國立中央大學八十六學年度碩士班研究生入學試題卷

所別：人力資源管理研究所　甲組科目：統計學　共 2 頁 第 1 頁

一. Please complete the following statements. Each blank may contain more than one word. (10%. Each blank weights equally.)

1. The standard deviation of a statistic used as an estimator of a population parameter is often called the _____ of the estimator.
2. Numerical descriptive measures computed from sample measurements are called _____. The corresponding probability distribution that results when random samples of size n are repeatedly drawn from a given population is called the _____.
3. The _____ is the set of all possible outcomes of an experiment ; while a _____ is a function that assigns to each outcome of that experiment one and only one real number.

二. Multiple choice (90%, There is only one correct answer for each question. Each question weights equally.)

1. Which of the following binomial experiments are the normal or Poisson approximations inadequate?

   a. n=15, p=0.5;　b. n=40, p=0.6;　c. n=10, p=0.2;　d.n=30, p=0.4

   (1) case c only.
   (2) cases a and c.
   (3) cases b, c, and d.
   (4) none of the 4 cases.

2. Suppose that the ranges for two sets of data are equal. From this information, one can infer that

   (1) the means are equal for the two sets.
   (2) the two sets are equally skewed.
   (3) the medians are equal for the two sets.
   (4) the two ranges are equal, nothing more.

3. Which of the following is correct statement concerning the Central Limit Theorem (CLT)?

   (1) The CLT states that the sample mean $\bar{x}$ is always equal to μ.
   (2) The CLT states that for large samples the sample mean $\bar{x}$ is equal to μ.
   (3) The CLT states for large samples the sampling distribution of the population mean is approximately normal.
   (4) The CLT states that for large samples the sampling distribution of the sample mean is approximately normal.

4. When repeated samples of size two are drawn from a population with mean μ and variance σ^2, X_1 and X_2 are the sampling outcomes. Define $\bar{x}=\frac{1}{2}X_1+\frac{1}{2}X_2$, and $\bar{\bar{x}}=\frac{2}{3}X_1+\frac{1}{3}X_2$. Then

   a. both $\bar{x}$ and $\bar{\bar{x}}$ are the unbiased estimators of μ;　b. $\mathrm{Var}(\bar{x})=\mathrm{Var}(\bar{\bar{x}})$;

   (1) Statement (a) is correct.
   (2) Statement (b) is correct.
   (3) Both statements (a) and (b) are correct.
   (4) Both statements (a) and (b) are incorrect.

5. Let x be N (μ, 100). To test $H_0:\mu=80$ against $H_a:\mu>80$, let the critical region be defined by C=($\bar{x}\geq 83$),where $\bar{x}$ is the sample mean of a random sample of size n=25 from this distribution.

   a. The significance level of this test, α is 0.0668;　b. The P-value corresponding to $\bar{x}=82.5$ is 0.1056;
   c. The values of the power of $\mu=83$ and 86 are 0.5 and 0.9332, respectively. ($P(0\leq z\leq 1.25)=0.3944$; $P(0\leq z\leq 1.50)=0.4332$)

   (1) Statements (a) and (b) are correct.
   (2) Statements (a) and (c) are correct.
   (3) Statements (b) and (c) are correct.
   (4) All the above statements are correct.

6. A random variable X has a distribution with density function given as $f(x)=\frac{1}{4}e^{-\frac{x}{4}}, x\geq 0$.

   a. X is an exponential distribution with expectation $\frac{1}{4}$ and variance $\frac{1}{16}$;　b. $p(3\leq x\leq 5)=0.185$;　c. $p(x=2)=0.152$.

   (1) Statements (a), (b), and (c) are accurate.
   (2) Statements (a) and (b) are accurate.
   (3) Statements (b) and (c) are accurate.
   (4) None of the above.

7. Given the samples (1.8, 2.9, 1.4, 1.1) and (5.0, 8.6, 9.6) from normal populations. ($F_{0.025}(4,3)=15.10$; $F_{0.025}(3,2)=39.17$)

   a. Since the F-value equals to 0.135, we cannot reject the null hypothesis that the variances are equal at the 5% level;
   b. we cannot reject the null hypothesis that the differences between the two populations means is less than 8 at the 0.05 level, since the t-value equals to 0.39.

   (1) Only statement (a) is correct.
   (2) Only statement (b) is correct.
   (3) Both statements are correct.
   (4) Both statements are incorrect.

