國立高雄大學 104 學年度研究所碩士班招生考試試題

科目：統計學　　系所：應用經濟學系　　是否使用計算機：是
考試時間：100 分鐘　　本科原始成績：100 分

Note: Please identify the choice that best complete the statement or answer the question. Each question has 2.5 points.

1. In the simple linear regression model, the slope represents the:

a. value of y when $x = 0$.
b. average change in y per unit change in x.
c. value of x when $y = 0$.
d. average change in x per unit change in y.

2. If event A and event B cannot occur at the same time, then A and B are said to be

a. mutually exclusive
b. independent
c. collectively exhaustive
d. None of these choices.

3. In testing the difference between two population means using two independent samples, we use the pooled variance in estimating the standard error of the sampling distribution of the sample mean difference $\bar{x}_1 - \bar{x}_2$ if:

a. the sample sizes are both large.
b. the populations are normal with equal variances.
c. the populations are non-normal with unequal variances.
d. All of these choices are true.

4. A survey claims that 9 out of 10 doctors recommend aspirin for their patients with headaches. To test this claim against the alternative that the actual proportion of doctors who recommend aspirin is less than 0.90, a random sample of 100 doctors' results in 83 who indicate that they recommend aspirin. The value of the test statistic in this problem is approximately equal to:

a. –1.67
b. –2.33
c. –1.86
d. –0.14

5. In a multiple regression analysis involving k independent variables and n data points, the number of degrees of freedom associated with the sum of squares for error is:

a. $k - 1$
b. $n - k$
c. $n - 1$
d. $n - k - 1$

6. Which of the following is true regarding the sampling distribution of the mean for a large sample size? Assume the population distribution is not normal.

a. It has the same shape, mean and standard deviation as the population.
b. It has the same mean as the population, but a different shape and standard deviation.
c. It the same mean and standard deviation as the population, but a different shape.
d. It has the same shape and mean as the population, but a different standard deviation.

7. A standard normal distribution is a normal distribution with:
a. a mean of zero and a standard deviation of one.
b. a mean of one and a standard deviation of zero.
c. a mean always larger than the standard deviation.
d. None of these choices.

8. Which of the following is not true for an exponential distribution with parameter λ?
a. $\mu = 1/\lambda$
b. $\sigma = 1/\lambda$
c. The *Y*-intercept of *f(x)* is λ.
d. All of these choices are true.

9. The portfolio expected return of two investments:
a. will be higher when the covariance is zero.
b. will be higher when the covariance is negative.
c. will be higher when the covariance is positive.
d. does not depend on the covariance.

10. It is desired to estimate the average total compensation of CEOs in the publishing industry. Data were randomly collected from 18 CEOs and 95% confidence interval was calculated to be ($2,190,000, $4,720,000). Based on the interval above, do you believe the actual average total compensation of CEOs in the publishing industry could be $3,000,000?
a. Yes, and I am sure of that.
b. Yes, and I am 95% confident of that.
c. No, and I am sure of that.
d. No, and I am 95% confident of that.

11. The weighted average of the possible values that a random variable *X* can assume, where the weights are the probabilities of occurrence of those values, is referred to as the:
a. variance.
b. standard deviation.
c. expected value.
d. None of these choices.

12. Which of the following has a mean and variance that depend on degrees of freedom?
a. Student *t*

b. χ^2
c. F
d. All of these choices are true.

13. The ratio of two independent chi-squared variables divided by their degrees of freedom is:
a. normally distributed
b. Student t-distributed
c. chi-squared distributed
d. F-distributed

14. Which of the following statements is correct regarding the percentile points of the F distribution?
a. $F_{0.10,10,20} = 1/F_{0.90,10,20}$
b. $F_{0.90,10,20} = 1/F_{0.10,20,10}$
c. $F_{0.90,10,20} = 1/F_{0.90,20,10}$
d. $F_{0.10,10,20} = 1/F_{0.10,20,10}$

15. Suppose that we reject a null hypothesis at the 0.05 level of significance. Then for which of the following α-values do we also reject the null hypothesis?
a. 0.06
b. 0.04
c. 0.03
d. 0.02

16. If two random samples of sizes n_1 and n_2 are selected independently from two non-normally distributed populations, then the sampling distribution of the sample mean difference, $\overline{X}_1 - \overline{X}_2$, is
a. always non-normal
b. always normal
c. approximately normal only if n_1 and n_2 are both larger than or equal to 30
d. approximately normal regardless of n_1 and n_2

17. The power of a test is measured by its capability of:
a. rejecting a null hypothesis that is true.
b. not rejecting a null hypothesis that is true.
c. rejecting a null hypothesis that is false.
d. not rejecting a null hypothesis that is false.

18. A sample of size n is selected at random from an infinite population. As n increases, which of the following statements is true?
a. The population standard deviation decreases.
b. The standard error of the sample mean decreases.
c. The population standard deviation increases.

d. The standard error of the sample mean increases.

19. Which of the following statistics and procedures can be used to determine whether a linear model should be employed?

a. The standard error of estimate.

b. The coefficient of determination.

c. The *t*-test of the slope.

d. All of these choices are true.

20. When the independent variables are correlated with one another in a multiple regression analysis, this condition is called:

a. heteroscedasticity.

b. homoscedasticity.

c. multicollinearity.

d. None of these choices.

21. A Type I error is committed if we make:

a. a correct decision when the null hypothesis is false.

b. a correct decision when the null hypothesis is true.

c. an incorrect decision when the null hypothesis is false.

d. an incorrect decision when the null hypothesis is true.

