

考試科目	經濟學	系所別	金融、財務管理	考試時間	二月 4 日(四) 第二節
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Multiple Choice (1 point each)

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

- A country has a comparative advantage in a product if
 - the world price is lower than its domestic price.
 - the world price is higher than its domestic price.
 - the world price is equal to its domestic price.
 - None of the above.
- Which of the following is unique to a monopolistically competitive firm when compared to an oligopoly?
 - a downward sloping demand curve
 - a horizontal demand curve
 - There are many sellers.
 - There are many buyers.
- For a firm in a perfectly competitive market, the price of the good is always equal to
 - marginal revenue.
 - average revenue.
 - equilibrium market price.
 - All of the above are correct.
- Demand is elastic if
 - elasticity is less than 1.
 - elasticity is equal to 1.
 - elasticity is greater than 1.
 - elasticity is equal to 0.
- The term *ceteris paribus* refers to
 - a central market price.
 - a real-world situation in which every variable is held constant.
 - a hypothetical situation in which some variables are assumed to be constant.
 - a situation in which only the price is held constant.

備註

- 作答於試題上者，不予計分。
- 試題請隨卷繳交。

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<p>6. When a firm is able to put idle equipment to use by hiring another worker,</p> <p>A. variable costs will rise.</p> <p>B. variable costs will fall.</p> <p>C. fixed costs will fall.</p> <p>D. both fixed costs and variable costs will rise.</p> <p>7. Very often, the reason that players can solve the prisoners' dilemma and reach the most profitable outcome is that</p> <p>A. each player tries to capture a large portion of the market share.</p> <p>B. the players play the game not once but many times.</p> <p>C. the game becomes more competitive.</p> <p>D. self interest results in the Nash equilibrium which is the best outcome for the players.</p> <p>8. Suppose that for Emily, DVDs and trips to the movie theater are perfect substitutes. Currently, Emily is spending all of her income on trips to the movie theater. If the price of DVDs doubles, the substitution effect will</p> <p>A. be two times the income effect.</p> <p>B. be half the income effect.</p> <p>C. be zero.</p> <p>D. always increase the number of trips to the movie theater Emily makes.</p> <p>9. How does a competitive market compare to a monopoly that engages in perfect price discrimination?</p> <p>A. In both cases, total social welfare is the same.</p> <p>B. Total social welfare is higher in the competitive market than with the perfectly price discriminating monopoly.</p> <p>C. In both cases, some potentially mutually beneficial trades do not occur.</p> <p>D. Consumer surplus is the same in both cases.</p> <p>10. Two firms, <i>A</i> and <i>B</i>, each currently dump 20 tons of chemicals into the local river. The government has decided to reduce the pollution and from now on will require a pollution permit for each ton of pollution dumped into the river. The government gives each firm 10 pollution permits, which it can either use or sell to the other firm. It costs Firm <i>A</i> \$100 for each ton of pollution that it eliminates before it reaches the river, and it costs Firm <i>B</i> \$50 for each ton of pollution that it</p>					
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<p>eliminates before it reaches the river. After the two firms buy or sell pollution permits from each other, we would expect that</p> <p>A. Firm <i>A</i> will no longer pollute, and Firm <i>B</i> will not reduce its pollution at all.</p> <p>B. Firm <i>B</i> will no longer pollute, and Firm <i>A</i> will not reduce its pollution at all.</p> <p>C. Firm <i>A</i> will dump 10 tons of pollution into the river, and Firm <i>B</i> will dump 10 tons of pollution into the river.</p> <p>D. Firm <i>A</i> will increase its pollution and Firm <i>B</i> will reduce its pollution.</p> <p>11. Suppose Country <i>A</i>'s Phillips Curve can be written as $U = 0.05$. Which of the following statements is wrong?</p> <p>A. The natural rate of unemployment is 5%.</p> <p>B. There is no inflation in the economy.</p> <p>C. It is a long-run Philips Curve.</p> <p>D. There is no cyclical unemployment.</p> <p>12. Other things remaining equal, which of the following policies might reduce the real interest rate of an economy?</p> <p>A. The central bank increases the discount rate.</p> <p>B. The central bank sells bonds.</p> <p>C. The central bank lowers the reserve ratio.</p> <p>D. None of the above.</p> <p>13. Which of the followings is not included in M1?</p> <p>A. Currency.</p> <p>B. Demand deposits.</p> <p>C. Credit cards.</p> <p>D. Traveler's checks.</p> <p>14. Assume a fixed basket of Goods to compute the CPI is 10 hotdogs and 10 hamburgers. What is the inflation rate when the price of hotdogs increases from 2 dollars to 3 dollars and the price of the hamburgers increases from 3 dollars to 4 dollars, compared with the base year?</p> <p>A. 20%</p> <p>B. 30%</p> <p>C. 40%</p> <p>D. 60%</p>					
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15. Which of the following policies can reduce the structural unemployment?
- The central bank reduces the discount rate.
 - The central bank conducts open market operation.
 - The central bank lowers the reserve ratio.
 - None of the above.
16. Decreasing government spending while increasing the tax rate would be the best policy for combating
- a recession.
 - inflation.
 - a decreasing average price level.
 - an expansionary fiscal policy.
17. If the U.S. government wanted to increase aggregate demand by \$50 billion and the MPS is 0.4, then it should
- decrease government spending by \$20 billion.
 - decrease government spending by \$10 billion.
 - increase government spending by \$20 billion.
 - increase government spending by \$10 billion.
18. The crowding out effect refers to which of the following?
- Increases in government spending may raise the interest rate and reduce investment.
 - Increases in government spending will shorten the recessionary gap.
 - Decreases in consumption will increase taxes.
 - High taxes reduce savings and decrease investment.
19. Tariffs and quotas share many of the same economic effects. Which of the following statements is false?
- Economic resources are reallocated toward inefficient producers.
 - Artificially high prices hurt consumers.
 - Inefficient domestic producers are protected at the expense of foreign firms creating dead weight loss.
 - Tariffs and quotas collect revenue for the government.

