

國立清華大學 100 學年度碩士班入學考試試題

系所班組別：計量財務金融學系碩士班甲組(財務金融組)

考試科目 (代碼)：統計學(4703)

共 4 頁，第 1 頁 *請在【答案卷、卡】作答

1. For the discrete distribution with $f(x|\theta) = k\theta^x$, $0 < \theta < 1$, and $x=0, 1, 2, \dots$, evaluate k in terms of θ .
 - a. Compute $E(x)$. (10%)
 - b. Compute $\text{Var}(x)$. (10%)

2. The random variables X and Y with the joint probabilities are given as follows:

X \ Y	-1	0	1	$f_X(X)$
1	0.1	0	0.2	0.3
2	0	0.1	0	0.1
3	0.3	0	0.3	0.6
$f_Y(Y)$	0.4	0.1	0.5	1

- a. Suppose $Z = Y^2$, compute the covariance and correlation coefficient of X and Z . (10%)
 - b. Compute $\text{Var}(X-Z)$. (15%)
3. Let X be $N(\mu, \sigma^2)$. Truncate the density of X to the left at A and to the right at B , that is, X takes only the values between A and B , both being some constant. Compute the mean of the above truncated normal, that is, $E(X|A < X < B)$. (15%)
4. A tire manufacturer produces tires that have a mean life of at least 25,000 miles when the production process is working properly. Based on past experience, the standard deviation of the tires is 3,500 miles and the tire life is normally distributed. The operations manager stop the process if there is evidence that the population mean tire life is below 25,000 miles. If you select a random sample of 25 tires and you are willing to have an $\alpha = .05$ risk of committing a Type I error, compute the power of the test and the probability of a Type II error if the population mean life is actually 24,900. (15%)

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共 4 頁，第 2 頁 *請在【答案卷、卡】作答

5. A fast food company uses two management-training methods. Method 1 is a traditional method of training and Method 2 is a new and innovative method. The company has just hired 31 new management trainees. 15 of the trainees are randomly selected and assigned to the first method, and the remaining 16 trainees are assigned to the second training method. After three months of training, the management trainees took a standardized test. The test was designed to evaluate their performance and learning from training. The sample mean score and sample standard deviation of the two methods are given below. The management wants to determine if the company should implement the new training method. Is there evidence at $\alpha = .05$ to conclude that the new training method is more effective than the traditional training method? (10%) (Upper tail Area:

$$t_{0.05,29} = 1.699, t_{0.025,29} = 2.0452, t_{0.01,29} = 2.4620, t_{0.05,30} = 1.673, t_{0.025,30} = 2.0423, \\ t_{0.01,30} = 2.4527)$$

Method 1 mean=69, Standard deviation=3.4

Method 2 mean=72, Standard deviation=3.8

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6. Three years ago, a major hotel chain purchased a large number of heating and air-conditioning units from three major manufacturers, A, B and C. The accounting department of the hotel chain kept records on their repair and replacement costs over the last 3 years. The manager of the purchasing department randomly selected 6 brand A, 7 brand B, and 6 brand C heating and air-conditioning unit records. The repair and replacement costs in dollars are summarized in the following table. At $\alpha = .05$, can it be concluded that there is a significant difference in repair costs among the three brands? (15%)
(Upper tail Area :

$$\chi^2_{0.05,1} = 3.841, \chi^2_{0.05,2} = 5.991, \chi^2_{0.05,3} = 7.815, \chi^2_{0.05,4} = 9.488$$

$$\chi^2_{0.025,1} = 5.024, \chi^2_{0.025,2} = 7.378, \chi^2_{0.025,3} = 9.348, \chi^2_{0.025,4} = 11.143)$$

Brand A	Brand B	Brand C
\$ 80	\$100	\$140
\$250	\$170	\$280
\$150	\$430	\$100
\$ 70	\$290	\$100
\$220	\$370	\$340
\$300	\$420	\$250
	\$350	

