國立中山大學 113 學年度
碩士班暨碩士在職專班招生考試試題

科目名稱：微積分【企管系企管甲班碩士班甲組選考、乙組選考、丙組選考】

請依題號順序將答案寫在答案卷上，並寫出計算或推導過程，違者不予計分。

Q1. (10%)

Given $(x^{0.5} + 2)^y = e^{2x}$, please find y'.

Q2. (10%)

Given $f(x) = \log_a(\log_a x)$, please find $f'(x)$.

Q3. (10%)

Given $f(x) = x^{x^{x}}$, please find $f'(x)$.

Q4. (10%)

Please evaluate the following integral:

$$\int \frac{6x - 7}{5x^2 - 7x} dx$$

Q5. (10%)

Please evaluate the following integral:

$$\int_2^4 \frac{e^{\log_2 x}}{x} dx$$

Q6. (10%)

Please find the area of the region completely enclosed by the graphs of the following two functions: $f(x) = x^3 - 3x + 3$ and $g(x) = x + 3$.

Q7. (10%)

Please evaluate the following integral:

$$\int \frac{xe^x}{(x+1)^2}\, dx$$

Q8. (10%)

Please determine the radius of convergence and interval of convergence for the following power series:

$$\sum_{n=1}^{\infty} \frac{2^n}{n}(4x-8)^n$$

Q9. (10%)

Please calculate the following value:

$$\lim_{x\to 0}\left(x^2 \sin\frac{1}{x}\right)$$

Q10. (5 + 5 = 10%)

Consider the following function:

$$f(x) = \frac{1}{7+8x}$$

(i) Please find the Taylor series of the function at the point $x = 0$.

(ii) Please give the interval of convergence for the series.

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科目名稱：管理學【企管系企管甲班碩士班甲組選考、乙組選考、丙組選考】

一、單選題 (50 分)：請選擇最適合的答案，每題 2 分，不倒扣

1. Which of the following feature is **NOT** linked to organic organizations?
   A. Cross-functional teams
   B. High formalization
   C. Wide spans of control
   D. Cross-hierarchical teams

2. The first studies of management are called the classical approach. Which of the following scholar of the classical approach first devised a classification scheme to label 17 basic hand motions called therbligs?
   A. Max Weber
   B. Frederick Taylor
   C. Frank Gilbreth
   D. Michael Porter

3. Emma Lee acts as a CEO of a semiconductor manufacturing firm and focuses on collecting, receiving and disseminating information. Based on Prof. Mintzberg's managerial role theory, which of the following roles that Emma Lee has exhibited?
   A. Big data roles
   B. Decisional roles
   C. Interpersonal roles
   D. Informational roles

4. Management skills can support managers in strengthening their firms' performance. Alice Chang serves as a first-line manager. Which of the following is the most important skills that Alice Chang should have?
   A. Conceptual skills
   B. Human skills
   C. Technical skills
   D. Communication skills

5. Authority refers to the rights inherent in a management position to tell people what to do and to expect them to do it. Which of the following authority entitles a manager to direct the work of an employee?
   A. Line authority
   B. Staff authority
   C. Committee authority
   D. Team authority

6. Global trade mechanisms serve to ensure that trade continues efficiently and effectively. Which of the following global trade mechanism emphasizes promoting long-term economic development and poverty reduction by providing members with technical and financial support?
   A. The International Monetary Fund
   B. The WTO
   C. The OECD
   D. The World Bank Group

7. According to different types of international organizations, which of the following type centralizes its management and other decisions in the home country?
   A. Multidomestic corporation
   B. Global company
   C. Transnational organization
   D. Borderless organization

8. With regard to departmentalization, a firm has departments such as marketing, production, R&D and Human resources. Which of the following departmentalization is adopted by this firm?
   A. Process departmentalization
   B. Functional departmentalization
   C. Geographical departmentalization
   D. Customer departmentalization

9. Human resource management serves to strengthen a firm's human capital. Which of the following step of the human resource management process is **NOT** used to retain competent and high performing employees?
   A. Performance management
   B. Compensation
   C. Career development
   D. Orientation

10. Mike Huang is a CEO of a smartphone producer and wants to get into a global market with minimal investment. Which of the following strategy is best suitable for Mike Huang's company?
    A. Foreign subsidiary
    B. Franchising
    C. Strategic alliance
    D. Global sourcing

11. Which of the following is **NOT** a recruiting source?
    A. Internet
    B. College recruiting
    C. Employee referrals
    D. Layoffs

12. Regional trading alliances facilitate international trade and support globalization. Which of the following regional trading alliance particularly focuses on reducing trade barriers between the US, Canada and Mexico?
    A. The EU
    B. The RCEP
    C. The USMCA
    D. The CPTPP

13. With regard to employees' performance appraisal methods, which of the following method utilizes feedback from supervisors, employees and coworkers?
    A. 360-degree appraisal
    B. Multi-person comparison
    C. Critical incident
    D. Written essay

14. According to the Maslow's hierarchy of human needs model, which of the following need is the highest-level need?
    A. Esteem needs
    B. Physiological needs
    C. Self-actualization needs
    D. Social needs

15. With regard to contemporary organizational designs, which of the following design is not defined by or limited to, horizontal, vertical or external boundaries imposed by predefined structure?
    A. Project organizational structure
    B. Team organizational structure
    C. Matrix organizational structure
    D. Boundaryless organizational structure

16. Most managers, at one point or another, will have to change some things in their workplace. Which of the following changes involve changing attitudes, expectations, perceptions and behaviors of individual and group?
    A. Technology
    B. People
    C. Strategy
    D. Structure

17. Which of the following leadership emphasizes motivating followers to work toward established goals by exchanging rewards for their productivity?
    A. Charismatic leadership
    B. Transactional leadership
    C. Ethical leadership
    D. Transformational leadership

18. Comparing the concept of centralization with that of decentralization, which of the following situation needs centralization?
    A. Decisions are significant.
    B. Lower-level managers do not want a say in decisions.
    C. Environment is complex and/or uncertain.
    D. Company is geographically dispersed.