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20. If the U.S. dollar depreciates relative to the Chinese yuan, then

- A. U.S. goods sold in China would become cheaper.
- B. U.S. goods sold in China would become more expensive.
- C. more yuan are needed to buy a dollar.
- D. prices would not differ for U.S. or Chinese goods.

Problems and Short-essay Questions

Please answer the following questions IN SEQUENCE. All questions may be answered in either Chinese or English.

1. Consider the following production function $Q = L^{1/2}K^{1/2}$, where Q represents the production level, L represents labor and K represents capital. Answer the following questions.

A. (6 points) Derive MRTS.

B. (6 points) Let w/r be the relative factor price, where w represents the wage and r the capital return. Suppose that firms in the market observe the relative factor price and take it as given. What is the condition that must be satisfied when the cost is minimized?

C. (8 points) Derive the marginal cost.

2. Scott has an expected utility function of $U(w) = \sqrt{w}$, where w is his level of wealth. Currently, his only wealth is a store worth 625. The probability that his store will burn is 20%. If a fire occurs, the store will be worth nothing.

A. (3 points) What is his expected utility?

B. (3 points) What is the certainty equivalent level of wealth?

C. (8 points) Suppose that there is a competitive risk-neutral insurance company offering actuarially fair insurance. How much insurance premium will he pay to eliminate the risk?

D. (6 points) Now suppose that the insurance company is a monopoly that has the market power to set the profit-maximizing prices. What is the most Scott is willing to pay for an insurance policy that would fully reimburse the amount of loss from fire?

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3. Suppose Country A only produces hot dogs and banana and imports only pork. The prices and the quantities of the outputs and the imports for year 2020 and 2021 are summarized in the table below.

Year 2020	Quantity	Price	Year 2021	Quantity	Price
Hot Dogs	4	10	Hot Dogs	20	5
Banana	10	5	Banana	10	10
Pork	10	20	Pork	20	10

Please answer the following questions. You should show your calculation to obtain full credits.

