

國立中山大學 102 學年度碩士暨碩士專班招生考試試題

科目名稱：經濟學【財管系碩士班】

題號：443001

※本科目依簡章規定「不可以」使用計算機

共 2 頁第 1 頁

說明：

經濟學[財管系碩士班]試題共有兩部份，第一部份為個體經濟學：填空題共 50 分，第二部份為總體經濟學，包括選擇題及簡答題，共 50 分，兩部份總計共 100 分。

第一部分(個體經濟學)填空題答案全對才給分。只需要填入最後的完整答案，”請勿”寫出計算過程。例如：你的第一個空格答案若為“m+b”，答案請填寫 (1) m+b。

填空題的答案卷請製作如下：

| | | |
|------|-----|-----|
| (1) | (2) | (3) |
| (4) | (5) | (6) |
| (7) | (8) | (9) |
| (10) | | |

第一部份填空題(個體經濟學)：共 10 格，每一個空格 5 分，共計 50 分。

Question 1.

Suppose that Natasha's utility function is given by $U(I) = \sqrt{100I}$, where I represents monthly income. Currently Natasha is earning a monthly income of \$ 40,000 NTD and can earn that monthly income next year with certainty. However, she is offered a chance to take a new job that offers a 0.6 probability of monthly earning \$ 44,100 NTD and a 0.4 probability of monthly income \$ 32,400 NTD. What is expected utility of the her new job's monthly salary = (1), and in the case of that she would like to take this new offer next year and she is willing to buy insurance against the variable income associate with the new job, how much she needs pay for the risk premium every month = (2)。

Question 2.

Suppose the process of producing light-weight parkas by Polly's Parkas is described by the (production) function: $q = 10K^{0.8}(L-40)^{0.2}$, where q is the number of parkas produced, K is the number of computerized stitching-machine hours, and L is the number of person-hours of labor. In addition to capital and labor, \$ 10 of raw materials are used in the production of each parkas. Therefore, with the costs of capital (r) and labor (w), includes \$ 10 of raw materials per unit of output, the total cost function becomes $TC(q) = wL + rK + 10q$. By minimizing cost, find the optimal function of $L^* =$ (3)。(in terms of only r , w , and q)

Question 3.

The market demand and supply function for imported beer are: $Q^d = 4800 - 40P$ and $Q^s = -1200 + 20P$. To encourage the consumption of domestic beer, Congress has imposed a quota of 600 units of imported beer. After the quota, the producer surplus = (4), and deadweight loss = (5)。

Question 4.

A monopolist is deciding how to locate output between two geographically separated markets (East for 1st market and West for the 2nd market). Demand for these two markets are: $P_1 = 15 - Q_1$, $P_2 = 25 - 2Q_2$. The monopolist's total cost is $TC = 5 + 3(Q_1 + Q_2)$, if the monopolist can price discriminate, total quantity ($Q_1 + Q_2$) is (6), total profit is (7)。

國立中山大學 102 學年度碩士暨碩士專班招生考試試題

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共 2 頁第 2 頁

Question 5.

Suppose that two identical firms produce weapons and that they are the only firms in the market. Their costs are given by $C_1 = 60Q_1$ and $C_2 = 60Q_2$, where Q_1 is the output of firm 1 and Q_2 is the output of firm 2. Price is determined by the following demand curve: $P = 300 - Q$, where $Q = Q_1 + Q_2$. At the Cournot-Nash equilibrium, the profit of firm 2 = (8). Suppose two firms form a Cartel to maximize joint profits, total output is (9), each firm profit is (10).