19. Which of the following feature is **NOT** related to intuitive decision making?
    A. Rational decisions
    B. Affect-initiated decisions
    C. Values or ethics-based decisions
    D. Experience-based decisions

20. Tony Wu is a senior manager of an Internet firm and makes use of the BCG matrix to evaluate the firm's business. If the firm's business has high market share with low growth potential, which of the following category within the BCG matrix can best describe such a business?
    A. Stars
    B. Cash cows
    C. Question marks
    D. Dogs

21. Which of the following corporate strategy is used to support firms in expanding the number of markets served or products offered?
    A. Growth strategy
    B. Stability strategy
    C. Renewal strategy
    D. Maintaining strategy

22. Which of the following refers to the invisible barrier that separates women and minorities from top management positions?
    A. Incivility
    B. Mockery and insults
    C. Sexual harassment
    D. Glass ceiling

23. Which of the following is **NOT** a feature of non-programmed decisions?
    A. Unique
    B. Nonrecurring
    C. Repetitive decisions
    D. Involving custom-made solutions

24. Managers and organizations can do many things to protect and preserve the natural environment. According to the shades to green model, which of the following approach reflects the highest degree of environmental sensitivity and illustrates social responsibility?
    A. The market approach
    B. The activist approach
    C. The legal approach
    D. The stakeholder approach

25. With regard to a country's type of economic system, which of the following system shows that economic decisions are planned by a central government?
    A. Planned economy
    B. Free market economy
    C. Monopoly economy
    D. Shared economy

二、申論題 (50 分)：請扼要切題的回答，切忌長篇大論不知所云

1. The concept of platforms plays an important role in today's economy. Read the following article adapted from the MIT Sloan Management Review (Cusumano, Yoffe and Gawer, 2020) and answer the given questions.

    Innovation platforms facilitate the development of new, complementary products and services, such as PC or smartphone apps, that are built mostly by third-party companies without traditional supplier contracts. By complementary, we mean that these innovations add functionality or assets to the platform. This is the source of their network effects: The more complements there are or the higher quality they are, the more attractive the platform becomes to users and other potential market actors.

    Transaction platforms are intermediaries or online marketplaces that make it possible for participants to exchange goods and services or information. The more participants and functions

available on a transaction platform, the more useful it becomes. These platforms create value by enabling exchanges that would not otherwise occur without the platform as an intermediary.

Hybrid companies contain both innovation and transaction platforms. Their strategies are novel because, in the early years of the PC and the internet, innovation and transaction platforms were distinct businesses. Connecting buyers and sellers, advertisers and consumers, or users of social networks appeared to be a fundamentally different activity from stimulating outside companies to create complementary innovations. In the past decade, however, a growing number of successful innovation platforms have integrated transaction platforms into their business models. Rather than lose control over distribution, the owners of these platforms have sought to manage the customer experience, like Apple has done with its App Store. Likewise, some successful transaction platforms have opened their application programming interfaces (APIs) and encouraged third parties to create complementary apps and services. The owners of these platforms, such as Facebook and WeChat, recognize that not all innovation can or should be internal. Other prominent examples of hybrid strategies include Google's decision to buy Android, Amazon's decision to create multiple innovation platforms around Amazon Web Services and Alexa-Echo home AI devices, and Uber's and Airbnb's decisions to allow third-party companies to offer services that complement their ride-sharing and room-sharing platforms. Today, the most valuable global companies (which we mentioned above) all follow hybrid strategies.

1.1 Please briefly introduce the Porter's five forces model. (5%)
1.2 Please clarify the terms "innovation platform" and "transaction platform". (6%)
1.3 Based on the article information, evaluate if the fives forces model is still appropriate for analyzing platform competition (14%)

2. The resource-based view (RBV) has clarified the strategic process of creating sustained competitive advantage. Read the following article adapted from the Research-Technology Management (Chesbrough, 2017) and answer the given questions.

The Taiwan Semiconductor Manufacturing Corporation (TSMC) provides manufacturing services; its clients design semiconductor chips that TSMC then fabricates. Designing chips is a complex process that requires a variety of design tools, such as reference designs and process recipes. As TSMC became an important player in the semiconductor design and manufacturing ecosystem, many of the third-party companies who make these tools began to ensure their offerings would run on TSMC's processes. This expansion in third-party tool offerings creates more design options for TSMC's customers—a clear benefit—but these offerings also increase the complexity customers must manage, increasing the risk of expensive chip redesigns or modifications— a clear risk. TSMC has addressed this risk with its Open Innovation Platform, which combines the company's design and manufacturing services with those provided by third-party companies and then tests them all together. The tests certify to customers that their designs will function correctly. This service avoids very expensive "turns" of the chip design, in which the chip must be redesigned in order to be manufactured properly at volume. The result is faster time to market for TSMC's customers at a lower design cost.