- A. (5 points) If Year 2020 is the base year, what is the GDP deflator in Year 2021?
- B. (5 points) If the Quantity Equation is hold and the rate at which money changes hands is 3, what is the quantity of money in Year 2020.
- C. (5 points) If the reserve ratio in Country A is 10 percent, what is the minimum initial deposits that can lead to the quantity of money in (B)?
- D. (5 points) Suppose the government uses the data in Year 2020 as the fixed basket for calculating the CPI. If the nominal interests in two years are the same, according to the simple Keynesian model, investment will increase or decrease in Year 2021, compared with Year 2020? Please explain your answer.

4. You are given the following information: bank deposits 100, currency-to-deposits ratio 0.2, required reserve ratio 0.1.

- A. (12 points) Calculate the money multiplier, the bank reserves, and the money supply.
- B. (8 points) Assume that the central bank increases the required reserve ratio to 0.5 by keeping the currency, the level of deposits, and the currency-holding ratio constant. What is the new level of bank reserves, and money supply?

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I. Explain the following term briefly (24 points, 4 points for each).

1. The yield curve
2. Weak-form efficiency
3. MIRR (modified IRR)
4. The market risk premium
5. Cyclical stocks
6. SML

II. Computational Questions (25 points, 5 points for each)

1. ABC common stock is expected to have extraordinary growth in earnings and dividends of 20% per year for 2 years, after which the growth rate will settle into a constant 6%. If the discount rate is 15% and the most recent dividend was \$2.50, what should be the approximate current share price?
2. Estimate a stock's beta based on the following information: Month 1 = Stock + 1.5%, Market + 1.1%; Month 2 = Stock + 2.0%, Market + 1.4%; Month 3 = Stock - 2.5%, Market - 2.0%.
3. The market portfolio has an expected return of 18% and the risk-free rate is 6%. An investor borrows \$100 at the risk-free rate and invests this and a further \$100 of his own in the market portfolio. What is his expected return?
4. How much debt is outstanding if the present value of a perpetual tax shield is \$300,000, the tax rate is 21% and the interest rate on the debt is 10%?
5. Evenglade Corp has 1,000 shares outstanding priced at \$10 a share. The company is unsure whether to pay out \$1 a share as a dividend or to use the money to repurchase stock. If it pays a dividend, what happens to the stock price? If it repurchases, how many shares will remain and at what price?

III. Short answer questions (10 points)

1. Based on the dividend growth model, briefly give the reason why a lower current payout will not affect the stock price. (5 points)
2. When Tri-C Corp. compares its ratios to industry averages, it has a higher current ratio, an average quick ratio, and a lower inventory turnover. What might you assume about Tri-C? (5 points)

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IV. Questions (41 points)

1. Econo-Cool air conditioners cost \$300 to purchase, result in electricity bills of \$150 per year, and last for 5 years. Luxury air models cost \$500, result in electricity bills of \$100 per year, and last for 8 years. The discount rate is 21%.
 - a. What is the equivalent annual cost of the Econo-Cool model? (4 points)
 - b. What is the equivalent annual cost of the Luxury air model? (4 points)
 - c. Which model is more cost-effective? (2 points)
 - d. Now you remember that the inflation rate is expected to be 10% per year for the foreseeable future. Redo parts (a) and (b). (8 points)

2. Astromet is financed entirely by common stock and has a beta of 1.0. The firm pays no taxes. The stock has a price-earning multiple of 10 and is priced to offer a 10% expected return. The company decides to repurchase half the common stock and substitute an equal value of debt. Assume that the debt yields a risk-free 5%. Calculate the following:
 - a. The beta of the common stock after the refinancing (5 points)
 - b. The required return and risk premium on the common stock after the refinancing (6 points)
 - c. The required return on the company (i.e., stock and debt combined) after the refinancing (3 points)

If EBIT remains constant:

 - d. What is the percentage increase in earnings per share after the refinancing? (5 points)
 - e. What is the new price-earnings multiple? (4 points)

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Note: Use the level of significance 0.05 for the test of hypothesis if required.

1. (30%) Two stocks are being consider to construct a portfolio. Let X =percent return for an investment in stock X, and Y = percent return for an investment in stock Y. The joint distribution of both stocks is as follows.