第二部份(總體經濟學)：包括選擇題及簡答題，共 50 分。

一、選擇題：單選題，有 10 小題，每小題 4 分，合計 40 分

1. 依 IS-LM-BP 模型，當一浮動匯率國家增加貨幣供給，則 A) 進口增加 B) 進口減少 C) 出口增加 D) 出口減少
2. 下列政府支出增加的乘數效果的排序何者正確? A) 簡單凱因斯 > AS-AD > IS-LM B) IS-LM > 簡單凱因斯 > AS-AD C) 簡單凱因斯 > IS-LM > AS-AD D) AS-AD > 簡單凱因斯 > IS-LM
3. 日本安倍首相主張同時採取擴張貨幣與擴張財政政策，若日本資本移動自由，依 IS-LM-BP 模型，下列何者正確? A) 日幣升值 B) 日幣貶值 C) 貿易餘額增加 D) 消費支出增加 E) 投資支出增加
4. IS-LM 構成總需求線，若政府提高稅收，同時增加等額採購，則 A) 總需求線右移 B) 總需求線左移 C) 總需求線移動方向無法確定 D) 沿著總需求線上移 E) 沿著總需求線下移
5. 依 IS-LM 模型，政府支出排擠的投資支出越多，若 A) 投資支出受利率影響越小 B) 貨幣需求受利率影響越小 C) 邊際消費傾向越小 D) 貨幣需求受所得影響越小
6. 根據可貸資金理論，資金需求為 $I(r) + (G - T)$ ，資金供應為 $S = \alpha(Y - T) + \beta r$ ， $1 > \alpha > 0$ ， $\beta > 0$ 。當政府增稅 100 億，則 A) 投資量降低 B) 儲蓄量增加 C) 利率下降 D) 利率上升
7. 以 IS-LM 構成總需求，依新興古典學派，若擴張財政政策可完全預期，則新均衡與原均衡相較 A) 利率不變 B) 名目工資上升 C) 實質工資上升 D) 所得上升
8. 依新興古典學派對貨幣的看法，A) 只有意料之外的貨幣供給變動才會改變物價 B) 只有意料之外的貨幣供給變動才會改變所得 C) 只有意料之內的貨幣供給變動才會改變物價 D) 只有意料之內的貨幣供給變動才會改變所得
9. 西班牙經濟落入嚴重衰退，最根本原因為該國 A) 房地產泡沫破滅 B) 福利過高 C) 財政赤字過鉅 D) 銀行破產 E) 產品競爭力太弱 F) 年輕人失業過多
10. 日幣貶值，下列台灣哪一製造業盈餘受惠最多? A) 汽車 B) 水泥 C) 紡織 D) 塑膠 E) 鋼鐵

二、簡答題：有 2 小題，每題 5 分，合計 10 分，每小題答案不得超過二十字。

1. 在政府對企業的管制上，美國共和黨與民主黨的主張有何不同?
2. 若一歐元區國家經濟衰退，失業增加，然而該國屬歐元區，無法採行獨立貨幣政策，依歐元區原來構想，有何機制可使該國失業問題緩和?

[題目結束]

國立中山大學 102 學年度碩士暨碩士專班招生考試試題

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共 4 頁第 1 頁

本試題分爲『第一部份』與『第二部份』，每部份的答題要求不全相同，請先閱讀各部份的注意事項。作答時不可以使用任何型號之計算機或翻譯機。

第一部份

注意事項：第一部份共有10題單選題、每題5分、此部份總分爲50分。請在答案卷選擇題作答欄作答。

1. A complete set of measures to analyze interest rate risk of bonds should include: (A) yield (B) expected return (C) variance (D) beta (E) duration (F) convexity:
(1) A and E (2) C and E (3) C and D (4) D and E (5) E and F
(6) C, D and E (7) D, E and F (8) C,D,E and F (9) A, E and F.
2. Which of the following is (are) most correct? (A) Zero-coupon bonds (no embedded option) have zero reinvestment risk. (B) The price of a zero-coupon bond (no embedded option) will go up over time. (C) When a bond has an option component, it is possible that its duration may be greater than its maturity.
(1) A (2) B (3) C (4) A, B (5) A, C (6) B, C (7) A, B, C.
3. Appropriate method(s) to analyze whether a merge generates synergy over the post-merger period should include (A) whether stock abnormal return of the combined company over post-merger period is positive, (B) whether industry-average-adjusted accounting net incomes over post-merger period are positive, (C) whether the combined company subsequently divests (事後賣掉) the target company over the post-merger period.
(1) A (2) B (3) C (4) A, B (5) B, C (6) A, C (7) A, B, C.
4. Modified IRR (MIRR) method is better than IRR method because MIRR method (A) has only one MIRR value, (B) can distinguish "lending MIRR" from "borrowing MIRR". (C) leads to the same conclusion (in analyzing two mutually-exclusive projects) as the NPV rule does.
(1) A (2) B (3) C (4) A, B (5) B, C (6) A, C (7) A, B, C.
5. Which of the following is (are) consistent with empirical data? (A) PPP, (B) covered interest rate parity, (C) uncovered interest rate parity:
(1) A (2) B (3) C (4) A, B (5) B, C (6) A, C (7) A, B, C.
6. In the APT analysis, a complete set of method(s) to minimize the risk of arbitrage portfolios should include (A) trading mis-priced assets and trading factors to offset factor risks, (B) diversification by investing in many "arbitrage positions" to control the non-factor risk, (C) using Fama-French 3-factor model to control size and BM effects:
(1) A (2) B (3) C (4) A, B (5) B, C (6) A, C (7) A, B, C.
7. In the absence of information asymmetry, the issuance of new stock (seasoned equity offering) to finance a positive-NPV project will (A) lead to EPS dilution, (B) allow new shareholders to earn a zero abnormal return on stock, (C) allow new shareholders to share a proportion of the positive NPV of the new project:
(1) A (2) B (3) C (4) A, B (5) B, C (6) A, C (7) A, B, C.

