國立高雄大學 103 學年度研究所碩士班招生考試試題

科目：統計學
考試時間：100 分鐘

系所：
經營管理研究所(甲組、乙組)　是否使用計算機：是
本科原始成績：100 分

I. MULTIPLE CHOICE QUESTIONS (30%)

所有答案請寫在答案卷，答案請五題寫在一行如下列所示：
All answers must be written on the answer sheet; write answers to five questions in each row, for example:

1. A　2. B　3. C　4. D　5. A
6. B　7. C　8. D　9. A　10. B

1. When sampling without replacement, the probability of obtaining a certain sample is best given by a
   (a) hypergeometric distribution
   (b) binomial distribution
   (c) Poisson distribution
   (d) normal distribution

2. Which of the following is a characteristic of a binomial experiment?
   (a) at least 2 outcomes are possible
   (b) the probability changes from trial to trial
   (c) the trials are independent
   (d) None of these alternatives is correct.

3. In the analysis of variance procedure (ANOVA), "***factor***" refers to
   (a) the dependent variable
   (b) the independent variable
   (c) different levels of a treatment
   (d) the critical value of F

4. A regression analysis between sales (Y in $1000) and advertising (X in dollars) resulted in the following equation

$$\hat{Y} = 30{,}000 + 4\,X$$

   The above equation implies that an
   (a) increase of $4 in advertising is associated with an increase of $4,000 in sales
   (b) increase of $1 in advertising is associated with an increase of $4 in sale
   (c) increase of $1 in advertising is associated with an increase of $34,000 in sales
   (d) increase of $1 in advertising is associated with an increase of $4,000 in sales

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5. A nonparametric test for the equivalence of two populations would be used instead of a parametric test for the equivalence of the population parameters if
   (a) the samples are very large
   (b) the samples are not independent
   (c) no information about the populations is available
   (d) The parametric test is always used in this situation.

6. In acceptance sampling, the risk of accepting a poor quality lot is known as
   (a) Consumer's risk
   (b) Producer's risk
   (c) a Type I error
   (d) None of these alternatives is correct.

7. Which of the following sampling methods is a probabilistic sampling method?
   (a) judgment sampling
   (b) convenience sampling
   (c) cluster sampling
   (d) None of these alternatives is correct.

8. The level of significance in hypothesis testing is the probability of
   (a) accepting a true null hypothesis
   (b) accepting a false null hypothesis
   (c) rejecting a true null hypothesis
   (d) None of these alternatives is correct.

9. The collection of all possible sample points in an experiment is
   (a) the sample space
   (b) a sample point
   (c) an experiment
   (d) the population

10. The median of a sample will always equal the
    (a) mode
    (b) mean
    (c) 50th percentile
    (d) all of the above answers are correct

II. Problems (40%)

(i) In order to determine whether or not the sales volume of a company (Y in millions of dollars) is related to advertising expenditures (X_1 in millions of dollars) and the number of salespeople (X_2), data were gathered for 10 years.

$$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \varepsilon_t.$$

Part of the regression results is shown below.

	Coefficient	**Standard Error**
Constant	7.0714	1.8972
X1	8.6233	2.3968
X2	0.0858	0.1845

Analysis of Variance

Source of Variation	**Degrees of Freedom**	**Sum of Squares**	**Mean Square**
Regression		321.11	
Error		63.39	

(a) If we want to test whether the parameter β_2 is significantly different from 0.1. The test statistic equals _____with _____ degree(s) of freedom.
(b) The null hypothesis of the corresponding ANOVA is _____.
(c) The adjusted coefficient of determination is _____.
(d) The estimate of Var (ε_t) is _____.

(ii) If X and Y are mutually exclusive events with Prob(X) = 0.295, Prob(Y) = 0.32, then Prob(X | Y) = _____.

(iii) An ANOVA procedure is applied to data obtained from 5 samples where each sample contains 30 observations. The numerator and denominator degree(s) of freedom (respectively) for the critical value of F are _____ and _____ .

(iv) A population consists of 8 items. The number of different simple random samples of size 3 that can be selected from this population is _____.

(v) If the moment-generating function of X is $0.3e^{-3t}$ + 0.45 + $0.25e^{2t}$, then $\text{Prob}(X = 3)$ = _____.

III. Let Y_1 and Y_2 be independent standard normal random variables. Define $U_1 = Y_1 + Y_2$ and $U_2 = Y_1 - Y_2$. Are U_1 and U_2 independent? Explain. (10%)

IV. Let $X_1, X_2, \cdots, X_n$ be a random sample from distribution with p.d.f

$$f(x;\theta) = \theta^x (1-\theta)^{1-x} \quad , x = 0,1, \quad 0 < \theta < 1.$$

(a) Find the maximum likelihood estimator $\hat{\theta}$ of θ. (10%)

(b) Is $\hat{\theta}$ is a consistent estimator of θ? Explain. (10%)