Y	X		
	-4	0	5
-3	0.05	0.05	0.10
0	0.10	0.20	0.15
4	0.10	0.15	0.10

It is known that the expected value and variance of Y are 0.8 and 6.76, respectively, and the covariance between X and Y is -1.1. Answer the following questions.

- (a) Find the expected value and variance of X . (10%)
 (b) Find the conditional distribution of X given $Y=0$. (6%)
 (c) Find the correlation between X and Y . (6%)
 (d) Let $Z=aX+bY$, where both a and b are any positive values. Find the expected value and variance of Z . (8%)
2. (35%) The following table contains a random sample of prices for hotel rooms in Cities X and Y.

Hotel	City X	City Y	Hotel	City X	City Y
1	85	125	11	80	115
2	65	110	12	60	75
3	100	105	13	65	100
4	120	120	14	70	90
5	115	85	15	75	115
6	125	115	16	65	160
7	50	65	17	75	65
8	90	60	18	85	80
9	115	95	19	95	60
10	70	105	20	75	85

Assume that the prices for hotel rooms in both cities follow a normal distribution.

- (a) Test whether the population mean of hotel room prices in City X is greater than 75. (7%)

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(b) Find a 99% confidence interval for the difference between the two population means of hotel room prices in both Cities X and Y. (10%)

(c) Can you conclude that the mean price of a hotel room in City X is lower than one in City Y?

(1) Assume that both samples are independent and the population variances of room prices in both cities are equal. (10%)

(2) Assume that the samples from both cities are paired-dependent. (8%)

3. (35%) A personnel director develops the following estimated regression equation relating employees' scores on a job satisfaction test to their length of service, wage rate, and sales regions (namely A, B, and C):

$$\hat{y} = 12.24 - 7.68x_1 + 13.25x_2 - 5.80x_3 + 15.32x_4$$

where

x_1 = length of service (years), x_2 = wage rate (dollars)

$x_3 = \begin{cases} 1 & \text{if sales region B} \\ 0 & \text{otherwise} \end{cases}$, $x_4 = \begin{cases} 1 & \text{if sales region C} \\ 0 & \text{otherwise} \end{cases}$

y = job satisfaction test score (higher scores indicate greater job satisfaction)

A partial computer output from a regression analysis follows.

	Standard error
<i>Constant</i>	8.191
x_1	4.105
x_2	2.805
x_3	4.373
x_4	4.373

ANOVA table

Source of Variation	SS	df	MS	F
Regression	1620.25			
Error		28		
Total				

$s = 5.5$ denotes the estimated standard error for regression

Please answer the following questions.

(a) Complete the analysis of variance (ANOVA) table and conclude the resulting F test. (12%)

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- (b) Explain the meanings of the estimated coefficients for x_2 and x_3 . (6%)
- (c) Test and conclude which explanatory variable(s) can be dropped. (12%)
- (d) What is the value of the adjusted R^2 ? (5%)