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共 4 頁第 2 頁

8. Which of the flowing should be included in analyzing how to determine a reasonable taxi rate (搭乘計程車費率)? (A) CAPM (B) Accounting Rate of Return Rule (C) EVA:
(1) A (2) B (3) C (4) A, B (5) B, C (6) A, C (7) A, B, C.
9. To determine whether the momentum effect of stocks exists, we should use (A) [over the ranking period] to identify winners and losers and calculate whether (B) of buying winners and selling losers [over the test period] is positive.
(1) A= stock return, B= stock return.
(2) A= stock return, B= stock abnormal return.
(3) A= stock abnormal return, B= stock return.
(4) A= stock abnormal return, B= stock abnormal return.
10. Company B intends to borrow \$100 millions to buy back its stock. Assume no information asymmetry and no taxes. Upon the announcement of stock buyback, how many of the following will remain the same? : Expected EPS, EPS standard deviation, EPS beta, stock' expected return, stock's standard deviation, stock's beta, beta of company assets, beta of company debt:
(1) 1 (2) 2 (3) 3 (4) 4 (5) 5 (6) 6 (7) 7 (8) 8 (9) 0.

第二部份

注意事項：第二部份的第11題至第16題皆為多重選擇題，至少有一個正確選項，每題5分，全對才給分；第17題至第19題為填充題，有四個空格待填入正確答案，每格5分，請以整數或最簡分數作答，或者以小數作答(如果是無窮小數，請四捨五入至小數點以下第三位)。第二部份總分為50分，每題(或每格)皆不需列出計算式，只需寫出答案即可，但是請標明題號，並且在答案卷非選擇題作答欄作答。再次強調，第二部份請在非選擇題作答欄作答。

11. Which of the following statements about option valuations is (are) correct?
(A) In the Black-Scholes pricing model, we do not need to know the risk neutral probability of each possible future stock price to calculate the option price.
(B) The expected rate of return on the underlying asset in the real world is unnecessary to calculate the option price using the Black-Scholes formula.
(C) To ensure that all assets in the risk-neutral world have an expected return equal to the risk-free rate, relative to the true probabilities, the risk-neutral probabilities underweight the bad states and overweight the good states.
(D) In Monte Carlo simulation, the expected payoff of a European-style option is estimated by calculating its largest payoff after simulating many random paths for the underlying asset.
(E) It is not suitable to use any Monte Carlo simulation to find the fair value of an American-style option.
12. Which of the following statements about capital structure theories is (are) correct?
(A) The lemons principle implies that the stock price increases on the announcement of an equity issue.
(B) The idea that managers will prefer to use retained earnings first, and will issue new equity only as a last resort, is often referred to as the pecking order theory.
(C) Signaling theory of debt indicates that the use of leverage is not one suitable way to signal good information to investors.
(D) Market timing view of capital structure implies that similar firms in the same industry will end up with similar capital structures.
(E) Market timing view of capital structure claims that the firm's overall capital structure depends in part on the market conditions that existed when it sought funding in the past.