22. If the probability of committing a Type I error for a given test is decreased, then for a fixed sample size *n*, the probability of committing a Type II error will:

a. decrease.

b. increase.

c. stay the same.

d. Not enough information to tell.

23. In regression analysis, the residuals represent the:

a. difference between the actual *y* values and their predicted values.

b. difference between the actual *x* values and their predicted values.

c. square root of the slope of the regression line.

d. change in *y* per unit change in *x*.

24. In the one-way ANOVA where *k* is the number of treatments and *n* is the number of observations in all samples, the number of degrees of freedom for error is:

a. $k - 1$

b. $n - 1$

c. $n - k$

d. $n - k + 1$

25. Which of the following is not a characteristic of a binomial experiment?

a. Each trial results in two or more outcomes.

b. There is a sequence of identical trials.

c. The trials are independent of each other.

d. The probability of success *p* is the same from one trial to another.

26. Using a confidence interval when conducting a two-tail test for μ, we do not reject H_0 if the hypothesized value for μ:

a. is to the left of the lower confidence limit (LCL).

b. is to the right of the upper confidence limit (UCL).

c. falls between the LCL and UCL.

d. falls in the rejection region.

27. If we reject the null hypothesis, we conclude that:

a. there is enough statistical evidence to infer that the alternative hypothesis is true.

b. there is not enough statistical evidence to infer that the alternative hypothesis is true.

c. there is enough statistical evidence to infer that the null hypothesis is true.

d. there is not enough statistical evidence to infer that the null hypothesis is true.

28. If *A* and *B* are any two events with $P(A) = .8$ and $P(B|A^c) = .7$, then $P(A^c \text{ and } B)$ is

a. 0.56

b. 0.14

c. 1.50

d. None of these choices.

29. In a simple linear regression problem, the following statistics are calculated from a sample of 10 observations: $\sum(x-\bar{x})(y-\bar{y}) = 2250$, $s_x = 10$, $\sum x = 50$, $\sum y = 75$. The least squares estimates of the slope and *y*-intercept are, respectively,

a. 1.5 and 0.5

b. 2.5 and 1.5

c. 1.5 and 2.5

d. 2.5 and –5.0

30. The Central Limit Theorem states that, if a random sample of size *n* is drawn from a population, then the sampling distribution of the sample mean $\overline{X}$:

a. is approximately normal if $n < 30$.

b. is approximately normal if $n > 30$.

c. is approximately normal if the underlying population is normal.

d. None of these choices.

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31. For the following multiple regression model: $\hat{y} = 2 - 3x_1 + 4x_2 + 5x_3$, a unit increase in x_1, holding x_2 and x_3 constant, results in:

a. a decrease of 3 units on average in the value of *y*.
b. an increase of 8 units in the value of *y*.
c. an increase of 3 units on average in the value of *y*.
d. None of these choices.

32. Which of the following about the binomial distribution is not a true statement?

a. The probability of success must be constant from trial to trial.
b. The random variable of interest is continuous.
c. Each outcome may be classified as either "success" or "failure".
d. Each outcome is independent of the other.

33. Suppose $P(A) = 0.60$, $P(B) = 0.85$, and *A* and *B* are independent. The probability of the complement of the event (*A* and *B*) is:

a. $.4 \times .15 = .060$
b. $0.40 + .15 = .55$
c. $1 - (.40 + .15) = .45$
d. $1 - (.6 \times .85) = .490$

34. Two independent samples of sizes 20 and 30 are randomly selected from two normally distributed populations. Assume that the population variances are unknown but equal. In order to test the difference between the population means, $\mu_1 - \mu_2$, the sampling distribution of the sample mean difference, $\bar{x}_1 - \bar{x}_2$, is:

a. normal.
b. Student-*t* with 50 degrees of freedom.
c. Student-*t* with 48 degrees of freedom.
d. None of these choices.

35. Suppose $f(x) = 1/4$ over the range $a \le x \le b$, and suppose $P(X > 4) = 1/2$. What are the values for *a* and *b*?

a. 0 and 4
b. 2 and 6
c. Can be any range of *x* values whose length $(b - a)$ equals 4.
d. Cannot answer with the information given.

36. Suppose a 95% confidence interval for μ turns out to be (1,000, 2,100). What does it mean to be 95% confident?

a. In repeated sampling, the population parameter would fall in the resulting interval 95% of the time.
b. 95% of the observations in the entire population fall in the given interval.

c. 95% of the observations in the sample fall in the given interval.
d. None of these choices.

37. Which of the following statements is correct?
a. The sample mean is an unbiased estimator of the population mean.
b. The sample proportion is an unbiased estimator of the population proportion.
c. The difference between two sample means is an unbiased estimator of the difference between two population means.
d. All of these choices are true.

38. For a two-tail test, the null hypothesis will be rejected at the 0.05 level of significance if the value of the standardized test statistic *z* is:
a. smaller than 1.96 or greater than −1.96
b. greater than −1.96 or smaller than 1.96
c. smaller than −1.96 or greater than 1.96
d. greater than 1.645 or less than −1.645

39. If X and Y are independent random variables, which of the following identities is false?
a. $\text{COV}(X, Y) = 1$
b. $E(X + Y) = E(X) + E(Y)$
c. $V(X + Y) = V(X) + V(Y)$
d. All of these choices are true.

40. A sample of 250 observations is selected at random from an infinite population. Given that the population proportion is .25, the standard error of the sampling distribution of the sample proportion is:
a. 0.0274
b. 0.5000
c. 0.0316
d. 0.0548