國立成功大學

113學年度碩士班招生考試試題

編　號：219、224

系　所：會計學系
財務金融研究所

科　目：統計學

日　期：0202

節　次：第 3 節

備　註：可使用計算機

※ 考生請注意：本試題可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

一、選擇題 50 分(每題五分)

1. Given a frequency distribution that has positive skewness (skewed to the right), which of the following statements is correct?
   a. The mode will exceed the median
   b. The mean will exceed the mode
   c. The median will exceed the mean
   d. The distribution will have mode large values than small values

2. Two balls are drawn from an urn containing 5 balls numbered from 1 to 5. The first ball is kept if it is numbered 1, and returned to the urn otherwise. What is the probability that the second ball drawn is number 2?
   a. 0.18
   b. 0.21
   c. 0.24
   d. 0.27

3. Of the following the most accurate statement concerning "sample error" (chance error) is
   a. This type of error cannot be totally prevented even when one is using the optimum sample design
   b. This type of error can be controlled by being accurate in calculations
   c. This type of error can be controlled by being accurate in measurements
   d. This type of error is the result of poor sample design

4. Which of the following is correct regarding p-values?
   a. A p-value is the probability of the observed value of the test statistic or some value even more contradictory to the null hypothesis, when in fact H0 is ture.
   b. A p-value is obtained from the probability distribution that correctly describes the sampling distribution of the test statistic when H0 is true.
   c. A p-value allows a decision maker to select different alpha levels without having to obtain new critical values for the hypothesis test
   d. All of the above

5. An economic study reports that the mean and standard deviation of the distribution of number of days out of work last year for persons unemployed at the beginning of the year are 21 and 6 days, respectively. We know from the Chebyshev inequality that the proportion of unemployed persons out of work less than 9 days or more than 33 days:

a. Is at least 0.75
b. Is at most 0.75
c. Is at least 0.25
d. Is at most 0.25

6. As the number of degrees of freedom for a t-distribution increases, the difference between the t-distribution and the standard normal distribution:
   a. Become Larger
   b. Become Smaller
   c. Stays the Same
   d. None of These Alternatives Is Correct

7. The probability of the sum of two positive numbers being less than or equal to 8 and the product being greater than 15 is:
   a. 0.3376
   b. 0.2126
   c. 0.0201
   d. 0.0106

8. The average daily catch of tuna by the Hokkaido Tuna Company is 130 metric tons, and the variability in its daily catch can be assessed by calculating its standard deviation. Assuming the standard deviation of the daily catch is X metric tons, what is the probability that the company's catch exceeds 4320 metric tons over the past 36 days?
   a. 0%
   b. 100%
   c. 59.48%
   d. 92.36%

9. A wholesaler buys cartons of 25 articles according to the following rules:
   (i) Five articles are drawn at random from a carton and inspected.
   (ii) If none of the five is defective, he accepts the entire carton.
   (iii) If one or more are defective, he rejects the carton.
   By this rule he wishes to accept good quality and reject bad. Calculate the probability of accepting a carton when the probability of any artical being defective is 0.1.
   a. 0.774
   b. 0.590
   c. 0.168

d. 0.031

10. A continuous random variable X has the following probability density function:

$$f(x)=\begin{cases}\dfrac{1}{2\pi e} & \text{if } 0\le x\le k\\ 0 & \text{otherwise}\end{cases}$$

The value of k is:

a. $\dfrac{1}{2\pi e}$

b. $\dfrac{\pi e}{2}$

c. $\dfrac{1}{\pi e}$

d. $2\pi e$

二、非選擇題 50 分

1. (5%)假使 $f(X)=\frac{1}{2}$, $-1<X<1$, 是隨機變數 X 之 p.d.f, 令 $Y=X^2$, 試求 Y 之 p.d.f.

2. (10%)試證明: $P(|X|>C)\le\dfrac{E(|X|)}{C}$, $C>0$.

3. (15%)設有 N+1 人出席會議，每人名牌上之號碼依次為 0,1,2,…,N。為了估計與會人數，今隨機抽取 5 個名牌，其號碼分別為 37, 16, 44, 43, 22。
   (1) 試以動插法(Method of moments estimation)來推估 N。
   (2) 試以最大概試法(Maximum likelihood estimation)來推估 N。
   (3) 上面(1)(2)之結果何者為不偏推定子？

4. (10%)設隨機變數 X 的機率密度函數為

$$f(X)=\begin{cases}\dfrac{1}{2\sqrt{3}}, & -\sqrt{3}<X<\sqrt{3}\\ 0, & \text{此外}\end{cases}$$

試利用 Chebyshev 不等式求算當 $k_1 = 1.5$ 及 $k_2 = 2$ 時 $P\left[|X-\mu| < k\sigma\right]$ 的值，並計算其與正確機率值的差。

5. (10%) 設有 covid-19 反應測試一種，對患者測試 98%呈陽性反應，而對非患者測試 3%呈陽性反應。已知某城市 covid-19 患者佔 5%，今在該城市隨機抽驗一人，經測試呈陽性反應，問此市民未患 covid-19 之機率為何?