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共 4 頁第 3 頁

13. Which of the following statements about executive stock options is (are) correct?
- (A) In practice, most firms grant options to their executives with the strike price equal to or lower than the market price of the firm stock at the grant date.
 - (B) In practice, the executive cannot exercise executive stock options before the termination of the vesting period.
 - (C) In practice, the executive can exercise executive stock options only at the expiration date.
 - (D) Backdating refers to the practice of choosing the grant date of executive stock options retroactively, so that the date of the grant would coincide with a date when the stock price was at its high for the quarter or for the year.
 - (E) The use of backdating suggests that some executive stock option compensation may not truly have been earned as the result of good performance of the firm.
 - (F) Managers have an incentive to manipulate the release of financial forecasts so that good news comes out before executive stock options are granted and bad news is delayed until after the options are granted.
14. Which of the following statements about “accrual-based earnings management” is (are) correct?
- (A) Firms are allowed to have discretion to recognize business transactions that affect future cash flows even though cash has not currently changed hands.
 - (B) We say that one company manages accruals downwards when earnings are abnormally low.
 - (C) Managers have an incentive to manage discretionary accruals downwards before the company’s initial public offering.
 - (D) Managers have an incentive to manage discretionary accruals downwards before exercising large amounts of executive stock options.
 - (E) Managers have an incentive to manage discretionary accruals downwards before the company’s open-market repurchases.
15. Which of the following statements about “real earnings management” is (are) correct?
- (A) Real earnings management is usually defined as the management of earnings through operational activities.
 - (B) We say that one company manages earnings through real activities when the reported cost of goods sold is abnormally low, regardless of the firm size.
 - (C) Real earnings management will affect cash flows but not accruals.
 - (D) Ceteris paribus, earnings will decrease when managers increase price discounts or more lenient credit terms, assuming positive margins.
 - (E) Ceteris paribus, earnings will decrease when there is an abnormal increase in expenditures on research and development.
16. 下列關於金融市場與經濟時事的論述，何者(或哪些)正確?
- (A) 民國102年2月27日臺灣集中市場收盤時，加權指數落在7800至7900點之間。
 - (B) 我國已於民國102年1月1日開徵個人證券交易所得稅，不過當臺灣集中市場加權指數低於9000點時，不予課徵。
 - (C) 美國蘋果公司(Apple Inc.)自正式營運以來，未發放過現金股利。
 - (D) 二代健保實施後，並非所有股利收入皆需納入計算補充保費。
 - (E) 日圓貶值對韓國出口產業的獲利能力，預料將有負面影響。
17. Consider one vanilla European-style put option. The payoff at the exercise date is $\text{Max}(K - S_T, 0)$, where S_T is the per-share price of the underlying asset (named as U asset) at the expiration date, and K is the strike price. The current per-share price of U asset is \$20. In the next year the price of U asset will either go up by 30% or fall by 20%. U asset will not pay dividends. The one year risk-free rate is

國立中山大學 102 學年度碩士暨碩士專班招生考試試題

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共 4 頁第 4 頁

0% and will remain constant. Using the two-state single-period binomial model, the value of a one-year European-style put option on U asset with a strike price of \$20 is (A). Moreover, assuming the beta on U asset is 1.2. The beta for a one-year European-style put option on U asset with a strike price of \$20 is (B).

18. Consider one European-style financial derivative. The payoff at the exercise date is $Max(2S_T - 20, 0)$, where S_T is the per-share price of the underlying asset at the expiration date. The current per-share price of the underlying asset is \$10. This financial derivative expires in one year. The underlying asset will not pay dividends. The one year risk-free rate is 0% and will remain constant. The volatility of the underlying asset is 0.1. The fair value of this financial derivative is (C).

Notes: You could refer to (or neglect) the following information when calculating the fair value. Assume that Z is a random variable followed by a normal distribution with a zero mean and standard deviation of one. The probabilities $P(Z < 0.05) = 0.52$, $P(Z < 0.25) = 0.599$, and $P(Z < 0.55) = 0.709$. Moreover, we have $\ln(2) = 0.693$ and $\ln(0.5) = -0.693$.

19. Suppose the stock of VERYGOOD company is currently trading for \$20 per share. Consider two cases: (i) VERYGOOD company does a 4:2 stock split, and (ii) VERYGOOD company does a 1:3 reverse split. In each case, the new share price of VERYGOOD company will be (D). (請依順序寫出，全對才給分。)

國立中山大學 102 學年度碩士暨碩士專班招生考試試題

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共 4 頁第 1 頁

說明：

統計學[財管系碩士班]試題共有兩部份，第一部份為填充題 50 分，第二部份為問答题 50 分，請依序作答，總計共 100 分。

填充題答案全對才給分。你只需要填入最後的完整答案，”請勿”寫出計算過程。

例如：你的第一個空格答案若為“a+b”，答案請填寫 **(1) a+b**。

填充題答案卷請製作如下：

| | | |
|-------------|------------|------------|
| (1) | (2) | (3) |
| (4) | (5) | (6) |
| (7) | (8) | (9) |
| (10) | | |

第一部份填充題：

共 10 格，每一個空格 5 分，共計 50 分。(請務必依據答案欄要求的格式，以及要求作答的方式)

Question 1.

