customer pays the bubble store 12 dollars more.
- C. For every bubble tea produced, the bubble store pays 12 dollars to the government.
- D. Set a quota equal to $q = 3$.

9. Consider the game in the payoff matrix.

| | | | |
|----------|---|----------|--------|
| | | Player 2 | |
| | | B | T |
| Player 1 | B | (2, 1) | (0, 0) |
| | T | (0, 0) | (1, 2) |

Which the following description is wrong?

- A. There are 3 Nash equilibria.
- B. In the mixed-strategy Nash equilibrium, all players get less than 1.
- C. If player 1 moves first, (2, 1) can be the Nash equilibrium payoff.
- D. If player 2 moves first, (2, 1) cannot be a Nash equilibrium payoff.

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10. Regarding the “tragedy of the commons,” which statement is incorrect?
- Rivalry in the use of the resource is the main cause of the problem.
 - It is an example of the prisoner’s dilemma.
 - Limiting access to the common resource can alleviate the problem.
 - The government may use a cap-and-trade policy to address the problem.
11. In the base year, consumers buy mostly beef. In the current year, beef prices rise sharply, so consumers switch to chicken (which did not rise in price). Assume the CPI is calculated using a fixed basket, while GDP deflator uses current quantities. Which statement is MOST likely true?
- CPI and GDP deflator both overstate inflation equally.
 - CPI overstates inflation more than GDP deflator.
 - GDP deflator overstates inflation more than CPI.
 - Both CPI and GDP deflator correctly measure inflation.
12. A country imports most of its consumer electronics. Due to a global chip shortage, import prices of electronics rise by 30%, while domestically produced goods barely change in price. No major change occurs in quantities produced. What happens?
- CPI rises significantly; GDP deflator rises little.
 - GDP deflator rises significantly; CPI rises little.
 - Both rise significantly.
 - Neither rises significantly.
13. In the simple Keynesian cross model with exogenous investment, the government requires households to deposit part of their income into restricted mutual-fund accounts for their children, and these funds are not used to finance any current domestic physical investment (they are held purely as financial assets for future use). What happens to current output?
- Current output rises because higher saving leads to higher investment.
 - Current output falls because consumption decreases and investment is exogenous.
 - Current output does not change because only government spending matters.
 - Current output rises because mutual-fund purchases count as investment in GDP.
14. U.S. inflation this year is 5%, and Taiwan’s inflation is 2%. Assume relative PPP holds, so the real exchange rate remains constant. What should happen to the nominal exchange rate? Let the exchange rate be quoted as NT dollars per U.S. dollar (NTD/USD).
- NTD/USD should rise by about 3%.
 - NTD/USD should fall by about 3%.
 - NTD/USD should not change.
 - The direction cannot be determined.

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15. Consider a small open economy with free capital mobility and a floating exchange rate. If the government increases its budget deficit (holding everything else constant), what is the most likely effect on the interest rate, net capital flows, and the real exchange rate?

- A. Domestic interest rate rises; capital inflow increases; domestic currency appreciates.
- B. Domestic interest rate rises; capital outflow increases; domestic currency depreciates.
- C. Domestic interest rate remains unchanged; capital inflow increases; domestic currency appreciates.
- D. Domestic interest rate remains unchanged; capital outflow increases; domestic currency depreciates.

16. Which of the following definitions is correct?

- A. Labor force = number of employed.
- B. Labor force = population - number of unemployed.
- C. Unemployment Rate = $(\text{number of unemployed} \div \text{adult population}) \times 100$.
- D. Unemployment Rate = $(\text{number of unemployed} \div [\text{number of employed} + \text{number of unemployed}]) \times 100$.

17. People will want to hold more money if the price level

- A. or the interest rate increases.
- B. or the interest rate decreases.
- C. increases or the interest rate decreases.
- D. decreases or the interest rate increases.

18. The Fisher equation states the long-run relationship between nominal interest rate, real interest rate, and the inflation rate. Suppose that the Fisher equation holds and that monetary policy is neutral in the sense that it has no impact on the real interest rate in the long run. Then given that the real interest rate is fixed over time, if the central bank increases the nominal interest rate target, how will the inflation rate respond in the long run?

- A. Increase
- B. Decrease
- C. Unchanged
- D. Uncertain

19. An increase in expected inflation shifts

- A. the long-run Phillips curve right.
- B. the short-run Phillips curve right.
- C. neither the short-run nor long-run Phillips curve right.
- D. both the short-run and long-run Phillips curve right.

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20. If the Fed conducts open-market operations and sells short-term government bonds, the money supply

- A. increases and aggregate demand shifts right.
- B. increases and aggregate demand shifts left.
- C. decreases and aggregate demand shifts right.
- D. decreases and aggregate demand shifts left.

II. Problems and Short-essay Questions

1. Suppose that the inverse demand function is $p = 10 - Q$ and the inverse supply function is $p = 1 + 2Q$.

- a. (8 points) Calculate the incidence of a specific tax of \$1 per unit falling on consumers.
- b. (8 points) What are the corresponding price elasticities of demand and supply in the pre-tax equilibrium?
- c. (4 points) Now suppose that the inverse demand function is given by $p = 10 - bQ$ and the inverse supply function is $p = 1 + dQ$. Calculate the incidence of a specific tax of \$1 per unit falling on consumers as a function of b and d .

2. A monopolist firm has two identical factories, 1 and 2. Each factory has cost q_i^2 , where q_i stands for factory i 's output, $i = 1, 2$. If a factory produces any positive output, the firm must pay a fixed tax of \$2 for that factory. Let total output be $Q = q_1 + q_2$.

