國立中央大學九十學年度碩士班研究生入學試題卷

(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%.

a. Draw a probability tree for this situation, with the first branch being "location".
b. Find the probability that the restaurant will survive its first year.
c. Find the probability that the restaurant is built in the south and is successful.
d. Find the probability that the restaurant is built in the south given that it is successful.
e. 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.

a. Fit a least-squares line to the data.
b. Does the x contribute information for the prediction of y ?
c. Find a 90% confidence interval for the expected value of y when $x = 80{,}000$, interpret the interval.
d. 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 CB311-62

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 =	9.9415
Sample Size (n) =	12

Table of Predicted Values

Row	X	Predicted Y	90% Prediction Lower Limit	90% Prediction Upper Limit	90% Confidence Lower Limit	90% Confidence Upper Limit
1	80	100.354	69.294	131.414	91.494	109.213
2	90	113.471	82.285	144.658	104.178	122.766

(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	A	450	B
Factor *B*	C	2	250	D
A * *B*	1,200	E	E	G
Within	44,550	891	H	

Critical Values for Chi-Squared Tests

1	2.706	3.841	6.635	10.828
2	4.605	5.991	9.210	13.816
3	6.251	7.815	11.345	16.266
4	7.779	9.488	13.277	18.467
5	9.236	11.071	15.086	20.515
6	10.645	12.592	16.812	22.458
7	12.017	14.067	18.475	24.322
8	13.362	15.507	20.090	26.124
9	14.684	16.919	21.666	27.877
10	15.987	18.307	23.209	29.588
11	17.275	19.675	24.725	31.264
12	18.549	21.026	26.217	32.909
13	19.812	22.362	27.688	34.528
14	21.064	23.685	29.141	36.123
15	22.307	24.996	30.578	37.697
16	23.542	26.296	32.000	39.252
17	24.769	27.587	33.409	40.790
18	25.989	28.869	34.805	42.312
19	27.204	30.144	36.191	43.820
20	28.412	31.410	37.566	45.315
21	29.615	32.671	38.932	46.797
22	30.813	33.924	40.289	48.268
23	32.007	35.172	41.638	49.728
24	33.196	36.415	42.980	51.179
25	34.382	37.652	44.314	52.620
26	35.563	38.885	45.642	54.052
27	36.741	40.113	46.963	55.476
28	37.916	41.337	48.278	56.892
29	39.087	42.557	49.588	58.301
30	40.256	43.773	50.892	59.703
31	41.422	44.985	52.191	61.098
32	42.585	46.194	53.486	62.487
33	43.745	47.400	54.776	63.870
34	44.903	48.602	56.061	65.247
35	46.059	49.802	57.342	66.619
36	47.212	50.998	58.619	67.985
37	48.363	52.192	59.893	69.346
38	49.513	53.384	61.162	70.703
39	50.660	54.572	62.428	72.055
40	51.805	55.758	63.691	73.402
41	52.949	56.942	64.950	74.745
42	54.090	58.124	66.206	76.084
43	55.230	59.304	67.459	77.419
44	56.369	60.481	68.710	78.749
45	57.505	61.656	69.957	80.077
46	58.641	62.830	71.201	81.400
47	59.774	64.001	72.443	82.720
48	60.907	65.171	73.683	84.037
49	62.038	66.339	74.919	85.351
50	63.167	67.505	76.154	86.661

Critical Values of *F*

ν_2 For Denominator	α	ν_1 (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	1.35	1.34	1.32
	.10	2.88	2.49	2.28	2.14	2.05	1.98	1.93	1.88	1.85	1.82	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	4.18	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	5.12	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	2.00	1.93	1.87	1.83	1.79	1.76	1.71	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	2.66	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	2.13	1.99	1.90	1.82	1.77	1.72	1.68	1.65	1.60	1.55
	.05	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96	1.91	1.83	1.75
	.025	5.15	3.80	3.23	2.89	2.67	2.52	2.39	2.30	2.22	2.16	2.05	1.94
	.01	6.85	4.79	3.95	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
200	.25	1.33	1.39	1.38	1.36	1.34	1.32	1.31	1.29	1.28	1.27	1.25	1.23
	.10	2.73	2.33	2.11	1.97	1.88	1.80	1.75	1.70	1.66	1.63	1.57	1.52
	.05	3.89	3.04	2.65	2.42	2.26	2.14	2.06	1.98	1.93	1.88	1.80	1.72
	.025	5.10	3.76	3.18	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	11.2	7.15	5.63	4.81	4.29	3.92	3.65	3.43	3.26	3.12	2.90	2.67
500	.25	1.33	1.39	1.37	1.35	1.33	1.31	1.30	1.28	1.27	1.26	1.24	1.22
	.10	2.72	2.31	2.10	1.96	1.86	1.79	1.73	1.68	1.64	1.61	1.56	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	5.05	3.72	3.14	2.81	2.59	2.43	2.31	2.22	2.14	2.07	1.97	1.86
	.01	6.69	4.65	3.82	3.36	3.05	2.84	2.68	2.55	2.46	2.36	2.22	2.07
	.001	11.0	7.00	5.50	4.69	4.17	3.81	3.54	3.33	3.16	3.02	2.80	2.57
1,000	.25	1.33	1.39	1.37	1.35	1.33	1.31	1.29	1.28	1.27	1.26	1.24	1.22
	.10	2.71	2.31	2.09	1.95	1.85	1.78	1.72	1.68	1.64	1.60	1.55	1.49
	.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	2.20	2.13	2.06	1.96	1.85
	.01	6.66	4.62	3.80	3.34	3.04	2.82	2.66	2.53	2.43	2.34	2.20	2.06
	.001	10.9	6.95	5.46	4.65	4.14	3.78	3.51	3.30	3.13	2.99	2.77	2.54
∞	.25	1.32	1.39	1.37	1.35	1.33	1.31	1.29	1.28	1.27	1.25	1.24	1.22
	.10	2.71	2.30	2.08	1.94	1.85	1.77	1.72	1.67	1.63	1.60	1.55	1.49
	.05	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83	1.75	1.67
	.025	5.02	3.69	3.12	2.79	2.57	2.41	2.29	2.19	2.11	2.05	1.94	1.83
	.01	6.63	4.61	3.78	3.32	3.02	2.80	2.64	2.51	2.41	2.32	2.18	2.04
	.001	10.8	6.91	5.42	4.62	4.10	3.74	3.47	3.27	3.10	2.96	2.74	2.51
	α	1	2	3	4	5	6	7	8	9	10	12	15