2.1 Please briefly introduce the resource-based view. (7%)
2.2 Based on the article information, please introduce the concept of open innovation and evaluate if the resource-based view still applies. (18%)

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一、複選題(共 20 題，每題五分，合計 100 分。每題有五選項，答錯 k 個選項者，得該題全部分數的(5-2k)/5，得分低於零分或所有選項均未作答者，該題以零分計)

Use the tables of probability distributions in Appendix as needed.

1. Which of the following is/are correct? (A) A "scatterplot" is good for obtaining the potential association between two categorical variables; (B) A "pie chart" is good for comparing the means of a numerical variable between two independent groups; (C) In a "Box-plot", the line drawn in the box indicates the location of the mean; (D) "100% stacked area chart" can be used to compare the change in distribution of a categorical variable over a period of time. (E) Unlike "bar graph", a "histogram" has no natural separation between rectangles of adjacent classes;

2. A sample of midterm grades for five students showed the following results: 72, 65, 82, 90, 76. Which of the following statements are acceptable? (A) The average midterm grade for the sample of five students is 77; (B) The average midterm grade for all students who took the exam is 77; (C) An estimate of the average midterm grade for all students who took the exam is 77; (D) More than half of the students who take this exam will score between 70 and 85; (E) If five other students are included in the sample, their grades will be between 65 and 90.

3. Suppose that an independent study of middle-level managers employed at companies located in Atlanta was conducted to compare the salaries of managers working at firms in Atlanta to the salaries of middle-level managers across the United States. Reported by the Wall Street Journal, the median of the whole United States is $85,000. The following data show the salary, in thousands of dollars, for a sample of 15 middle-level managers employed at companies in the Atlanta area.

$$108, 83, 106, 73, 53, 85, 80, 63, 67, 75, 124, 55, 93, 118, 77$$

Which of the following are correct? (A) The median salary for the sample of 15 middle-level managers working at firms in Atlanta is lightly higher than the median salary in the whole United States reported by the Wall Street Journal; (B) The sample mean salary is $84,000; (C) The distribution of salaries for middle-level managers working at firms in Atlanta is positively skewed; (D) The first quartile for the salaries of middle-level managers in the Atlanta area is 67; (E) The 75th percentile for the salaries of middle-level managers in the Atlanta area is 121.

4. Assume P(X) is the probability of event X and P(Y) is the probability of event Y. Which of the following descriptions is/are NOT correct? (A) $P(X \cap Y)=P(X) \cdot P(Y)$ if X and Y are mutually exclusive; (B) $P(Y|X)=P(X)$ if X and Y are independent events; (C) If X and Y are mutually exclusive, Y is the complement of X; (D) If X and Y are independent, $P(X \cup Y)=P(X) \cdot P(Y)$; (E) $P(X \cup Y)= P(X) + P(Y)$ if X and Y are mutually exclusive.

5. Which of the following belongs to continuous probability distributions? (A) Normal probability distribution; (B) Poisson probability distribution; (C) Binomial probability distribution; (D) Exponential probability distribution; (E) Chi-square probability distribution.

6. The National Center for Health Statistics, housed within the U.S. Centers for Disease Control and Prevention (CDC), tracks the number of adults in the United States who have health insurance. According to this agency, the uninsured rates for Americans in 2020 are as follows: 5.1% of those under the age of 18. 12.4% of those ages 18-64, and 1.1% of those 65 and older do not have health insurance. Approximately 22.8% of Americans are under age 18, and 61.4% of Americans are ages 18-64. Which of the following is/are correct? (All estimates are rounded to 3 decimal places.) (A) The probability that a randomly selected person is 65 or older is 0.158; (B) The probability that a randomly selected person is uninsured is 0.062; (C) Given that the person is an uninsured American, the probability that the person is 65 or older is 0.019; (D) Given that the person is an insured American, the probability that the person is under the age of 18 is 0.949; (E) The probability that a randomly selected person is aged 18-64 and insured is 0.538.

7. Let P[Y=x] indicate the probability of a sum of x when rolling three dice. Which of the following is/are correct? (A) P[Y=1]=1/216; (B) P[Y=3]=3/216; (C) P[Y=18]=1/216; (D) P[Y=17]=3/216; (E) P[Y<5]=4/216.

8. Suppose that the mean hours of time per customer staying in a coffee shop after purchasing their beverages follows a normal distribution with a mean of 1 hours and a standard deviation of 0.4. Which of the following is/are correct? (A) The probability that a customer stays for exact 1 hour is 0.5; (B) The probability that a customer stays for more than 2 hours is 0.0228; (C) The probability that a customer stays between 1.5-2 hours is 0.0994; (D) About 20% of customers stay in the shop for at least 1.34 hours; (E) None of above.

9. Cars arrive at a car wash service randomly and independently. The probability of an arrival is the same for any interval of equal length. The mean arrival rate is 4 cars per 10 minutes. Which of the following is/are correct? (A) The probability that less than 2 cars will arrive during any given 10 minutes of operation is 0.2381; (B) The probability that 5 or more cars will arrive during any given 10 minutes of operation is 0.7815; (C) The probability that more than 6 cars will arrive during any given 10 minutes of operation is 0.1107; (D) The probability that exact 7 cars will arrive during any given 10 minutes of operation is about 0.0596; (E) The standard deviation of the arrival rate per 10 minutes is 2.