- a. (10 points) What is the cost function of the firm?
- b. (10 points) Suppose the firm can identify two isolated markets, A and B , with demand functions

$$P_A = 5 - Q_A,$$

$$P_B = 5 - \frac{1}{2}Q_B.$$

Please calculate the equilibrium price and quantity in each market.

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3. Consider an open economy described by the following equations:

$$Y = C + I + G + NX$$

$$C = 180 + 0.65(Y - T)$$

$$I = 350 - 40r$$

$$G = 200$$

$$T = 150$$

$$NX = 120 - 0.1Y + 15q$$

where Y is GDP, C is consumption, I is investment, G is government purchases, T is taxes, r is the interest rate, NX is net exports, and q is the real exchange rate (an increase in q means a depreciation). Suppose the full-employment level of GDP is $Y^* = 2000$.

a. (10 points) Suppose the central bank keeps the interest rate fixed at $r = 4$ and the real exchange rate is $q = 1$. Solve for equilibrium GDP. Is the economy above or below full employment? Please show your calculation.

b. (5 points) Assuming no change in monetary or exchange-rate policy, by how much would GDP have to change to restore full employment? Please show your calculation.

c. (5 points) Instead, suppose fiscal policy does not change. What change in the real exchange rate q would be required to restore full employment (interpret your result as appreciation or depreciation)? Please show your calculation.

4. Suppose that an economy has the Phillips curve

$$\pi_t = \pi_{t-1} - 0.5(u_t - 0.04)$$

where π_t is the inflation rate at time t and u_t is the unemployment rate at time t .

a. (3 points) What is the natural rate of unemployment? Briefly explain your answer.

b. (7 points) Graph the short-run and long-run relationships between inflation and unemployment implied by this Phillips curve. Clearly label: (i) the horizontal axis, (ii) the vertical axis, and (iii) the point at which the short-run Phillips curve intersects the long-run Phillips curve.

c. (5 points) Compute the sacrifice ratio in this economy. Clearly explain your calculations.

d. (5 points) Suppose the current inflation rate is 10 percent. The central bank aims to reduce inflation to 5 percent. How much cyclical unemployment is necessary to achieve this reduction in inflation? Clearly explain your calculations.

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1. Let random variables A and B be independent and identically distributed, each taking values $-1, 0,$ and 1 with probabilities: $0.3, 0.4,$ and $0.3,$ respectively.

Define a new variable V as:

$$V = \begin{cases} 1, & \text{if } A \geq B \\ 0, & \text{if } A < B \end{cases}$$

Let $W = A^2 + 1.$

- a. Assess whether V and A are independent. Justify your answer. (10%)
- b. Find the distribution function of $W.$ (10%)

2. A factory produces equipment whose lifespan T (in years) is a continuous random variable with probability density function

$$f(t) = \begin{cases} \frac{1}{5}e^{-\frac{t}{5}}, & t > 0 \\ 0, & t \leq 0 \end{cases}$$

The factory offers a warranty: if the equipment fails within 1.5 years, it is replaced at a cost of \$180. The factory earns \$120 when the equipment is sold. Let Y be the profit from selling one unit, including any replacement costs during the warranty:

$$Y = 120 - 180 \cdot \mathbf{1}\{T \leq 1.5\}, \text{ where } \mathbf{1} \text{ is an indicator function.}$$

Compute

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- a. Sale probability: $P(Y = 120)$. (10%)
- b. Expected profit: $E(Y)$. (10%)
3. A retailer faces weekly demand for a product, represented by the random variable X , which is uniformly distributed over the interval $[20,40]$. The retailer chooses an integer order quantity Q within the same interval. Each unit sold from stock yields a profit of \$600. If supply exceeds demand, unsold units are liquidated at a loss of \$150 per unit. If demand exceeds supply, additional units can be sourced externally, but only at a reduced profit of \$350 per unit. Find the smallest order quantity Q such that the expected profit is at least \$12500. (20%)
4. A commercial enterprise reports data for the five years 2016–2020 (all units in ten-thousand):
- Average annual sales revenue: $\bar{x} = 500$ with standard deviation $s_x = 25$.
 - Average annual commercial profit: $\bar{y} = 120$ with standard deviation $s_y = 18$.
 - Sum of the products of sales and profit: $\sum x_i y_i = 301,440$.
 - Sum of squares of annual sales revenue: $\sum x_i^2 = 1,252,500$.
 - Sum of squares of annual commercial profit: $\sum y_i^2 = 73,296$.
 - Sample size: $n = 5$.
- a. Calculate the sample correlation coefficient between sales revenue and commercial profit, and explain its meaning. (10%)

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b. Assuming a linear correlation exists between sales revenue and commercial profit, estimate the commercial profit (in ten thousand yuan) when the sales revenue is 6 million yuan. (10%)

5. A company introduces a new marketing strategy and wants to test whether it increases average weekly sales compared to the current baseline. Let μ denote the true mean weekly sales (in thousands of units) after the strategy is implemented.

The baseline average weekly sales is known to be $\mu_0 = 500$. We test:

$H_0: \mu = 500$ (the strategy has no effect),

versus

$H_1: \mu > 500$ (the strategy is effective, increasing sales).

Suppose a sample of $n = 36$ weeks of sales is collected, with a known variance

$\sigma^2 = 3600$. The company decides to reject H_0 if the sample mean \bar{X} exceeds 510.

a. Using diagrams of the sampling distributions under H_0 and under an alternative (e.g., $\mu = 520$), illustrate how the size (significance level) and the power of the test can be computed. Clearly indicate the rejection region on your diagrams. (10%)

b. Compute the power of the test under the alternative hypothesis $H_1: \mu = 520$. You may leave the result expressed in terms of the cumulative Normal distribution function Φ . (10%)

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