Percentage Points of the t Distribution; $t_{v, \alpha}$

$$P(T > t_{v, \alpha}) = \alpha$$



v	α													
	0.40	0.30	0.20	0.15	0.10	0.05	0.025	0.02	0.015	0.01	0.0075	0.005	0.0025	0.0005
1	0.325	0.727	1.376	1.963	3.078	6.314	12.706	15.895	21.205	31.821	42.434	63.657	127.322	636.590
2	0.289	0.617	1.061	1.386	1.886	2.920	4.303	4.849	5.643	6.965	8.073	9.925	14.089	31.598
3	0.277	0.584	0.978	1.250	1.638	2.353	3.182	3.482	3.896	4.541	5.047	5.841	7.453	12.924
4	0.271	0.569	0.941	1.190	1.533	2.132	2.776	2.999	3.298	3.747	4.088	4.604	5.598	8.610
5	0.267	0.559	0.920	1.156	1.476	2.015	2.571	2.757	3.003	3.365	3.634	4.032	4.773	6.869
6	0.265	0.553	0.906	1.134	1.440	1.943	2.447	2.612	2.829	3.143	3.372	3.707	4.317	5.959
7	0.263	0.549	0.896	1.119	1.415	1.895	2.365	2.517	2.715	2.998	3.203	3.499	4.029	5.408
8	0.262	0.546	0.889	1.108	1.397	1.860	2.306	2.449	2.634	2.896	3.085	3.355	3.833	5.041
9	0.261	0.543	0.883	1.100	1.383	1.833	2.262	2.398	2.574	2.821	2.998	3.250	3.690	4.781
10	0.260	0.542	0.879	1.093	1.372	1.812	2.228	2.359	2.527	2.764	2.932	3.169	3.581	4.587
11	0.260	0.540	0.876	1.088	1.363	1.796	2.201	2.328	2.491	2.718	2.879	3.106	3.497	4.437
12	0.259	0.539	0.873	1.083	1.356	1.782	2.179	2.303	2.461	2.681	2.836	3.055	3.428	4.318
13	0.259	0.538	0.870	1.079	1.350	1.771	2.160	2.282	2.436	2.650	2.801	3.012	3.372	4.221
14	0.258	0.537	0.868	1.076	1.345	1.761	2.145	2.264	2.415	2.624	2.771	2.977	3.326	4.140
15	0.258	0.536	0.866	1.074	1.341	1.753	2.131	2.249	2.397	2.602	2.746	2.947	3.286	4.073
16	0.258	0.535	0.865	1.071	1.337	1.746	2.120	2.235	2.382	2.583	2.724	2.921	3.252	4.015
17	0.257	0.534	0.863	1.069	1.333	1.740	2.110	2.224	2.368	2.567	2.706	2.898	3.222	3.965
18	0.257	0.534	0.862	1.067	1.330	1.734	2.101	2.214	2.356	2.552	2.689	2.878	3.197	3.922
19	0.257	0.533	0.861	1.066	1.328	1.729	2.093	2.205	2.346	2.539	2.674	2.861	3.174	3.883
20	0.257	0.533	0.860	1.064	1.325	1.725	2.086	2.197	2.336	2.528	2.661	2.845	3.153	3.850
21	0.257	0.532	0.859	1.063	1.323	1.721	2.080	2.189	2.328	2.518	2.649	2.831	3.135	3.819
22	0.256	0.532	0.858	1.061	1.321	1.717	2.074	2.183	2.320	2.508	2.639	2.819	3.119	3.792
23	0.256	0.532	0.858	1.060	1.319	1.714	2.069	2.177	2.313	2.500	2.629	2.807	3.104	3.768
24	0.256	0.531	0.857	1.059	1.318	1.711	2.064	2.172	2.307	2.492	2.620	2.797	3.091	3.745
25	0.256	0.531	0.856	1.058	1.316	1.708	2.060	2.167	2.301	2.485	2.612	2.787	3.078	3.725
26	0.256	0.531	0.856	1.058	1.315	1.706	2.056	2.162	2.296	2.479	2.605	2.779	3.067	3.707
27	0.256	0.531	0.855	1.057	1.314	1.703	2.052	2.158	2.291	2.473	2.598	2.771	3.057	3.690
28	0.256	0.530	0.855	1.056	1.313	1.701	2.048	2.154	2.286	2.467	2.592	2.763	3.047	3.674
29	0.256	0.530	0.854	1.055	1.311	1.699	2.045	2.150	2.282	2.462	2.586	2.756	3.038	3.659
30	0.256	0.530	0.854	1.055	1.310	1.697	2.042	2.147	2.278	2.457	2.581	2.750	3.030	3.646
40	0.255	0.529	0.851	1.050	1.303	1.684	2.021	2.123	2.250	2.423	2.542	2.704	2.971	3.551
60	0.254	0.527	0.848	1.045	1.296	1.671	2.000	2.099	2.223	2.390	2.504	2.660	2.915	3.460
120	0.254	0.526	0.845	1.041	1.289	1.658	1.980	2.076	2.196	2.358	2.468	2.617	2.860	3.373
∞	0.253	0.524	0.842	1.036	1.282	1.645	1.960	2.054	2.170	2.326	2.432	2.576	2.807	3.291