10. Rejecting a null hypothesis when the null hypothesis is false is called: (A) Type I error; (B) Type II error; (C) Type III error; (D) power; (E) confidence limit.

11. Suppose that a paint supply store wanted to estimate the correct amount of paint contained in one-gallon cans purchased from a nationally known manufacturer. It is known from the manufacturer's specifications that the standard deviation of the amount of paint is 0.02 gallon. A random sample of 64 cans is selected, and the average amount of paint per one-gallon can is 0.99 gallon. (A) The 99% confidence interval (CI) estimate of the true population average amount of paint included in a one-gallon can is (0.9385~1.0415); (B) The 99% CI estimate of the true population average amount of paint included in a one-gallon can is (0.9836~0.9964); (C) Given the significance level of 0.01, the store owner has no reason to believe that the volume is different from 1.0 gallon; (D) Since the population standard deviation is known and n=64, from the central limit theorem we may assume that the population of amount of paint per can is approximately normally distributed; (E) Based on the correct statistical testing, if it is true that the one-gallon can is not filled with 1 gallon of paint, we made type-2 error.

12. Which of the following is/are correct about ANOVA? (A) One assumption of ANOVA is that all samples are drawn independently; (B) One assumption of ANOVA is that the variances of the populations are equal; (C) Suppose four groups are compared, the null hypothesis is $\mu1= \mu2= \mu3 = \mu4$, while the alternative hypothesis is $\mu1\neq \mu2\neq \mu3 \neq \mu4$; (D) One-way ANOVA is a one-tailed test, while two-way ANOVA is a two-tailed test; (E) If the test result is not to reject the null hypothesis, we must perform a post-hoc test to confirm that these groups are truly no different from each other.

13. Suppose that you got data of "Hight in centimeter" and "Weight in kilogram" from all students in an elementary school and you want to investigate the association between the height and weight. Which of the following is/are appropriate? (A) Conduct a line chart to visualize their association; (B) Estimate a correlation coefficient, which ranges from -1 to +1; (C) Conduct a t-test to compare whether height and weight are statistically different; (D) Develop a simple linear regression model and detect whether the slope is significantly different from 0; (E) Conduct a Chi-square test to detect whether these two variables are independent or not.

14. Which of the following is/are correct conclusion of the central limit theorem? (A) As the sample size increases, the distribution of the sample means will approach a normal distribution; (B) The distribution of the sample data will approach a normal distribution as the sample size increases; (C) The standard deviation of all sample means is the population standard deviation divided by the square root of the sample size; (D) The mean of all sample means is equal to the population mean; (E) None of above is correct.

15. Consider the following hypothesis test: H0: $\mu\leq20$; Ha: $\mu>20$. A sample of 25 provided a sample mean of 21 and a sample standard deviation of 2.5. Which of the following is/are correct? (A) The t-test is appropriate for the statistic testing and the computed statistic is 2; (B) The degree of freedom is 25; (C) The p-value <0.05; (D) At α=0.05, the critical values are ±1.96 for the statistical testing; (E) At α=0.05, do not reject the null hypothesis.

16. A survey was conducted among mid-sized and small-sized enterprises in Taiwan to investigate their employment plan ("Add Employees", "No Change", or "Lay-off Employee") in Year 2024. The table below summarizes the observed result for each cell:

	Mid-size	Small size	Total
Add Employees	17	23	40
No Change	12	18	30
Lay-off Employees	12	18	30
Total	41	59	100

Which of the following is/are correct? (A) The expected value of mid-sized companies responding to "Add Employees" is 16.4; (B) The degree of freedom is 6; (C) The Chi-squared statistic is 0.062; (D) The p-value<0.05; (E) Given $\alpha=0.05$, we conclude that there is an association between the size of company and its employment plan.

17. A sample of size 100 is selected from a population with proportion $p = 0.4$. Which of the following is/are correct? ($\bar{p}$ denotes sample proportion.) (A) The expected value of $\bar{p}$ =0.4; (B) The standard error of $\bar{p} = 0.049$; (C) The sampling distribution of $\bar{p}$ follows a normal distribution with $E(\bar{p}) = 0.4$ and $\sigma_{\bar{p}} = 0.049$; (D) The probability that the sample proportion will be below 0.45 of the population proportion is about 0.846; (E) The probability that the sample proportion will be within ±0.05 of the population proportion is about 0.692.

18. The following data are from a completely randomized design:

	Treatment A	Treatment B	Treatment C
	162	142	126
	142	156	122
	165	124	138
	145	142	140
	148	136	150
	174	152	128
Sample mean	156	142	134
Sample variance	164.4	131.2	110.4

The ANOVA table is set up for this problem:

Source of Variation	SS	df	MS	F	P-value	F critical value
Between Groups	?	?	①.	③.	?	④.
Within Groups	?	?	②.			
	?					
Total		?				

Conduct the statistical testing at the 0.05 level of significance. Which of the following descriptions is/are correct? (A) ①=496; (B) ②=135.333; (C) ③=3.666; (D) ④=3.6823; (E) Based on the statistical testing, we reject the null hypothesis and conclude that the means for the three treatments are not equal.