We've collected data on the percentage of the population of each county in Taiwan that is considered obese, using clinical measures, and that has been diagnosed with diabetes. We have constructed two random variables, *Obesity* and *Diabetes*, of the following forms (note: how the categories are constructed is irrelevant),

Obesity = 1 if percent obese is <18.6

2 if percent obese is 18.6 – 23.5

3 if percent obese is >23.5

Diabetes=1 if percent w/ diabetes is <6.4

2 if percent w/ diabetes is 6.4 – 7.6

3 if percent w/ diabetes is >7.6

The following table reflects the joint probability function of our two variables:

| | <i>Obesity</i> = 1 | <i>Obesity</i> = 2 | <i>Obesity</i> = 3 |
|---------------------|--------------------|--------------------|--------------------|
| <i>Diabetes</i> = 1 | 0.017 | 0.000 | 0.034 |
| <i>Diabetes</i> = 2 | 0.0165 | 0.278 | 0.189 |
| <i>Diabetes</i> = 3 | 0.0165 | 0.122 | 0.327 |

What is the probability that *Obesity* = 2, say $\Pr(\text{Obesity}=2)=$ **(1)** _____, what is the conditional probability of *Diabetes*=1 given that *Obesity* = 1, say $\Pr(\text{Diabetes}=1 / \text{Obesity}=1)=$ **(2)** _____. Calculate conditional expectation of *Diabetes* given that *Obesity* = 1, say $E(\text{Diabetes} / \text{Obesity}=1)=$ **(3)** _____, and covariance of *Diabetes* and *Obesity*, say $\text{Cov}(\text{Obesity}, \text{Diabetes})=$ **(4)** _____.

Question 2.

A manufacturer general manager claims that his brand of DVD player has an average life expectancy of 6 years and 6 months with a standard deviation of 1 year and 3 months. Assume that the life expectancy is normally distributed. Randomly selecting one DVD player from this brand, find the probability of its life expectancy (years): $\Pr(6 < Y < 8) =$ **(5)** _____. Assume you decide to test 100 DVDs of this brand, the average life in these samples is 5 years and the sample standard deviation is 2 years. Calculate a 95% level of confidence interval for the average life (in years) = **(6)** _____(四捨五入至小數點以下第 3 位).

國立中山大學 102 學年度碩士暨碩士專班招生考試試題

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共 4 頁第 2 頁

Question 3.

You are estimating the linear regression model by Ordinary Least Square (OLS) method, setting the basic model $Y_i = b_0 + b_1 X_i + \varepsilon_i$ (ε_i is error term), and considering the following data,

| | | | | | |
|-----|---|---|----|---|----|
| Y | 8 | 3 | 4 | 2 | -2 |
| X | 5 | 3 | -1 | 2 | 0 |

Find the estimator of $b_1 =$ (7) (四捨五入至小數點以下第 3 位). Then assume given sum of squared residuals is 30.772, the variance of the regression = (8). (四捨五入至小數點以下第 3 位)

Question 4.

Suppose you have estimated a simple regression model that explains household food expenditures (in dollars) as a function of household income using 1000 observations:

| | Coefficient | Std. error | T-stat. | P-value |
|------------------|-------------|------------|---------|---------|
| <i>Intercept</i> | 83.41 | (甲) | 1.92 | 0.062 |
| <i>INCOME</i> | 10.20 | 2.09 | (乙) | 0.000 |

Find the value of (甲) = (9) (四捨五入至小數點以下第 3 位). Construct a 95% interval estimate for coefficient of *INCOME* = (10). (四捨五入至小數點以下第 3 位)

[最後有兩張可查詢的表]

第二部分一問答題，共 4 個小題，每小題的配分在題號前，共計 50 分。

- (5 分) Suppose that X and Y are random variables. Please derive $Cov(X, Y)^2 \leq Var(X)Var(Y)$.
- (10 分) A random sample X_1, X_2, \dots, X_n of size n is taken from $N(\mu, \sigma^2)$ where μ is a real number and σ^2 is finite. Please find the Cramer-Rao lower bound (C.R.L.B.).
- (15 分) Let future stock price S_T as a lognormal random variable, i.e.,
 $\ln S_T \sim N(\ln S_0 + (r - \frac{1}{2}\sigma^2)T, \sigma^2 T)$, where S_0, K, r, σ, T are all constant numbers. Please prove that $e^{-rT} E[Max(S_T - K, 0)]$ is equal to $S_0 N(d_1) - Ke^{-rT} N(d_2)$, where $d_1 = \frac{\ln(S_0/K) + (r + \sigma^2/2)T}{\sigma\sqrt{T}}$ and $d_2 = d_1 - \sigma\sqrt{T}$.
- (20 分) The discrete uniform distribution is known as the "equally likely outcomes" distribution. Suppose X is a discrete uniform random variable. If we let the values of the random variable be $1, 2, \dots, N$, then the probability mass function (pmf) $f(x) = 1/N$, where $x = 1, 2, \dots, N$. Please prove the following identities.

