

國立臺灣師範大學 107 學年度碩士班招生考試試題

科目：統計學

適用系所：全球經營與策略研究所

注意：1.本試題共 2 頁，請依序在答案卷上作答，並標明題號，不必抄題。2.答案必須寫在指定作答區內，否則依規定扣分。

1. A manager of human resource department at the local bank collected the employees' data of Salary (in NT\$10,000) with some demographic variables. The results of the two-way ANOVA about salary differences show in Table 1.

- (1) Indicate the sample size and the names of the independent variables with the number of levels. (5 points)
- (2) What are the values of the A, B, C, D, and E? (5 points)
- (3) What are the meanings of the A, B, C, D, and E? (10 points)
- (4) What are the conclusions about the ANOVA? (10 points)

Table 1: Summary of the results of ANOVA (Dependant Variable: Salary in NT\$10,000)

Sources	SS	df	MS	F	P
Gender	A	1	130.4	55.5	E
Minority	47.6	B	47.6	20.3	<.001
Interaction	11.5	1	C	D	.026
Error	930.5	396	2.3		
Total	1120.0	399			

2. Continuous with the previous example, the manager would like to build a regression model to predict Salary by Age, Gender, and Minority. Results of descriptive statistics and correlation matrix list in Table 2. The regression equation is

$$\hat{y} = -7.5 + 0.5\text{Age} - .007\text{Age}^2 + 1.2\text{Gender} - 1.1\text{Minority}$$

The R^2 of the regression analysis is .30 ($F(4,395)=44.5$, $p<.01$), and all coefficients in the equation are significant at the .01 level.

Table 2: Descriptive Statistics and Correlation Coefficients

Variables	Mean	Std	Salary	Age	Gender	Minority
Salary	3.60	1.787	1.000			
Age	35.00	8.000	0.034	1.000		
Gender	0.50	0.500	0.463*	-0.017	1.000	
Minority	0.20	0.406	-0.198*	0.197*	0.022	1.000

* $p<.01$

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- (1) If male coded as 1, female coded as 0 in Gender; minority people coded as 1, non-minority people coded as 0 in Minority, how many people are male? how many people are minority? (5 points)
- (2) Indicate the 95% confidence interval of the population mean of Age and the percentage of Gender. (10 points)
- (3) Using the correlation coefficient in Table 2, explain the relationship of Salary with Age, Gender, and Minority with significance. (5 points)
- (4) Explain the meaning of the $R^2=.30$ and $F(4,395)=44.5, p<.01$. (10 points)
- (5) Based on the regression equation, discuss the magnitude of the prediction of Age, Gender, and Minority on Salary. (10 points)

3. For the following pair terms, briefly explain the meanings/functions and discuss the differences and similarities

(1) standard score and standard error (6 points)

(2) Poisson distribution and exponential distribution (6 points)

(3) kurtosis and skewness (6 points)

(4) multicollinearity and homoscedasticity (6 points)

(5) moving average and seasonal variation (6 points)

t distribution

df	α							
	One-tail	.1	.075	.05	.025	.01	.005	.001
Two-tail	.2	.15	.10	.05	.02	.01	.005	.001
1	3.078	4.165	6.314	12.706	31.821	63.657	318.309	
2	1.886	2.282	2.920	4.303	6.965	9.925	22.327	
3	1.638	1.924	2.353	3.182	4.541	5.841	10.215	
4	1.533	1.778	2.132	2.776	3.747	4.604	7.173	
5	1.476	1.699	2.015	2.571	3.365	4.032	5.893	
6	1.440	1.650	1.943	2.447	3.143	3.707	5.208	
7	1.415	1.617	1.895	2.365	2.998	3.499	4.785	
8	1.397	1.592	1.860	2.306	2.896	3.355	4.501	
9	1.383	1.574	1.833	2.262	2.821	3.250	4.297	
10	1.372	1.559	1.812	2.228	2.764	3.169	4.144	
11	1.363	1.548	1.796	2.201	2.718	3.106	4.025	
12	1.356	1.538	1.782	2.179	2.681	3.055	3.930	
13	1.350	1.530	1.771	2.160	2.650	3.012	3.852	
14	1.345	1.523	1.761	2.145	2.624	2.977	3.787	
15	1.341	1.517	1.753	2.131	2.602	2.947	3.733	
16	1.337	1.512	1.746	2.120	2.583	2.921	3.686	
17	1.333	1.508	1.740	2.110	2.567	2.898	3.646	
18	1.330	1.504	1.734	2.101	2.552	2.878	3.610	
19	1.328	1.500	1.729	2.093	2.539	2.861	3.579	
20	1.325	1.497	1.725	2.086	2.528	2.845	3.552	
21	1.323	1.494	1.721	2.080	2.518	2.831	3.527	
22	1.321	1.492	1.717	2.074	2.508	2.819	3.505	
23	1.319	1.489	1.714	2.069	2.500	2.807	3.485	
24	1.318	1.487	1.711	2.064	2.492	2.797	3.467	
25	1.316	1.485	1.708	2.060	2.485	2.787	3.450	
26	1.315	1.483	1.706	2.056	2.479	2.779	3.435	
27	1.314	1.482	1.703	2.052	2.473	2.771	3.421	
28	1.313	1.480	1.701	2.048	2.467	2.763	3.408	
29	1.311	1.479	1.699	2.045	2.462	2.756	3.396	
30	1.310	1.477	1.697	2.042	2.457	2.750	3.385	
40	1.303	1.473	1.684	2.021	2.423	2.704	3.348	
50	1.299	1.471	1.676	2.009	2.403	2.678	3.333	
100	1.290	1.460	1.660	1.984	2.364	2.626	3.245	
150	1.287	1.456	1.655	1.976	2.351	2.609	3.211	
200	1.286	1.453	1.653	1.972	2.345	2.601	3.195	
400	1.284	1.442	1.649	1.966	2.336	2.588	3.111	
∞	1.282	1.452	1.645	1.960	2.326	2.576	3.183	