

※ 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. A continuity correction adjustment should be made when
 - (a) one is using the normal distribution estimate probabilities for a uniformly distributed random variable.
 - (b) one is using the normal distribution to approximate a binomial distribution since the latter is discrete while the normal distribution is continuous.
 - (c) one is sampling and the variable in question is continuous.
 - (d) one is sampling and the sampling design is such that n is small and the variable of interest is the sample mean.
2. There are three basic assumptions for the F test in *ANOVA* to be valid, and those assumptions are
 - (a) normality, large sample sizes, and equal group variances.
 - (b) normality, independence, and equal variance.
 - (c) large sample sizes, normality, and equal variances.
 - (d) equal variances, large sample sizes, and independence.
3. When a qualitative variable is entered into a model by using dummy variables,
 - (a) the number of dummy variables entered for the qualitative variables always one less than the number of levels of the qualitative variable.
 - (b) only one dummy variable needs to be entered into the model.
 - (c) the number of dummy variables entered for the qualitative variable equals the number of values the qualitative variable can assume.
 - (d) one should not enter a second qualitative variable because there will be too many dummy variables in the model.
4. Given a variable x , what kind of set of explanatory variables you put into a regression will have the problem of multicollinearity?
 - (a) x and x^2
 - (b) x and $\frac{1}{x}$
 - (c) $\log(x)$ and $\log(x^2)$
 - (d) x and e^x
5. The time series component that exhibits a repeating pattern over successive periods, often one-year intervals is called
 - (a) a trend component.

- (b) seasonal component.
 - (c) cyclical component.
 - (d) irregular component.
6. Consider a data set consisting of the following five values: 10, 127, 128, 128, 129. By inspection, the third moment about the mean, m_3 , for this data set is:
- (a) negative (b) zero (c) positive (d) negative or positive, depending on whether the standard deviation is negative or positive
7. The chief distinction between a point estimate and an interval estimate is that:
- (a) an interval estimate is always correct (though it may not be precise) but a point estimate is usually incorrect
 - (b) a point estimate is always more useful than an interval estimate
 - (c) an interval estimate indicates the precision of the estimate while a point estimate does not
 - (d) a point estimate does not differ from an interval estimate except in minor respects
8. Assume that the sampled population is normal and confidence coefficient $1 - \alpha$ remains constant. If the sample size n increases, the width of a confidence interval
- (a) increases
 - (b) decreases
 - (c) does not change
 - (d) may increase or decrease, depending on other conditions
9. A paired-difference test is a
- (a) Simple example of a chi-square goodness-of-fit test
 - (b) Simple example of a randomized block design
 - (c) Simple example of a completely randomized experiment
 - (d) Simple example of a chi-square homogeneity test
10. A chi-square test of independence seeks to detect
- (a) the interdependence of several methods of classification
 - (b) the dependence of two methods of classification
 - (c) whether two samples are independent of one another
 - (d) whether the variances for two sets of data are independent

二、非選擇題 50 分

1. (10%) You arrive at the bus station at 9:50 AM. The arrive time of the bus is uniformly distributed between 10:00 AM and 10:12 Am. What is your expected waiting time?

2. (10%) Let X_1, \dots, X_n be a random sample from a distribution with density

$$f(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2}}, \quad -\infty < x < \infty, \mu > 0, \text{ find constant } C \text{ so that}$$

$$C\bar{X} \sum_{i=1}^n (X_i - \bar{X})^2 \text{ is an unbiased estimator of } \mu.$$

3. (10%) Let X and Y have a trinomial distribution (n, p_1, p_2) . Given the following information:

$$E(y|x) = (n-x)p_2 / (1-p_1) \text{ and } E(x|y) = (n-y)p_1 / (1-p_2)$$

Find the correlation coefficient of X and Y .

4. (10%) Suppose the lifetime of an electronic tube has an exponential distribution with a mean time of $\frac{1}{\lambda}$ hours. Find the expected lifetime of a tube, given that the tube has lasted at least T hours.

5. (10%) Let the p.d.f of X be $f(x) = \frac{1}{2} e^{-x/2}, 0 \leq x < \infty$

(1) (5%) What are the mean, variance, and the moment generating function of X ?

(2) (5%) Calculate $P(x > 5 | x > 2)$