國立中山大學114學年度
碩士班考試入學招生考試試題

科目名稱：統計學【數金所碩士班乙組】

—作答注意事項—

考試時間：100分鐘

- 考試開始鈴響前不得翻閱試題，並不得書寫、劃記、作答。請先檢查答案卷（卡）之應考證號碼、桌角號碼、應試科目是否正確，如有不同立即請監試人員處理。
- 答案卷限用藍、黑色筆(含鉛筆)書寫、繪圖或標示，可攜帶橡皮擦、無色透明無文字墊板、尺規、修正液（帶）、手錶(未附計算器者)。每人每節限使用一份答案卷，請衡酌作答。
- 答案卡請以2B鉛筆劃記，不可使用修正液（帶）塗改，未使用2B鉛筆、劃記太輕或污損致光學閱讀機無法辨識答案者，後果由考生自負。
- 答案卷（卡）應保持清潔完整，不得折疊、破壞或塗改應考證號碼及條碼，亦不得書寫考生姓名、應考證號碼或與答案無關之任何文字或符號。
- 可否使用計算機請依試題資訊內標註為準，如「可以」使用，廠牌、功能不拘，唯不得攜帶書籍、紙張（應考證不得做計算紙書寫）、具有通訊、記憶、傳輸或收發等功能之相關電子產品或其他有礙試場安寧、考試公平之各類器材入場。
- **試題及答案卷（卡）請務必繳回，未繳回者該科成績以零分計算。**
- **試題採雙面列印，考生應注意試題頁數確實作答。**
- **違規者依本校招生考試試場規則及違規處理辦法處理。**

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※本科目依簡章規定「不可以」使用計算機(混合題)　　

PART I: Answer each question by selecting one of options from A-E (60%, Each question 3%)

1. **Which of the following is an example of categorical data?**
   (A) Age of students in a class
   (B) Eye color of individuals
   (C) Weight of athletes
   (D) Test scores of students
   (E) Daily temperatures

2. **Which statistical graph is best suited for displaying the relationship between two quantitative variables?**
   (A) Bar chart
   (B) Pie chart
   (C) Scatterplot
   (D) Histogram
   (E) Stem-and-leaf plot

3. **Which of the following measures is resistant to extreme values?**
   (A) Mean
   (B) Median
   (C) Variance
   (D) Standard deviation
   (E) Range

4. **In a boxplot, which of the following represents the interquartile range (IQR)?**
   (A) The distance between the minimum and maximum values
   (B) The range of the data
   (C) The distance between the first and third quartiles
   (D) The difference between the median and mean
   (E) The total frequency of the data

5. **Which of the following is true about the normal distribution?**
   (A) It is skewed to the right
   (B) The mean, median, and mode are equal
   (C) It is a discrete distribution
   (D) It is always symmetrical around zero
   (E) It has no standard deviation

6. **Which theorem states that the sampling distribution of the sample mean approaches a normal distribution as the sample size increases?**
   (A) Bayes' theorem
   (B) Central limit theorem
   (C) Chebyshev's theorem
   (D) Law of large numbers
   (E) Probability theory

7. **Chebyshev's theorem states that for any data set, at least what percentage of values lie within two standard deviations of the mean?**

(A) 50%
(B) 68%
(C) 75%
(D) 89%
(E) 95%

8. **Which of the following is a measure of central tendency?**
(A) Variance
(B) Standard deviation
(C) Median
(D) Interquartile range
(E) Skewness

9. **A boxplot is particularly useful for identifying:**
(A) The mean of a data set
(B) The standard deviation of data
(C) Outliers in the data
(D) The frequency distribution
(E) The correlation between variables

10. **In hypothesis testing, what is the p-value used for?**
(A) To calculate the sample mean
(B) To determine the likelihood of the null hypothesis being true
(C) To test the independence of data
(D) To summarize the central tendency of data
(E) To test for normality