19. Which of the following descriptions is/are correct about the assumptions for the sample linear regression model ($y = \beta_0 + \beta_1 x + \in$)? (A) The error term ($\in$) is a random variable with a mean or expected value of zero; (B) The variance of the error term is the same for all values of x; (C) The values of $\in$ are independent; (D) The error term is a normally distributed random variable for all values of x; (E) For those observations where $\in$ are not zero, that is because of sampling error.

20. Below is the estimated linear regression equation based on 15 observations, where x_1 and x_2 are numerical variables:

$$\hat{y} = 8.13 + 7.602x_1 + 3.111x_2$$

where SSR (sum of squares due to regression) =1612, SSE (sum of squares due to error) =134.67, s_{b1}=2.105, and s_{b2}=0.613. The b_1 and b_2 are the estimated values of β_1 and β_2 for the variable x_1, x_2, respectively; s_{b1}, s_{b2} are the standard errors of the estimated coefficients. Which of the following is/are correct? (A) R-square=92.3%; (B) MSR (regression mean square) = 806; (C) MSE (mean square error) = 10.36; (D) Given α=0.05, t-test with the critical values of ±2.1788 can be used to detect whether β_1 is significantly different from zero; (E) β_2 is not significantly different from zero given α=0.05.

Appendix:

Poisson Cumulative Distribution*

λ=	1	2	3	4	5	6	7	8	9
x=									
0	0.3679	0.1353	0.0498	0.0183	0.0067	0.0025	0.0009	0.0003	0.0001
1	0.7358	0.4060	0.1991	0.0916	0.0404	0.0174	0.0073	0.0030	0.0012
2	0.9197	0.6767	0.4232	0.2381	0.1247	0.0620	0.0296	0.0138	0.0062
3	0.9810	0.8571	0.6472	0.4335	0.2650	0.1512	0.0818	0.0424	0.0212
4	0.9963	0.9473	0.8153	0.6288	0.4405	0.2851	0.1730	0.0996	0.0550
5	0.9994	0.9834	0.9161	0.7851	0.6160	0.4457	0.3007	0.1912	0.1157
6	0.9999	0.9955	0.9665	0.8893	0.7622	0.6063	0.4497	0.3134	0.2068
7	1.0000	0.9989	0.9881	0.9489	0.8666	0.7440	0.5987	0.4530	0.3239
8	1.0000	0.9998	0.9962	0.9786	0.9319	0.8472	0.7291	0.5925	0.4557
9	1.0000	1.0000	0.9989	0.9919	0.9682	0.9161	0.8305	0.7166	0.5874

* The table gives the probability of that a Poisson random variable X with mean= λ is less than or equal to x. That is, the table gives $P(X \le x) = \sum_{r=0}^{x} \frac{e^{-\lambda}\lambda^r}{r!}$

Cumulative Chi-square Probability Distribution (Upper-Tail Areas)*

p=	0.1	0.05	0.025	0.01	0.001
df=					
1	2.7055	3.8415	5.0239	6.6349	10.8276
2	4.6052	5.9915	7.3778	9.2103	13.8155
3	6.2514	7.8147	9.3484	11.3449	16.2662
4	7.7794	9.4877	11.1433	13.2767	18.4668
5	9.2364	11.0705	12.8325	15.0863	20.5150
6	10.6446	12.5916	14.4494	16.8119	22.4577
7	12.0170	14.0671	16.0128	18.4753	24.3219
8	13.3616	15.5073	17.5345	20.0902	26.1245
9	14.6837	16.9190	19.0228	21.6660	27.8772
10	15.9872	18.3070	20.4832	23.2093	29.5883

*The table shows the Chi-square values given the probability (p) as upper-tail area at the degree of freedom of 'df'.

Left-Tailed Cumulative Standard Normal Probability Distribution (Z)*

z	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-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	0.0018	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	0.0179	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	0.0351	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	0.0721	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	0.3707	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

* The probabilities given in this table represent the area to the left of the z-score.

Right-tailed Cumulative Student's t Distribution

α=	0.1	0.05	0.025	0.01	0.005	0.001
df=						
5	1.4759	2.0150	2.5706	3.3649	4.0321	5.8934
6	1.4398	1.9432	2.4469	3.1427	3.7074	5.2076
7	1.4149	1.8946	2.3646	2.9980	3.4995	4.7853
8	1.3968	1.8595	2.3060	2.8965	3.3554	4.5008
9	1.3830	1.8331	2.2622	2.8214	3.2498	4.2968
10	1.3722	1.8125	2.2281	2.7638	3.1693	4.1437
11	1.3634	1.7959	2.2010	2.7181	3.1058	4.0247
12	1.3562	1.7823	2.1788	2.6810	3.0545	3.9296
13	1.3502	1.7709	2.1604	2.6503	3.0123	3.8520
14	1.3450	1.7613	2.1448	2.6245	2.9768	3.7874
15	1.3406	1.7531	2.1314	2.6025	2.9467	3.7328
16	1.3368	1.7459	2.1199	2.5835	2.9208	3.6862
17	1.3334	1.7396	2.1098	2.5669	2.8982	3.6458
18	1.3304	1.7341	2.1009	2.5524	2.8784	3.6105
19	1.3277	1.7291	2.0930	2.5395	2.8609	3.5794
20	1.3253	1.7247	2.0860	2.5280	2.8453	3.5518
21	1.3232	1.7207	2.0796	2.5176	2.8314	3.5272
22	1.3212	1.7171	2.0739	2.5083	2.8188	3.5050
23	1.3195	1.7139	2.0687	2.4999	2.8073	3.4850
24	1.3178	1.7109	2.0639	2.4922	2.7969	3.4668
25	1.3163	1.7081	2.0595	2.4851	2.7874	3.4502
26	1.3150	1.7056	2.0555	2.4786	2.7787	3.4350
27	1.3137	1.7033	2.0518	2.4727	2.7707	3.4210
28	1.3125	1.7011	2.0484	2.4671	2.7633	3.4082
29	1.3114	1.6991	2.0452	2.4620	2.7564	3.3962
30	1.3104	1.6973	2.0423	2.4573	2.7500	3.3852
31	1.3095	1.6955	2.0395	2.4528	2.7440	3.3749
32	1.3086	1.6939	2.0369	2.4487	2.7385	3.3653
33	1.3077	1.6924	2.0345	2.4448	2.7333	3.3563
34	1.3070	1.6909	2.0322	2.4411	2.7284	3.3479
35	1.3062	1.6896	2.0301	2.4377	2.7238	3.3400

