

# 國立中央大學九十學年度碩士班研究生入學試題卷

所別：土木工程學系 己組 科目：統計學 共 2 頁 第 1 頁

(10%) 1. For a particular set of data,  $Y_{ij} = \mu_j + (\alpha_j) * (e_{ij})$ . What ANOVA assumption has been violated, and what can be done to correct the problem?

(10%) 2. Please read the following cases and answer corresponding questions.

Case I:

Suppose that there are approximately 1 million adults in a certain sales region who are potential buyers for a new product and that an unknown proportion  $p$  would purchase the product if it was offered for sale. A sample of 1000 adults will be chosen in such a way that each of the 1 million in the sales region has an equal chance of being chosen. Each adult in the sample will be asked whether he or she would purchase the product if it was offered for sale.

(5%) Q: Is this a binomial experiment? Why or why not?

Case II:

A purchaser, who has received a shipment containing 20 personal computers, wishes to sample three of the PCs to see whether they are in working order before he unloads the shipment. The 3 nearest PCs are removed for testing and, afterward, are declared either defective or nondefective. Unknown to the purchaser, 2 of the 20 PCs are defective.

(5%) Q: Is this a binomial experiment? Why or why not?

(20%) 3. There are two locations in town (north and south) under consideration for a new restaurant, but only one location will actually become available. If it is built in the north, the restaurant stands a 90% of chance of successfully surviving its first year. However, if it is built in the south, its chances of survival are only 65%. It is estimated that the chances of the northern location being available are 40%.

- Draw a probability tree for this situation, with the first branch being "location".
- Find the probability that the restaurant will survive its first year.
- Find the probability that the restaurant is built in the south and is successful.
- Find the probability that the restaurant is built in the south given that it is successful.
- Find the probability of failure given that it is in the north.

(20%) 4. The following data represent the tax-office appraised values and the actual sale prices of 12 residential properties sold in last week.

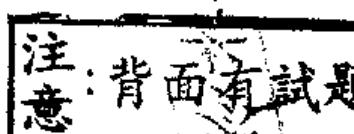
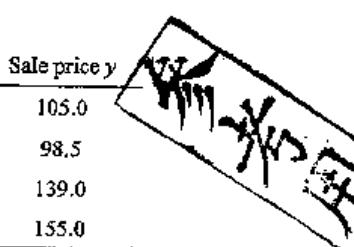
- Fit a least-squares line to the data.
- Does the  $x$  contribute information for the prediction of  $y$ ?
- Find a 90% confidence interval for the expected value of  $y$  when  $x = 80,000$ , interpret the interval.
- Find  $r^2$  and interpret its value.

Appraised value x	Sale price y	Appraised value x	Sale price y	Appraised value x	Sale price y
65.5	80.0	81.5	95.0	93.0	105.0
62.6	77.5	104.7	130.0	101.7	98.5
71.2	86.2	86.4	109.0	86.4	139.0
60.5	71.9	89.1	116.7	102.8	155.0

Simple Regression Analysis for CB911-52					
Linear Model: $Y = -4.58706 + 1.31176 * X$					
Table of Estimates					
	Estimate	Standard Error	t Value	P Value	
Intercept	-4.58706	26.7341	-0.17	0.8672	
Slope	1.31176	0.3140	4.18	0.0019	
R-Squared =	63.57%				
Correlation Coef. =	0.797				
Std Error of Estimation =	16.425				
Durbin-Watson Statistic =	1.6228				
Mean Absolute Error =	8.9415				
Sample Size (n) =	12				

Row	X	Y	Predicted		90% Prediction		90% Confidence	
			Lower Limit	Upper Limit	Lower Limit	Upper Limit	Lower Limit	Upper Limit
1	89	100.354	89.234	131.474	91.494	109.213		
2	90	113.471	92.285	144.650	104.178	122.766		



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(10%) 5. A survey of 100 cars, each of which was classified according to whether or not it had antilock

brakes and whether or not it had been involved in an accident in the past year.

	Antilock brakes	No antilock brakes
Accident	3	12
No accident	40	45

a. Does the proportion of cars that have had accidents depend on whether or not the car has antilock brakes?

Test at  $\alpha = .05$ .

(10%) 6. Consider the following set of data points.

a. Compute the linear correlation coefficient,  $r$ .

b. Can you conclude from your result in part (a) that the variables  $x$  and  $y$  are unrelated? Why?

c. Is it appropriate to use the linear correlation coefficient as a descriptive measure for the data? Why or why not?

x	-3	-2	-1	0	1	2	3
y	9	4	1	0	1	4	9

(20%) 7. Portions of the ANOVA table from a research are given.

a. Complete the table and then answer the following two questions.

b. Can the null hypotheses for the two main effects be rejected?

c. Is the  $A * B$  interaction statistically significant?