11. **Which of the following is a continuous probability distribution?**
(A) Binomial distribution
(B) Poisson distribution
(C) Exponential distribution
(D) Hypergeometric distribution
(E) Bernoulli distribution

12. **Which distribution is used to model the number of events occurring within a fixed interval of time?**
(A) Normal distribution
(B) Binomial distribution
(C) Poisson distribution
(D) Exponential distribution
(E) Uniform distribution

13. **In a hypothesis test, if the test statistic falls within the critical region, what decision should be made?**
(A) Fail to reject the null hypothesis
(B) Reject the null hypothesis
(C) Increase the sample size
(D) Adjust the significance level
(E) Retest using a different method

14. **The mode of a data set is:**
(A) The middle value in a sorted data set
(B) The most frequently occurring value
(C) The average of the data
(D) The range of the data
(E) The difference between the maximum and minimum values

15. **What is the main feature of a uniform distribution?**
(A) All outcomes are equally likely
(B) The mean equals the variance
(C) It is always skewed to the right
(D) It is suitable for rare events
(E) It is used for categorical data

16. **The purpose of a hypothesis test is to:**
(A) Estimate a population parameter
(B) Test the validity of a claim about a population
(C) Determine the range of a data set
(D) Analyze the distribution of data
(E) Calculate a confidence interval

17. **What is the primary purpose of Bayes' Theorem?**
(A) To calculate the marginal probability of an event
(B) To update conditional probabilities based on new evidence
(C) To compute the standard deviation of an event
(D) To measure the correlation between two events
(E) To determine the posterior probability of a hypothesis given prior evidence

18. **What does the term "mutually exclusive events" mean in probability?**
(A) Events that cannot occur together
(B) Events that occur with equal probabilities
(C) Events that occur independently
(D) Events that always occur together
(E) Events with overlapping outcomes

19. **The standard normal distribution has which of the following properties?**
(A) Mean = 1, Variance = 1
(B) Mean = 0, Variance = 1
(C) Mean = 0, Variance = 0
(D) Mean = 1, Variance = 0
(E) Mean = -1, Variance = 1

20. **What is the purpose of the Law of Large Numbers?**
(A) To describe the sampling distribution of the sample mean
(B) To ensure that sample means converge to the population mean as sample size increases
(C) To estimate probabilities in rare events
(D) To calculate cumulative probabilities
(E) To identify the central tendency of a dataset

PART II: Short Answer Question (40%, Each question 5%)

Q1. The restaurant wants to determine the relationship between the daily number of visitors to the restaurant (X) and the burger sale (in hundreds) (Y). It is known that the restaurant was open for 25 days last month, and the following data were collected:

$\Sigma X = 200$, $\Sigma Y = 300$, $\Sigma X^2 = 1{,}660$, $\Sigma Y^2 = 3{,}696$, $\Sigma XY = 2{,}436$。

21. Find the value of $\widehat{\beta_0}$ in the regression line $\hat{Y} = \widehat{\beta_0} + \widehat{\beta_1}X$.

22. Find the value of $\widehat{\beta_1}$ in the regression line $\hat{Y} = \widehat{\beta_0} + \widehat{\beta_1}X$.

Q2. The probability distribution of the number of passengers per bus on Route 85 in Kaohsiung is as follows:

X (number of passengers)	20	30	40	50	60	70	80	90
$f(X)$	0.05	0.1	0.1	0.1	0.25	0.25	0.1	0.05

23. Calculate the expected value *E(X)* of the number of passengers per bus.
24. Calculate the variance *V(X)* of the number of passengers per bus.
25. If each passenger pays 10 NTD and Y represents the revenue from passengers per bus, find expected revenue *E(Y)*
26. If each passenger pays 10 NTD and Y represents the revenue from passengers per bus, find the variance *V(Y)*

Q3. Assume A and B are independent events, and P(.) is the probability of an event. If $P(A)= 0.9$, $P(B) = 0.3$, find the following:

27. $P(\overline{A} \mid B)$=?

28. $P(A \cap \overline{B})$=?