

東吳大學 101 學年度碩士班研究生招生考試試題

第 1 頁，共 3 頁

系級	企業管理學系碩士班 B、D 組	考試時間	100 分鐘
科目	統計學	本科總分	100 分

PART I. MULTIPLE CHOICES (10 questions, 4 points each, 40 points)

- (1) Suppose that you believe that a cubic relationship exists between the independent variable (of time) and the dependent variable Y. Which of the following would represent a valid linear regression model?
- (A) $Y = b_0 + 3b_1 X$, where $X = \text{time}$
 (B) $Y = b_0 + b_1 X^3$, where $X = \text{time}$
 (C) $Y = b_0 + b_1 X$, where $X = \text{time}^3$
 (D) $Y = b_0 + b_1 X$, where $X = \text{time}^{1/3}$
 (E) $Y = b_0 + 3b_1 X$, where $X^3 = \text{time}$
- (2) A healthcare executive is using regression to predict total revenues. She has decided to include both patient length of stay and insurance type in her model. Insurance type can be grouped into three categories: Government-Funded, Private-Pay, and 'Other'. Her model is
- (A) $Y = b_0$.
 (B) $Y = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3$.
 (C) $Y = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4$.
 (D) $Y = b_0 + b_1 X_1$.
 (E) $Y = b_0 + b_1 X_1 + b_2 X_2$.
- (3) Which distribution is helpful in testing hypotheses about variances?
- (A) exponential distribution
 (B) binomial distribution
 (C) Poisson distribution
 (D) normal distribution
 (E) F distribution
- (4) The number of cell phone minutes used by high school seniors follows a normal distribution with a mean of 500 and a standard deviation of 50. What is the probability that a student uses more than 350 minutes?
- (A) 0.999 (B) 0.382 (C) 0.001 (D) 0.618 (E) none of the above
- (5) Which of the following is not true about continuous random variables?
- (A) Some may be described by uniform distributions or exponential distributions.
 (B) The area under each of the curves represents probabilities.
 (C) The entire area under each of the curves equals one.
 (D) They have an infinite set of values.
 (E) They are useful for describing a discrete probability distribution.

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- (6) In a distribution that is skewed to the right, what is the relationship of the mean, median, and mode?
- A) median > mean > mode
 B) mode > median > mean
 C) mode > mean > median
 D) mean > median > mode
 E) median < mode < mean
- (7) Suppose the number of babies born each hour at a hospital follows a Poisson distribution with a mean of 4. Some people believe that the presence of a full moon increases the number of births that take place. Suppose during the presence of a full moon, the hospital experienced eight consecutive hours with more than five births each hour. Based on this fact, comment on the belief that the full moon increases the number of births.
- (A) The belief is not supported as the probability of observing this many births is 0.215.
 (B) The belief is supported as the probability of observing this many births would be 0.215.
 (C) The belief is not supported as the probability of observing this many births is 0.00000457.
 (D) The belief is supported as the probability of observing this many births would be 0.00000457.
 (E) none of the above
- (8) Suppose that the random variable x has an exponential distribution with $\theta = 10$. Find the probability that $P(X \geq 10)$.
- (A) .247596 (B) .656986 (C) .505698 (D) .367879 (E) .436598
- (9) Which expression represents the sum of the squares of the observations in a data set?
- (A) $\sqrt{\sum x^2}$ (B) $\frac{\sum_{i=1}^n x_i^2}{n}$ (C) $\sum x^2$ (D) $(\sum x)^2$ (E) $\sqrt{\frac{\sum_{i=1}^n x_i^2}{n}}$
- (10) A confidence interval for $(\mu_1 - \mu_2)$ is $(-5, 8)$. Which of the following inferences is correct?
- (A) no significant difference between means
 (B) $\mu_1 < \mu_2$
 (C) $\mu_1 > \mu_2$
 (D) $\mu_1 \neq \mu_2$
 (E) none of the above

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第 3 頁，共 3 頁

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PART II. SOLVING THE PROBLEMS (60 points)

(1) $P(B) = .6$. Suppose that B and C are mutually exclusive and complementary events. Consider another event A such that $P(A | B) = .2$ and $P(A | C) = .5$. (5 questions, 3 points each, 15 points)

- (i) Find $P(A \text{ and } C)$
- (ii) Find $P(A)$
- (iii) Find $P(B | A)$
- (iv) Find $P(A \text{ or } C)$
- (v) Find $P(A \text{ or } C | B)$

(2) Consider the actual values Y and forecast values F given in the table below.

- (i) Calculate the mean squared error (MSE) (5 points) (Round the answer to three decimal places)
- (ii) Explain the meaning of MSE and root mean squared error (RMSE) (5 points)

Time Period	Y	F
1	19.5	19.3
2	21.5	20.9
3	22.6	22.5

(3) For the function $f(x) = 3x^2$ $0 < x < k$ (35 points)

- (i) Find the constant value of k so that the function $f(x)$ is a p.d.f of a random variable of X (6 points), and then do (ii) to (vi)
- (ii) find the expected value of X (6 points),
- (iii) find the variance of X (6 points),
- (iv) sketch graphs of the p.d.f $f(x)$ (6 points)
- (v) sketch graphs of the distribution function of $F(x) = P(X \leq x)$ (6 points)
- (vi) compute the probability $P(0 < X < 0.1)$ (5 points)