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F - Distribution ($\alpha = 0.05$ in the Right Tail)

df ₂ \ df ₁		Numerator Degrees of Freedom								
		1	2	3	4	5	6	7	8	9
1		161.45	199.50	215.71	224.58	230.16	233.99	236.77	238.88	240.54
2		18.513	19.000	19.164	19.247	19.296	19.330	19.353	19.371	19.385
3		10.128	9.5521	9.2766	9.1172	9.0135	8.9406	8.8667	8.8452	8.8123
4		7.7086	9.9443	6.5914	6.3882	6.2561	6.1631	6.0942	6.0410	6.9988
5		6.6079	5.7861	5.4095	5.1922	5.0503	4.9503	4.8759	4.8183	4.7725
6		5.9874	5.1433	4.7571	4.5337	4.3874	4.2839	4.2067	4.1468	4.0990
7		5.5914	4.7374	4.3468	4.1203	3.9715	3.8660	3.7870	3.7257	3.6767
8		5.3177	4.4590	4.0662	3.8379	3.6875	3.5806	3.5005	3.4381	3.3881
9		5.1174	4.2565	3.8625	3.6331	3.4817	3.3738	3.2927	3.2296	3.1789
10		4.9646	4.1028	3.7083	3.4780	3.3258	3.2172	3.1355	3.0717	3.0204
11		4.8443	3.9823	3.5874	3.3567	3.2039	3.0946	3.0123	2.9480	2.8962
12		4.7472	3.8853	3.4903	3.2592	3.1059	2.9961	2.9134	2.8486	2.7964
13		4.6672	3.8056	3.4105	3.1791	3.0254	2.9153	2.8321	2.7669	2.7144
14		4.6001	3.7389	3.3439	3.1122	2.9582	2.8477	2.7642	2.6987	2.6458
15		4.5431	3.6823	3.2874	3.0556	2.9013	2.7905	2.7066	2.6408	2.5876
16		4.4940	3.6337	3.2389	3.0069	2.8524	2.7413	2.6572	2.5911	2.5377
17		4.4513	3.5915	3.1968	2.9647	2.8100	2.6987	2.6143	2.5480	2.4943
18		4.4139	3.5546	3.1599	2.9277	2.7729	2.6613	2.5767	2.5102	2.4563
19		4.3807	3.5219	3.1274	2.8951	2.7401	2.6283	2.5435	2.4768	2.4227
20		4.3512	3.4928	3.0984	2.8661	2.7109	2.5990	2.5140	2.4471	2.3928
21		4.3248	3.4668	3.0725	2.8401	2.6848	2.5727	2.4876	2.4205	2.3660
22		4.3009	3.4434	3.0491	2.8167	2.6613	2.5491	2.4638	2.3965	2.3419
23		4.2793	3.4221	3.0280	2.7955	2.6400	2.5277	2.4422	2.3748	2.3201
24		4.2597	3.4028	3.0088	2.7763	2.6207	2.5082	2.4226	2.3551	2.3002
25		4.2417	3.3852	2.9912	2.7587	2.6030	2.4904	2.4047	2.3371	2.2821
26		4.2252	3.3690	2.9752	2.7426	2.5868	2.4741	2.3883	2.3205	2.2655
27		4.2100	3.3541	2.9604	2.7278	2.5719	2.4591	2.3732	2.3053	2.2501
28		4.1960	3.3404	2.9467	2.7141	2.5581	2.4453	2.3593	2.2913	2.2360
29		4.1830	3.3277	2.9340	2.7014	2.5454	2.4324	2.3463	2.2783	2.2229
30		4.1709	3.3158	2.9223	2.6896	2.5336	2.4205	2.3343	2.2662	2.2107
40		4.0847	3.2317	2.8387	2.6060	2.4495	2.3359	2.2490	2.1802	2.1240
60		4.0012	3.1504	2.7581	2.5252	2.3683	2.2541	2.1665	2.0970	2.0401
120		3.9201	3.0718	2.6802	2.4472	2.2899	2.1750	2.0868	2.0164	1.9588
∞		3.8415	2.9957	2.6049	2.3719	2.2141	2.0986	2.0096	1.9384	1.8799

備

註

- 一、作答於試題上者，不予計分。
- 二、試題請隨卷繳交。

考試科目	統計學 B	系所別	金融學系財務工程 與金融科技組	考試時間	2月4日(四) 第三節
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Short Answer Questions

Write your answers on the answer sheet. No need to provide details unless otherwise told. Each blank worths 5 points.