(a) $E(X) = \frac{N+1}{2}$ (b) $Var(X) = \frac{N^2-1}{12}$ (c) $M_X(t) = \frac{e^t(1-e^{Nt})}{N(1-e^t)}$ (d) $E(X^n) = \sum_{x=1}^N \frac{x^n}{N}$

國立中山大學 102 學年度碩士暨碩士專班招生考試試題

科目名稱：統計學【財管系碩士班】

題號：443003

※本科目依簡章規定「不可以」使用計算機

共 4 頁第 3 頁

A.5 F分配之臨界值 (續)

$$f_{0.05}(v_1, v_2)$$

| v_2 | v_1 | | | | | | | | | |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| | 10 | 12 | 15 | 20 | 24 | 30 | 40 | 60 | 120 | ∞ |
| 1 | 241.9 | 243.9 | 245.9 | 248.0 | 249.1 | 250.1 | 251.1 | 252.2 | 253.3 | 254.3 |
| 2 | 19.40 | 19.41 | 19.43 | 19.45 | 19.45 | 19.46 | 19.47 | 19.48 | 19.49 | 19.50 |
| 3 | 8.79 | 8.74 | 8.70 | 8.66 | 8.64 | 8.62 | 8.59 | 8.57 | 8.55 | 8.53 |
| 4 | 5.96 | 5.91 | 5.86 | 5.80 | 5.77 | 5.75 | 5.72 | 5.69 | 5.66 | 5.63 |
| 5 | 4.74 | 4.68 | 4.62 | 4.56 | 4.53 | 4.50 | 4.46 | 4.43 | 4.40 | 4.36 |
| 6 | 4.06 | 4.00 | 3.94 | 3.87 | 3.84 | 3.81 | 3.77 | 3.74 | 3.70 | 3.67 |
| 7 | 3.64 | 3.57 | 3.51 | 3.44 | 3.41 | 3.38 | 3.34 | 3.30 | 3.27 | 3.23 |
| 8 | 3.35 | 3.28 | 3.22 | 3.15 | 3.12 | 3.08 | 3.04 | 3.10 | 2.97 | 2.93 |
| 9 | 3.14 | 3.07 | 3.01 | 2.94 | 2.90 | 2.86 | 2.83 | 2.79 | 2.75 | 2.71 |
| 10 | 2.98 | 2.91 | 2.85 | 2.77 | 2.74 | 2.70 | 2.66 | 2.62 | 2.58 | 2.54 |
| 11 | 2.85 | 2.79 | 2.72 | 2.65 | 2.61 | 2.57 | 2.53 | 2.49 | 2.45 | 2.40 |
| 12 | 2.75 | 2.69 | 2.62 | 2.54 | 2.51 | 2.47 | 2.43 | 2.38 | 2.34 | 2.30 |
| 13 | 2.67 | 2.60 | 2.53 | 2.46 | 2.42 | 2.38 | 2.34 | 2.30 | 2.25 | 2.21 |
| 14 | 2.60 | 2.53 | 2.46 | 2.39 | 2.35 | 2.31 | 2.27 | 2.22 | 2.18 | 2.13 |
| 15 | 2.54 | 2.48 | 2.40 | 2.33 | 2.29 | 2.25 | 2.20 | 2.16 | 2.11 | 2.07 |
| 16 | 2.49 | 2.42 | 2.35 | 2.28 | 2.24 | 2.19 | 2.15 | 2.11 | 2.06 | 2.01 |
| 17 | 2.45 | 2.38 | 2.31 | 2.23 | 2.19 | 2.15 | 2.10 | 2.06 | 2.01 | 1.96 |
| 18 | 2.41 | 2.34 | 2.27 | 2.19 | 2.15 | 2.11 | 2.06 | 2.02 | 1.97 | 1.92 |
| 19 | 2.38 | 2.31 | 2.23 | 2.16 | 2.11 | 2.07 | 2.03 | 1.98 | 1.93 | 1.88 |
| 20 | 2.35 | 2.28 | 2.20 | 2.12 | 2.08 | 2.04 | 1.99 | 1.95 | 1.90 | 1.84 |
| 21 | 2.32 | 2.25 | 2.18 | 2.10 | 2.05 | 2.01 | 1.96 | 1.92 | 1.87 | 1.81 |
| 22 | 2.30 | 2.23 | 2.15 | 2.07 | 2.03 | 1.98 | 1.94 | 1.89 | 1.84 | 1.78 |
| 23 | 2.27 | 2.20 | 2.13 | 2.05 | 2.01 | 1.96 | 1.91 | 1.86 | 1.81 | 1.76 |
| 24 | 2.25 | 2.18 | 2.11 | 2.03 | 1.98 | 1.94 | 1.89 | 1.84 | 1.79 | 1.73 |
| 25 | 2.24 | 2.16 | 2.09 | 2.01 | 1.96 | 1.92 | 1.87 | 1.82 | 1.77 | 1.71 |
| 26 | 2.22 | 2.15 | 2.07 | 1.99 | 1.95 | 1.90 | 1.85 | 1.80 | 1.75 | 1.69 |
| 27 | 2.20 | 2.13 | 2.06 | 1.97 | 1.93 | 1.88 | 1.84 | 1.79 | 1.73 | 1.67 |
| 28 | 2.19 | 2.12 | 2.04 | 1.96 | 1.91 | 1.87 | 1.82 | 1.77 | 1.71 | 1.65 |
| 29 | 2.18 | 2.10 | 2.03 | 1.94 | 1.90 | 1.85 | 1.81 | 1.75 | 1.70 | 1.64 |
| 30 | 2.16 | 2.09 | 2.01 | 1.93 | 1.89 | 1.84 | 1.79 | 1.74 | 1.68 | 1.62 |
| 40 | 2.08 | 2.00 | 1.92 | 1.84 | 1.79 | 1.74 | 1.96 | 1.64 | 1.58 | 1.51 |
| 60 | 1.99 | 1.92 | 1.84 | 1.75 | 1.70 | 1.65 | 1.59 | 1.53 | 1.47 | 1.39 |
| 120 | 1.91 | 1.83 | 1.75 | 1.66 | 1.61 | 1.55 | 1.50 | 1.43 | 1.35 | 1.25 |
| ∞ | 1.83 | 1.75 | 1.67 | 1.57 | 1.52 | 1.46 | 1.39 | 1.32 | 1.22 | 1.00 |