The table gives the value of $t(\alpha;df)$ where $Pr(T(df)>t(\alpha;df))=\alpha$ with df degree of freedom.

The Critical values for F-distributions at (df1, df2) degree of freedom, given alpha=0.05

		Numerator degrees of freedom (df1)									
		1	2	3	4	5	6	7	8	9	10
Denominator degrees of freedom (df2)	1	161.45	199.50	215.71	224.58	230.16	233.99	236.77	238.88	240.54	241.88
	2	18.513	19.000	19.164	19.247	19.296	19.330	19.353	19.371	19.385	19.396
	3	10.128	9.5521	9.2766	9.1172	9.0135	8.9406	8.8867	8.8452	8.8123	8.7855
	4	7.7086	6.9443	6.5914	6.3882	6.2561	6.1631	6.0942	6.0410	5.9988	5.9644
	5	6.6079	5.7861	5.4095	5.1922	5.0503	4.9503	4.8759	4.8183	4.7725	4.7351
	6	5.9874	5.1433	4.7571	4.5337	4.3874	4.2839	4.2067	4.1468	4.0990	4.0600
	7	5.5914	4.7374	4.3468	4.1203	3.9715	3.8660	3.7870	3.7257	3.6767	3.6365
	8	5.3177	4.4590	4.0662	3.8379	3.6875	3.5806	3.5005	3.4381	3.3881	3.3472
	9	5.1174	4.2565	3.8625	3.6331	3.4817	3.3738	3.2927	3.2296	3.1789	3.1373
	10	4.9646	4.1028	3.7083	3.4780	3.3258	3.2172	3.1355	3.0717	3.0204	2.9782
	11	4.8443	3.9823	3.5874	3.3567	3.2039	3.0946	3.0123	2.9480	2.8962	2.8536
	12	4.7472	3.8853	3.4903	3.2592	3.1059	2.9961	2.9134	2.8486	2.7964	2.7534
	13	4.6672	3.8056	3.4105	3.1791	3.0254	2.9153	2.8321	2.7669	2.7144	2.6710
	14	4.6001	3.7389	3.3439	3.1122	2.9582	2.8477	2.7642	2.6987	2.6458	2.6022
	15	4.5431	3.6823	3.2874	3.0556	2.9013	2.7905	2.7066	2.6408	2.5876	2.5437
	16	4.4940	3.6337	3.2389	3.0069	2.8524	2.7413	2.6572	2.5911	2.5377	2.4935
	17	4.4513	3.5915	3.1968	2.9647	2.8100	2.6987	2.6143	2.5480	2.4943	2.4499
	18	4.4139	3.5546	3.1599	2.9277	2.7729	2.6613	2.5767	2.5102	2.4563	2.4117
	19	4.3807	3.5219	3.1274	2.8951	2.7401	2.6283	2.5435	2.4768	2.4227	2.3779
	20	4.3512	3.4928	3.0984	2.8661	2.7109	2.5990	2.5140	2.4471	2.3928	2.3479
	21	4.3248	3.4668	3.0725	2.8401	2.6848	2.5727	2.4876	2.4205	2.3660	2.3210
	22	4.3009	3.4434	3.0491	2.8167	2.6613	2.5491	2.4638	2.3965	2.3419	2.2967
	23	4.2793	3.4221	3.0280	2.7955	2.6400	2.5277	2.4422	2.3748	2.3201	2.2747
	24	4.2597	3.4028	3.0088	2.7763	2.6207	2.5082	2.4226	2.3551	2.3002	2.2547
	25	4.2417	3.3852	2.9912	2.7587	2.6030	2.4904	2.4047	2.3371	2.2821	2.2365
	26	4.2252	3.3690	2.9752	2.7426	2.5868	2.4741	2.3883	2.3205	2.2655	2.2197
	27	4.2100	3.3541	2.9604	2.7278	2.5719	2.4591	2.3732	2.3053	2.2501	2.2043
	28	4.1960	3.3404	2.9467	2.7141	2.5581	2.4453	2.3593	2.2913	2.2360	2.1900
	29	4.1830	3.3277	2.9340	2.7014	2.5454	2.4324	2.3463	2.2783	2.2229	2.1768

