

國立臺北大學九十七學年度碩士班招生考試試題

系(所)別：國際企業研究所

科目：統計學

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本次考試題目皆為填充題

- The linear regression lines: $Y=30.331-1.877X$ and $X=15.481-0.503Y$
The absolute value of Pearson correlation coefficient between variables X and Y is _____. (5%)
- Americans spend an average of 8.6 minutes (μ) per day reading newspapers nationally. A researcher believes that individuals in management positions spend more than the national average time per day reading newspapers. A sample of individuals in management positions will be selected by the researcher. The null hypothesis for this study is _____. (5%)
- In a study, MML is an instrument designed to assess severity of patient's disability. There are 5 patients and 3 raters who used MML to assess patient disability in this study. Each patient was evaluated by 3 raters simultaneously in the admission of medical hospital in Canada. One-way ANOVA using patient as the factor was performed. SST(total variance), SSTR (between-group variance), and SSE(within-group variance) were calculated as sum of squares in ANOVA table. The sum of square measuring the consistency among raters in ANOVA table is _____. (5%)
- Lynn is interested in buying one of stocks X and Y. The **annual** rate of return on stock X is normally distributed with mean of 17% and standard deviation of 3%. The **quarterly** rate of return on stock Y is also normally distributed with mean of 4% and standard deviation of 2%. Assume that four quarterly rate of returns in a year are independent. The probability that the annual rate of return for stock X is less than the annual rate of return for stock Y is _____. (5%)
- Suppose that μ_A and μ_B are the mean cost using method A and method B, respectively. Assuming the cost for both methods are normally distributed with equal variances. Two random samples were collected. _____ and _____ are two different statistical methods which can be used to test the null hypothesis $H_0: \mu_A = \mu_B$. (10%)
- A company has recorded data on the daily demand for its product (Y in thousands of units) and the unit price (X in hundreds of dollars). A sample of 18 days demand and associated prices resulted in the following data. In order to predict Y using X, a regression line is fitted. To determine whether the slope is significantly different from zero with $\alpha = 0.05$, the value for t statistic is _____. (10%)
 $\Sigma X = 75$ $\Sigma Y = 135$ $\Sigma(Y - \bar{Y})(X - \bar{X}) = -59$
 $\Sigma(X - \bar{X})^2 = 81$ $\Sigma(Y - \bar{Y})^2 = 100$ $SSE = 64$
- A state highway patrol periodically samples vehicle speeds at various locations on a particular highway system into order to test vehicle speeds $H_0: \mu \leq 65$ vs $H_a: \mu > 65$. A sample of 64 vehicles will be selected and the population standard deviation is assumed to be 4 miles per hour. With 0.05 level of significance, the probability of making a Type II error when the actual mean speed is 69 miles per hour is _____. (10%)
- The data consist of the length of service calls in minutes (the response variable, Y) and units of components repaired (the predictor variable, X). A regression analysis was conducted to predict the relationship of the two variables. The data and results are as follows:

Minutes	23	29	49	64	74	87	96	97	109	119	149	145	154	166
Units	1	2	3	4	4	5	6	6	7	8	9	9	10	10

$$\bar{x} = 6, \quad \bar{y} = 97.21, \quad \Sigma(x_i - \bar{x})^2 = 114, \quad \Sigma(y_i - \bar{y})^2 = 27768.36, \quad \Sigma(x_i - \bar{x})(y_i - \bar{y}) = 1768$$

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Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	27420	27420	943.20	.0001
Error	12	348.84837	29.07070		
Corrected Total	13	27768			

Variable	DF	Parameter Estimate	Standard Error
Intercept	1	4.16165	3.35510
Units	1	15.50877	0.50498

- a. What is the 95% confidence interval for the regression parameter of the units of components repaired?
 _____ (10%)
- b. What is the 95% confidence interval for the mean response when the units equal 4? _____ (10%)
9. Suppose that the incidence of a disease in a population is 0.001. A diagnostic test for this disease exists but has a false positive rate of 0.05 and a false negative rate of 0.01; that is, 5% of tests on non-diseased people will indicate the presence of the disease while 1% of tests on people with the disease will not indicate the presence of the disease. If a person drawn at random from the population tests positive, what is the probability that that person has the disease? _____ (10%)
10. Suppose that X is a continuous random variable with density

$$f_X(x) = \begin{cases} |x| & \text{for } -1 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

and define $Y = X^2$. What is the variance of Y? _____ (10%)

11. Let \bar{X}, \bar{Y}, S_X^2 and S_Y^2 be the respective sample means and unbiased estimates of the variance using independent samples of sizes n and m from the normal distributions $N(\mu_X, \sigma_X^2)$ and $N(\mu_Y, \sigma_Y^2)$, where $\mu_X, \sigma_X^2, \mu_Y, \sigma_Y^2$ are unknown. If $\sigma_X^2 / \sigma_Y^2 = d$, a known constant. What is the standard deviation of $\frac{(\bar{X} - \bar{Y}) - (\mu_X - \mu_Y)}{\sqrt{d\sigma_Y^2/n + \sigma_Y^2/m}}$? _____ (10%)

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