國立中山大學 102 學年度碩士暨碩士專班招生考試試題

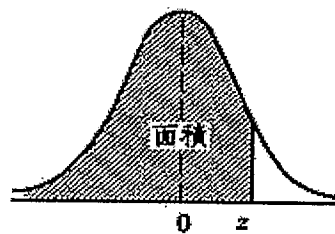
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共 4 頁第 4 頁

A.2 常態曲線下之面積



| z | 0.00 | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 |
|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| -3.4 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0002 |
| -3.3 | 0.0005 | 0.0005 | 0.0005 | 0.0004 | 0.0004 | 0.0004 | 0.0004 | 0.0004 | 0.0004 | 0.0003 |
| -3.2 | 0.0007 | 0.0007 | 0.0006 | 0.0006 | 0.0006 | 0.0006 | 0.0006 | 0.0005 | 0.0005 | 0.0005 |
| -3.1 | 0.0010 | 0.0009 | 0.0009 | 0.0009 | 0.0008 | 0.0008 | 0.0008 | 0.0008 | 0.0007 | 0.0007 |
| -3.0 | 0.0013 | 0.0013 | 0.0013 | 0.0012 | 0.0012 | 0.0011 | 0.0011 | 0.0011 | 0.0010 | 0.0010 |
| -2.9 | 0.0019 | 0.0018 | 0.0017 | 0.0017 | 0.0016 | 0.0016 | 0.0015 | 0.0015 | 0.0014 | 0.0014 |
| -2.8 | 0.0026 | 0.0025 | 0.0024 | 0.0023 | 0.0023 | 0.0022 | 0.0021 | 0.0021 | 0.0020 | 0.0019 |
| -2.7 | 0.0035 | 0.0034 | 0.0033 | 0.0032 | 0.0031 | 0.0030 | 0.0029 | 0.0028 | 0.0027 | 0.0026 |
| -2.6 | 0.0047 | 0.0045 | 0.0044 | 0.0043 | 0.0041 | 0.0040 | 0.0039 | 0.0038 | 0.0037 | 0.0036 |
| -2.5 | 0.0062 | 0.0060 | 0.0059 | 0.0057 | 0.0055 | 0.0054 | 0.0052 | 0.0051 | 0.0049 | 0.0048 |
| -2.4 | 0.0082 | 0.0080 | 0.0078 | 0.0075 | 0.0073 | 0.0071 | 0.0069 | 0.0068 | 0.0066 | 0.0064 |
| -2.3 | 0.0107 | 0.0104 | 0.0102 | 0.0099 | 0.0096 | 0.0094 | 0.0091 | 0.0089 | 0.0087 | 0.0084 |
| -2.2 | 0.0139 | 0.0136 | 0.0132 | 0.0129 | 0.0125 | 0.0122 | 0.0119 | 0.0116 | 0.0113 | 0.0110 |
| -2.1 | 0.0197 | 0.0174 | 0.0170 | 0.0166 | 0.0162 | 0.0158 | 0.0154 | 0.0150 | 0.0146 | 0.0143 |
| -2.0 | 0.0228 | 0.0222 | 0.0217 | 0.0212 | 0.0207 | 0.0202 | 0.0197 | 0.0192 | 0.0188 | 0.0183 |
| -1.9 | 0.0287 | 0.0281 | 0.0274 | 0.0268 | 0.0262 | 0.0256 | 0.0250 | 0.0244 | 0.0239 | 0.0233 |