- In a survey of 300 visitors, 165 responded that they prefer to go to the beach and 135 responded that they prefer to stay in their hotels. Let p denote the fraction of all visitors who prefer to go to the beach and $\Phi(\cdot)$ be the cumulative probability density function of the standard normal distribution. The approximate p -value for the test $H_0 : p = 0.5$ versus $H_1 : p > 0.5$ in terms of $\Phi(\cdot)$ is (1). If the true p is 0.6 and the significance level $\alpha = 0.05$, the power of this test in terms of $\Phi(\cdot)$ is (2).

- Let X be the number of weeks before the prices change in a grocery store and p be the probability of updating the prices in a given week. The pricing decision is independent between any two weeks. If the distribution of X is described by

$$f(x) = \binom{x-1}{r-1} p^r (1-p)^{x-r},$$

where $x = r, r+1, \dots$. The average duration of prices in this store is (3) if $r = 1$.

- Let X and Y be two random variables where $E(X) = \mu_X$, $Var(X) = \sigma_X^2$, $E(Y) = \mu_Y$, $Var(Y) = \sigma_Y^2$ and their correlation is ρ . If $E(Y|X) = a + bX$ where a and b are constants, then $a =$ (4), $b =$ (5), and $E[Var(Y|X)] =$ (6).

- Let X be a random variable with the distribution

$$f(x) = \frac{x^{\alpha-1}}{\Gamma(\alpha)\beta^\alpha} \exp\left(-\frac{x}{\beta}\right),$$

where $\alpha > 0$ and $\beta > 0$. If $Y = 1/X$, the probability density function of Y is (7), and $E(Y^r) =$ (8), where r is a positive integer.

備

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- Let X be a random variable with the distribution $f(x) = \theta x^{\theta-1}$, where $0 < x < 1$ and $\theta > 0$. Let $E(X) = \mu_x$ and $\hat{S} = (1/n) \sum_{i=1}^n X_i$, where $i = 1, 2, \dots, n$. The statistic \hat{S} converges in probability to (9), and $\sqrt{n}(\hat{S} - \mu_x)$ converges in distribution to (10).
- Consider a linear model $y_i = \beta x_i + u_i$ where $u_i | x_i \sim N(0, \sigma_u^2)$. The maximum likelihood estimator $\hat{\beta} =$ (11), and the maximized log likelihood in terms of the residual \hat{u}_i is (12).
- Consider a linear model $y_i = \mu + \eta_i$ where $E(\eta_i) = 0$ but $Var(\eta_i)$ and the distribution of η are unknown. The method of moments estimator for μ is (13), and an appropriate estimator for $Var(\eta_i)$ in this case is (14).
- Consider a time series $y_t = 0.5y_{t-1} + \epsilon_t$ where $\epsilon_t \stackrel{i.i.d.}{\sim} (0, \sigma_\epsilon^2)$. Its long-run variance is (15), and the first-order autocorrelation function is (16). Consider another process $y_t = 0.5y_{t-1} + \phi y_{t-2} + \epsilon_t$. The range of ϕ that ensures the stationarity of this process is (17).
- The table below displays twenty actual observations of a binary variable Y and the predicted probability $\Pr(Y = 1|X)$ using a set of variable X .

Actual	1	1	0	1	0	0	1	0	0	0
Predicted	0.58	0.42	0.12	0.85	0.72	0.08	0.81	0.24	0.61	0.03

Actual	1	1	0	1	0	0	1	0	0	1
Predicted	0.02	0.75	0.33	0.69	0.38	0.59	0.39	0.27	0.17	0.75

The odds of $Y = 1$ relative to $Y = 0$ is (18). Given the criterion $\hat{Y} = 1$ if $\Pr(Y = 1|X) \geq 0.5$ and $\hat{Y} = 0$ otherwise, the percent of correct prediction is (19), and the coordinate on the receiver operating characteristic (ROC) curve is (20).

備

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