8. Of 64 offspring of a certain cross between guinea pigs, 34 were red, 10 were black, and 20 were white. According to the genetic model, these numbers should be in the ratio 9:3:4. (χ^2_α : $\chi^2_{0.100}(2)=4.61$, $\chi^2_{0.05}(2)=5.99$, $\chi^2_{0.01}(2)=9.21$, $\chi^2_{0.100}(3)=6.25$, $\chi^2_{0.05}(3)=7.81$, $\chi^2_{0.01}(3)=11.34$)

   (1) The data is consistent with the model at the 5% level.
   (2) The data is inconsistent with the model at the 5% level.
   (3) Some more information is needed to make the judgment.
   (4) None of the above.

9. The characteristic line of modern investment analysis is simply the regression line obtained from the following model: $r_{it}=\alpha_i+\beta_i r_{mt}+u_t$, where r_{it}= the rate of return on the i th security in time t, r_{mt}= the rate of return on the market portfolio in time t, and u_t is the stochastic disturbance

term. A security whose coefficient of β_i is greater than one is said to be a volatile security. Suppose the characteristic line for IBM stock estimated from a random sample of size 240 is $r_{it} = \underset{(0.3001)}{0.7264} + \underset{(0.0728)}{1.0598} r_{mt}$, $R^2 = 0.4710$, degrees of freedom is 238, and $F_{1,238} = 211.896$

(1) IBM is a volatile security.
(2) IBM is not a volatile security.
(3) Some more information is needed to make the judgment.
(4) None of the above.

10. If 10 numbers are selected at random from the interval (0,1).

a. the probability that exactly 5 numbers are less than $\frac{1}{2}$ is 0.246; b. on the average 5 numbers are less than $\frac{1}{2}$.

(1) Only statement (a) is accurate.
(2) Only statement (b) is accurate.
(3) Both statement (a) and (b) are correct.
(4) None of the statements is correct.

11. An urn contains five balls numbered 1 to 5 of which the first three are black and the last two are gold. A sample of size 2 is drawn. Let B_1 denote the event that the first ball drawn is black and B_2 denote the event that the second ball drawn is black.

a. $p(B_1)=p(B_2)=\frac{3}{5}$, no matter if the sample of size 2 is drawn with or without replacement

b. $p(B_1 \cap B_2)$ is larger when drawing with replacement than that when drawing without replacement.

(1) Only statement (a) is correct.
(2) Only statement (b) is correct.
(3) Both statement (a) and (b) are correct.
(4) None of the statements is correct.

12. P(A)=0.5, P(A∪B)=0.6 a. P(B)=0.2 if A is independent of B. b. $P(B)=\frac{1}{6}$ if P(A|B)=0.4

(1) Only statement (a) is correct.
(2) Only statement (b) is correct.
(3) Both statements (a) and (b) are correct.
(4) None of the statements is correct.

13. Which of the following statements is correct?

a. The estimated slope of the regression of Y on X will never equal the reciprocal of the estimated slope of the regression of X on Y.
b. The R^2 for the two-variable regression is unchanged if a linear transformation is made on both variables; that is, $Y^* = a_1 + a_2 Y$, $X^* = b_1 + b_2 X$.
c. One can improve the significance of the estimated parameter by selecting values of X at the endpoints of the range of possible values.

(1) Both statements (a) and (b) are correct.
(2) Both statements (b) and (c) are correct.
(3) Both statements (a) and (c) are correct.
(4) All the statements are correct.

14. The partially completed ANOVA table for a randomized block design is shown below : (F_α : $F_{0.05}(5,10) = 3.33$; $F_{0.05}(2,10) = 4.10$)

Source	DF	SS	MS	F
Treatments	2	12.7		
Blocks		9.6		
Error	10			
Total	17	32.2		

(1) 5 observations are in each treatment total.
(2) The data presents sufficient evidence to indicate differences among treatment means.
(3) The data presents sufficient evidence to indicate differences among block means.
(4) All of the above.

15. Let X_1, X_2, X_3, X_4 equal the cholesterol level of a women under the age of 50, a man under 50, a woman 50 or older, and a man 50 or older, respectively. Assume that the distribution of X_i is N (μ_i, σ^2), $i=1,2,3,4$. We shall test the null hypotheses $H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4$ using 7 observations of each X_i. The critical region for an $\alpha = 0.05$ significance level is $F_{0.05}(v_1, v_2) = 3.01$, where v_1 and v_2 represent the related degrees of freedom in this case. The corresponding ANOVA summary table is shown below.

Source	SS	DF	MS	F
Treatment	12,280.86			
Error	28,434.57			
Total	40,715.43			

Note: $F_{0.10}(v_1, v_2) = 2.33$, $F_{0.05}(v_1, v_2) = 3.01$, $F_{0.01}(v_1, v_2) = 3.72$, $F_{0.025}(v_1, v_2) = 4.72$

(1) p-value ≥ 0.100
(2) 0.050<p-value<0.100
(3) 0.025<p-value<0.050
(4) 0.010<p-value<0.025