| -1.8 | 0.0359 | 0.0352 | 0.0344 | 0.0336 | 0.0329 | 0.0322 | 0.0314 | 0.0307 | 0.0301 | 0.0294 |
| -1.7 | 0.0446 | 0.0436 | 0.0427 | 0.0418 | 0.0409 | 0.0401 | 0.0392 | 0.0384 | 0.0375 | 0.0367 |
| -1.6 | 0.0548 | 0.0537 | 0.0526 | 0.0516 | 0.0505 | 0.0495 | 0.0485 | 0.0475 | 0.0465 | 0.0455 |
| -1.5 | 0.0668 | 0.0655 | 0.0643 | 0.0630 | 0.0618 | 0.0606 | 0.0594 | 0.0582 | 0.0571 | 0.0559 |
| -1.4 | 0.0808 | 0.0793 | 0.0778 | 0.0764 | 0.0749 | 0.0735 | 0.0722 | 0.0708 | 0.0694 | 0.0681 |
| -1.3 | 0.0968 | 0.0951 | 0.0934 | 0.0918 | 0.0901 | 0.0885 | 0.0869 | 0.0853 | 0.0838 | 0.0823 |
| -1.2 | 0.1151 | 0.1131 | 0.1112 | 0.1093 | 0.1075 | 0.1056 | 0.1038 | 0.1020 | 0.1003 | 0.0985 |
| -1.1 | 0.1357 | 0.1335 | 0.1314 | 0.1292 | 0.1271 | 0.1251 | 0.1230 | 0.1210 | 0.1190 | 0.1170 |
| -1.0 | 0.1587 | 0.1562 | 0.1539 | 0.1515 | 0.1492 | 0.1469 | 0.1446 | 0.1423 | 0.1401 | 0.1379 |
| -0.9 | 0.1841 | 0.1814 | 0.1788 | 0.1762 | 0.1736 | 0.1711 | 0.1685 | 0.1660 | 0.1635 | 0.1611 |
| -0.8 | 0.2119 | 0.2090 | 0.2061 | 0.2033 | 0.2005 | 0.1977 | 0.1949 | 0.1922 | 0.1894 | 0.1867 |
| -0.7 | 0.2420 | 0.2389 | 0.2358 | 0.2327 | 0.2296 | 0.2266 | 0.2236 | 0.2206 | 0.2177 | 0.2148 |
| -0.6 | 0.2743 | 0.2709 | 0.2676 | 0.2643 | 0.2611 | 0.2578 | 0.2546 | 0.2514 | 0.2483 | 0.2451 |
| -0.5 | 0.3085 | 0.3050 | 0.3015 | 0.2981 | 0.2946 | 0.2912 | 0.2877 | 0.2843 | 0.2810 | 0.2776 |
| -0.4 | 0.3446 | 0.3409 | 0.3372 | 0.3336 | 0.3300 | 0.3264 | 0.3228 | 0.3192 | 0.3156 | 0.3121 |
| -0.3 | 0.3821 | 0.3783 | 0.3745 | 0.3717 | 0.3669 | 0.3632 | 0.3594 | 0.3557 | 0.3520 | 0.3483 |
| -0.2 | 0.4207 | 0.4168 | 0.4129 | 0.4090 | 0.4052 | 0.4013 | 0.3974 | 0.3936 | 0.3897 | 0.3859 |
| -0.1 | 0.4602 | 0.4562 | 0.4522 | 0.4483 | 0.4443 | 0.4404 | 0.4364 | 0.4325 | 0.4286 | 0.4247 |
| -0.0 | 0.5000 | 0.4960 | 0.4920 | 0.4880 | 0.4840 | 0.4801 | 0.4761 | 0.4721 | 0.4681 | 0.4641 |