國立中山大學113學年度
碩士班暨碩士在職專班招生考試試題

科目名稱：經濟學【企管系企管甲班碩士班甲組、乙組、丙組】

Part I: Multiple Choice Questions: (Single Answer, 4 points per question, 40%)

1. A lawyer running his own business earns $18,000 in revenue monthly. He pays $8,000 as explicit costs including staff salary and utilities. He owns the office space so no rent is paid. The lawyer could work for other legal firms and earn $10,000 per month. His business profit is _____ and his economic profit is _____.
   A) $10,000, $10,000
   B) $28,000, $10,000
   C) $10,000, $0
   D) $8,000, $0
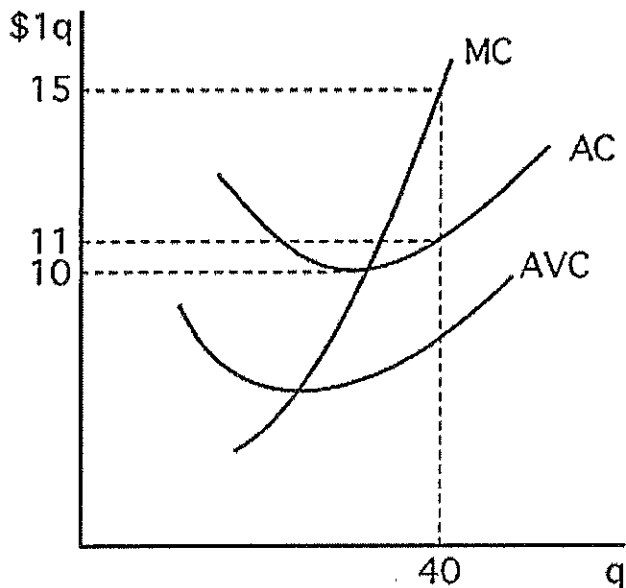
2. The above figure shows the cost curves for a competitive firm. If the firm is to earn economic profit, price must exceed
   A) $0.
   B) $5.
   C) $10.
   D) $11.
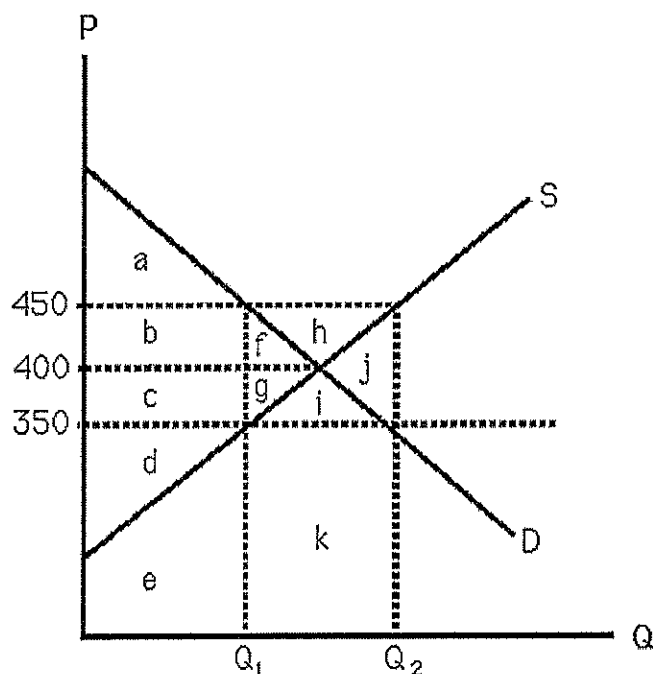
3. The above figure shows supply and demand curves for apartment units in a large city. If the city government passes a law that establishes $350 per month as the legal maximum rent, the loss in social welfare equals
A) b + c.
B) f.
C) a.
D) f + g.

4. The above figure shows supply and demand curves for apartment units in a large city. If the city government passes a law that establishes $350 per month as the legal maximum rent, producer surplus decreases by
A) d.
B) b + f.
C) c + g.
D) i.

5. The competitive firm's supply curve is equal to
A) its marginal cost curve.
B) the portion of its marginal cost curve that lies above AC.
C) the portion of its marginal cost curve that lies above AVC.
D) the portion of its marginal cost curve that lies above AFC.

6. If the inverse demand function for a monopoly's product is $p = a - bQ$, then the firm's marginal revenue function is
A) a.
B) $a - (1/2)bQ$.
C) $a - bQ$.
D) $a - 2bQ$.

7. If the inverse demand curve a monopoly faces is p = 100 - 2Q, and MC is constant at 16, then profit maximization
A) is achieved when 21 units are produced.
B) is achieved by setting price equal to 21.
C) is achieved only by shutting down in the short run.
D) cannot be determined solely from the information provided.