	SS	V	MS	F
Factor A	900		450	
Factor B		2	250	
$A * B$	1,200			G
Within	44,550	891	H	

Critical Values for Chi-Squared Tests

Critical Values of F

$v_1$ For Denomi- nator	$\alpha$	v <sub>2</sub> (Degrees of Freedom for Numerator)											
		1	2	3	4	5	6	7	8	9	10	12	15
30	.25	1.38	1.45	1.44	1.42	1.41	1.39	1.38	1.37	1.36	1.33	1.31	1.32
	.10	2.88	2.49	2.38	2.14	1.05	1.98	1.93	1.89	1.85	1.81	1.77	1.72
	.05	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.09	2.01
	.025	5.57	4.16	3.59	3.25	3.03	2.87	2.75	2.65	2.57	2.51	2.41	2.31
	.01	7.56	5.39	4.51	4.02	3.70	3.47	3.30	3.17	3.07	2.98	2.84	2.70
	.001	13.3	8.77	7.05	6.12	5.53	4.12	4.82	4.58	4.39	4.24	4.00	3.75
40	.25	1.36	1.44	1.42	1.40	1.39	1.37	1.36	1.35	1.34	1.33	1.31	1.30
	.10	2.84	2.44	2.23	2.09	1.93	1.87	1.83	1.79	1.76	1.71	1.66	1.66
	.05	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.00	1.92
	.025	5.42	4.05	3.46	3.13	2.90	2.74	2.62	2.53	2.45	2.39	2.29	2.18
	.01	7.31	5.18	4.31	3.83	3.51	3.29	3.12	2.99	2.89	2.80	2.65	2.52
	.001	12.6	8.25	6.60	5.70	5.13	4.73	4.44	4.21	4.02	3.87	3.64	3.40
60	.25	1.35	1.42	1.41	1.38	1.37	1.35	1.33	1.32	1.31	1.30	1.29	1.27
	.10	2.79	2.39	2.18	2.04	1.95	1.87	1.82	1.77	1.74	1.71	1.66	1.60
	.05	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99	1.92	1.84
	.025	5.29	3.93	3.34	3.01	2.79	2.63	2.51	2.41	2.33	2.27	2.17	2.06
	.01	7.08	4.98	4.13	3.65	3.34	3.12	2.95	2.82	2.72	2.63	2.50	2.35
	.001	12.0	7.76	6.17	5.31	4.76	4.37	4.09	3.87	3.69	3.54	3.31	3.08
120	.25	1.34	1.40	1.39	1.37	1.35	1.33	1.31	1.30	1.29	1.28	1.26	1.24
	.10	2.75	2.35	2.18	2.04	1.95	1.87	1.82	1.77	1.74	1.71	1.66	1.60
	.05	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99	1.92	1.84
	.025	5.29	3.93	3.34	3.01	2.79	2.63	2.51	2.41	2.33	2.27	2.17	2.06
	.01	7.08	4.98	4.13	3.65	3.34	3.12	2.95	2.82	2.72	2.63	2.50	2.35
	.001	12.0	7.76	6.17	5.31	4.76	4.37	4.09	3.87	3.69	3.54	3.31	3.08
200	.25	1.33	1.39	1.37	1.35	1.33	1.31	1.30	1.29	1.28	1.27	1.25	1.23
	.10	2.73	2.32	2.11	1.92	1.80	1.75	1.70	1.66	1.63	1.57	1.52	1.50
	.05	3.99	3.04	2.65	2.42	2.26	2.14	2.06	1.98	1.93	1.86	1.80	1.72
	.025	5.15	3.80	3.23	2.89	2.57	2.32	2.19	2.10	2.02	1.96	1.89	1.81
	.01	6.85	4.79	3.94	3.48	3.17	2.96	2.79	2.66	2.56	2.47	2.34	2.19
	.001	11.4	7.32	5.79	4.95	4.42	4.04	3.77	3.55	3.38	3.24	3.02	2.78
500	.25	1.33	1.39	1.37	1.35	1.33	1.31	1.30	1.28	1.27	1.25	1.24	1.22
	.10	2.73	2.32	2.11	1.92	1.80	1.75	1.70	1.66	1.63	1.57	1.52	1.50
	.05	3.86	3.01	2.62	2.39	2.23	2.12	2.03	1.96	1.90	1.85	1.77	1.69
	.025	5.10	3.76	3.19	2.85	2.63	2.47	2.35	2.26	2.18	2.11	2.01	1.90
	.01	6.76	4.71	3.88	3.41	3.11	2.89	2.73	2.60	2.50	2.41	2.27	2.13
	.001	11.3	7.13	5.63	4.81	4.29	3.92	3.65	3.43	3.26	3.12	2.90	2.67
1,000	.25	1.33	1.39	1.37	1.35	1.33	1.31	1.30	1.28	1.27	1.25	1.24	1.22
	.10	2.71	2.31	2.09	1.95	1.85	1.78	1.72	1.69	1.64	1.61	1.56	1.50
	.05	3.85	3.00	2.61	2.38	2.22	2.10	2.02	1.95	1.89	1.84	1.76	1.68
	.025	5.04	3.70	3.13	2.80	2.58	2.42	2.30	2.19	2.13	2.06	1.96	1.85
	.01	6.66	4.62	3.80	3.34	3.04	2.82	2.66	2.43	2.34	2.24	2.06	1.96
	.001	10.9	6.95	5.46	4.65	4.14	3.78	3.51	3.30	3.16	3.02	2.80	2.57

