銘傳大學八十七學年度管理科學研究所博士班招生考試

應用統計 試題

請注意：本試題可用手掌型計算機作答。

統計檢定之顯著水準，一律使用 α=0.05。

答題所需統計表，僅限使用下頁所提供之表。

1. A study of the purchase decisions for the three stock portfolio managers, A,B,C, was conducted to rates of the stock purchases that resulted in profits over a time period that was less than or equal to one year. Three hundred randomly selected purchases obtained for each of the managers gave the results shown in the accompanying table.

	Manager		
Purchase result	A	B	C
Profit	24	19	33
No profit	76	81	67

a) Do the data provide evidence of the differences among the rates of successful purchase for the three managers? Write down the hypothses and carry out the test.（10%）

b) What is the p-value in part a)（5%）？

2. A study was conducted to examine the relationship of linear regression between annual salary（US dollars）, and the number of years of experience of the manager and the sex of the manager. Random samples of six female managers and six male managers were selected form among managers in a development department. Using the code of sex（=1, male, 0, female）, the SAS output us shown below.

Dependent variable：Salary

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Model	3	42108777.028	14036259.009	346.24	0.0001
Error	8	324314.637	40539.329		
Corrected Total	11	42433091.165			

R-Square	Root MSE	C.V.	Y Mean
0.992	201.344	0.889	22630.833

Source	DF	Type I SS	F Value	Pr>F
Years of Experience	1	33294036.235	821.28	0.0001
Sex	1	8452796.515	208.51	0.0001
Sex*Years of Experience	1	361944.277	8.93	0.0174

Source	DF	Type I SS	F Value	Pr>F
Years of Experience	1	9389610.000	231.62	0.0001
Sex	1	326808.743	8.06	0.0218
Sex*Years of Experience	1	361944.277	8.93	0.0174

Parameter Estimates

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Variable	Estimate	Parameter=0	PR>|T|	Std Error
Intercept	18593.000	89.41	0.0001	207.946
Years of Experience	969.000	15.22	0.0001	63.670
Sex	866.710	2.84	0.0218	305.256
Sex*Years of Experience	260.130	2.99	0.0174	87.057

a) Write down the estimated regression model based on the SAS output shown above. （10%）

b) What is the value of the multiple coefficient of determination？ （5%）

c) Do the data show sufficient evidence that any one of the factors of sex, years of experience, and the interaction of both has effect on salaries? Write down the hypothses and carry out the test. （10%）

d) Do the data show sufficient evidence that the annual rate of increase in male manager salaries exceeds the annual rate of increase in female manager salaries? Write down the hypothses and carry out the test. （10%）

3. The manager of a manufacturing plant conducted three replications of a 2 x 3 factorial experiment to investigate the effect of "foreman" and "shift" on the output of a production line. The SAS output is given below.

Dependent variable：Output

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Model	5	100179.166	20035.833	27.85	0.0001
Error	12	8633.333	719.444		
Corrected Total	17	108812.499			

Source	DF	ANOVA SS	F Value	Pr>F
Foreman	1	19012.500	26.43	0.0002
Shift	2	258.333	0.18	0.8379

Shift * Foreman   2   80908.333   56.23   0.0001

a) Test the hypothesis of the interaction effect of shift and foreman.（10%）
b) Test the hypothesis of the main effect of foreman.（10%）
c) Give any comment on the conclusions you made in parts a) and b).（10%）

4. Suppose that a simple linear regression model on a pair (y, x) of random sample of size n is studied.

   a) Write down the model and its assumptions. Clearly declare each symbol you used.（10%）

   b) Describe how you check the adequacy of the stated model.（10%）

Table 1. Critical Values of the χ^2 Distribution

$$\rho(\chi^2 > x) = \alpha$$

Degrees of Freedom	α					
	0.975	0.95	0.90	0.10	0.05	0.025
1	0.001	0.004	0.016	2.706	3.841	5.024
2	0.051	0.103	0.211	4.605	5.991	7.378
3	0.216	0.352	0.584	6.251	7.815	9.348
4	0.484	0.711	1.064	7.779	9.488	11.143
5	0.831	1.145	1.610	9.236	11.071	12.833
6	1.237	1.635	2.204	10.645	12.592	14.449
7	1.690	2.167	2.833	12.017	14.067	16.013
8	2.180	2.733	3.490	13.362	15.507	17.535
9	2.700	3.325	4.168	14.684	16.919	19.023
10	3.247	3.940	4.865	15.987	18.307	20.483