8. A monopoly sets a price of $50 per unit for an item that has a marginal cost of $10. Assuming profit maximization, the implicit demand elasticity is
A) -0.2.
B) -0.8.
C) -1.25.
D) -5.0.
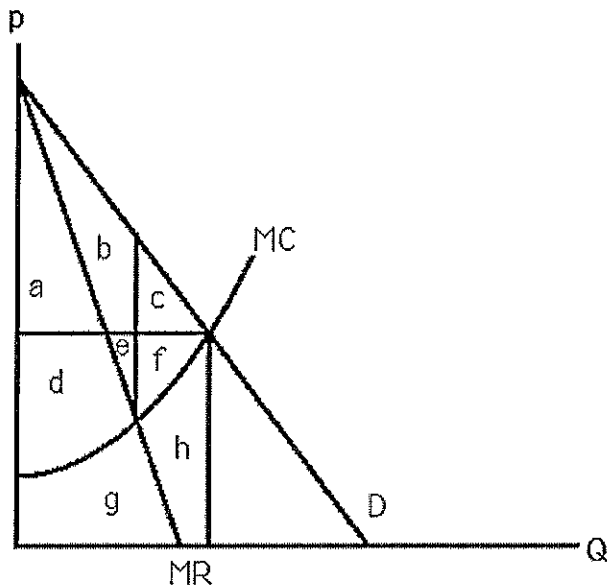
9. The above figure shows the demand and marginal cost curves for a monopoly. The deadweight loss of this monopoly equals
A) h.
B) c.
C) c + f.
D) c + d + e + f.

10. Under monopsony, the wage rate
A) equals the marginal product of labor.
B) equals the marginal revenue product of labor.
C) is less than the marginal revenue product of labor.
D) is greater than it would be under perfect competition.

Part II. Multiple Choice Questions: (Single Answer, 2 points per question, 10%)
11. The gains of specialization and trade are enhanced under the following conditions:
(A) Implementation of tariffs and quotas.
(B) Escalation of exchange costs.
(C) Heightened transaction costs.

(D) Reduction of artificial trade barriers.

12. Which of the following actions would likely lead to a domestic recession while enhancing the trade balance?
(A) Implementing a more stringent domestic fiscal policy.
(B) Reducing the domestic price of imports.
(C) Adopting a looser domestic monetary policy.
(D) Encountering a domestic investment boom.

13. When a government enacts a policy aimed at reducing inflation, it can anticipate that unemployment will:
(A) rise in the short run.
(B) fall in the short run.
(C) increase in the long run.
(D) decrease in the long run.

14. What causes a rightward shift in the AD curve?
(A) Expansionary fiscal policy and expansionary monetary policy.
(B) Contractionary fiscal policy and contractionary monetary policy.
(C) Contractionary fiscal policy and expansionary monetary policy.
(D) Expansionary fiscal policy and contractionary monetary policy.

15. With a fixed money supply, an increase in output (Y) causes the money demand curve (Md) to shift to the right, leading to a rise in the equilibrium interest rate. This relationship is illustrated by the:
(A) LM curve.
(B) ZZ line.
(C) IS curve.
(D) Md curve.

Part III: Answer the following questions (5 points per question, 10%)

16. The inverse supply curve in a market is given by $Q = 3p^2$. What is the producer surplus when the market price is $6? Illustrate using a graph.

17. The following is a simplified duopoly model of competition between two firms. Firms simultaneously choose the quantity of outputs to produce, and then profits are realized. Each firm is restricted to producing 25, 35, 50 or 100 units of output. The details of how the payoffs are derived are unimportant because payoffs are all given in the table below.

Firm 2

		$Q_2 = 25$	35	50	100
	$Q_1 = 25$	125, 125	100, 140	63, 125	-63, -250
Firm 1	35	140, 100	105, 105	53, 75	-123, -350
	50	125, 63	75, 53	0, 0	-250, -500
	100	-250, -63	-350, -130	-500, -250	-900, -900

Find the Nash equilibrium(s) in the game.

Part IV: Fill in the following blanks (40%)

18. If the economic system's output growth rate is 4%, the money supply growth rate is 8%, the nominal interest rate is 6%. Please calculate the real interest rate based on the Classical Economics _____%. (4%)

19. Assuming a country's aggregate production function is $Y=AK^\beta L^{1-\beta}$, where A represents technological level, K denotes capital stock, L stands for labor input, and ß=0.3. If the growth rate is 6%, K is 9%, L is 3%, then the technological growth rate is_____%. (4%)

20. In a macroeconomic context, the connections between consumption, investment, government expenditure, tax revenue, real money demand, and supply are outlined as follows: (4 points per answer, 16%)

$C =100+0.75(Y-T)-5R$　　　　$I =300-10R$
$G = 300$　　　　　　　　　　　$T =200+0.2Y$
$L =0.4Y-10R$　　　　　　　　$M/P =300$

Please answer the following questions:
(1) Find the equilibrium output _____
(2) Find interest rate _____
(3) Calculate the increase in output resulting from a 60 unit increase in government expenditure. Find the new output _____
(4) Determine the extent of crowding-out effect on the private economy caused by a 60 unit increase in government expenditure. Find private investment _____

21. Examine an open economy described by the subsequent equations: (2 points per answer, 16%)

$Y=C+I+G+NX$　　　　　$Y = 6000$
$G=1800$　　　　　　　　$T=1800$
$C=300+0.6(Y-T)$　　　　$I=1200-40\gamma$
$NX =400-400\varepsilon$　　　　　$\gamma=\gamma^*=4$

(Y is output, C is consumption, I is investment, G is government purchase, NX is net exports, T is tax, γ is domestic interest rate, ε is exchange rate, γ^* is world interest rate)
(1) Find the national savings _____
(2) Find the investment_____
(3) Find the trade balance_____
(4) Find the equilibrium exchange rate_____
Now, suppose that G increases from 1800 to 2000.
(5) Find the new national savings_____
(6) Find the new investment_____
(7) Find the new trade balance_____
(8) Find the new equilibrium exchange rate _____