國立臺灣師範大學 109 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 7 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。

一、問答計算題 (共40分)

1)

The managing partner of an advertising agency believes that his company's sales are related to the industry sales. He uses Microsoft Excel's Data Analysis tool to analyze the last 4 years of quarterly data (i.e., $n = 16$) with the following results:

TABLE 1-1:

Regression Statistics	
Multiple R	0.802
R Square	0.643
Adjusted R Square	0.618
Standard Error SYX	0.9224
Observations	16

ANOVA

	df	SS	MS	F	Sig.F
Regression	1	21.497	21.497	25.27	0.000
Error	14	11.912	0.851		
Total	15	33.409			

Predictor	Coefficients	Standard Error	t Stat	p-value
Intercept	3.962	1.440	2.75	0.016
Industry	0.040451	0.008048	5.03	0.000

Durbin-Watson Statistic 1.59

Referring to Table 1-1,

(a) Can he accept his belief that his company's sales are related to the industry sales? Explain your answer. (5 points)

(b) The prediction for a quarter in which $X = 120$ is $Y =$ _____. (5 points)

(c) The correlation coefficient is _____. (5 points)

(d) The partner wants to test for autocorrelation using the Durbin-Watson statistic. Using a level of significance of 0.05 and Table 1-2, the critical values of the test are

$d_L =$ _____, and $d_U =$ _____. (5 points)

TABLE 1-2: Critical Values d_L and d_U of the Durbin-Watson statistic, D

Level of significance α = .05.										
	p-1=1		p-1=2		p-1=3		p-1=4		p-1=5	
n	d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U
15	1.08	1.36	0.95	1.54	0.82	1.75	0.69	1.97	0.56	2.21
16	1.10	1.37	0.98	1.54	0.86	1.73	0.74	1.93	0.62	2.15
17	1.13	1.38	1.02	1.54	0.90	1.71	0.78	1.90	0.67	2.10
18	1.16	1.39	1.05	1.53	0.93	1.69	0.82	1.87	0.71	2.06
19	1.18	1.40	1.08	1.53	0.97	1.68	0.86	1.85	0.75	2.02
20	1.20	1.41	1.10	1.54	1.00	1.68	0.90	1.83	0.79	1.99
21	1.22	1.42	1.13	1.54	1.03	1.67	0.93	1.81	0.83	1.96
22	1.24	1.43	1.15	1.54	1.05	1.66	0.96	1.80	0.86	1.94
23	1.26	1.44	1.17	1.54	1.08	1.66	0.99	1.79	0.90	1.92
24	1.27	1.45	1.19	1.55	1.10	1.66	1.01	1.78	0.93	1.90
25	1.29	1.45	1.21	1.55	1.12	1.66	1.04	1.77	0.95	1.89
26	1.30	1.46	1.22	1.55	1.14	1.65	1.06	1.76	0.98	1.88
27	1.32	1.47	1.24	1.56	1.16	1.65	1.08	1.76	1.01	1.86
28	1.33	1.48	1.26	1.56	1.18	1.65	1.10	1.75	1.03	1.85
29	1.34	1.48	1.27	1.56	1.20	1.65	1.12	1.74	1.05	1.84

2)
As part of an evaluation program, a sporting goods retailer wanted to compare the downhill coasting speeds of 4 brands of bicycles. She took 3 of each brand and determined their maximum downhill speeds. The results are presented in miles per hour in the table below.

TABLE 2-1:

Trial	Barth	Tornado	Reiser	Shaw
1	43	37	41	43
2	46	38	45	45
3	43	39	42	46

(a) Referring to Table 2-1, construct the ANOVA table from the sample data. (10 points)
(b) Referring to the ANOVA table that you construct in (a) and Table 2-2 (F Distribution), should the null hypothesis be rejected at a 5% level of significance? Explain your Answer. (10 points)

TABLE 2-2:

Percentage points of *Fisher*'s distribution

$$f_{0.05, v_1, v_2}$$

Degrees of freedom of the numerator (v_1)

v_2	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	∞
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5	241.9	243.9	245.9	248	249.1	250.1	251.1	252.2	253.3	254.3
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.43	19.45	19.45	19.46	19.47	19.48	19.49	19.50
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.55	8.53
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40	4.36
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.94	3.87	3.84	3.81	3.77	3.74	3.70	3.67
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.51	3.44	3.41	3.38	3.34	3.30	3.27	3.23
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.22	3.15	3.12	3.08	3.04	3.01	2.97	2.93
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.07	3.01	2.94	2.90	2.86	2.83	2.79	2.75	2.71
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58	2.54
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.72	2.65	2.61	2.57	2.53	2.49	2.45	2.40
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.62	2.54	2.51	2.47	2.43	2.38	2.34	2.30
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.60	2.53	2.46	2.42	2.38	2.34	2.30	2.25	2.21
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.53	2.46	2.39	2.35	2.31	2.27	2.22	2.18	2.13
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.48	2.40	2.33	2.29	2.25	2.20	2.16	2.11	2.07
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49	2.42	2.35	2.28	2.24	2.19	2.15	2.11	2.06	2.01
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.38	2.31	2.23	2.19	2.15	2.10	2.06	2.01	1.96
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41	2.34	2.27	2.19	2.15	2.11	2.06	2.02	1.97	1.92
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38	2.31	2.23	2.16	2.11	2.07	2.03	1.98	1.93	1.88
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.28	2.20	2.12	2.08	2.04	1.99	1.95	1.90	1.84
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32	2.25	2.18	2.10	2.05	2.01	1.96	1.92	1.87	1.81
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30	2.23	2.15	2.07	2.03	1.98	1.94	1.89	1.84	1.78
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27	2.20	2.31	2.05	2.01	1.96	1.91	1.86	1.81	1.76
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25	2.18	2.11	2.03	1.98	1.94	1.89	1.84	1.79	1.73
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24	2.16	2.09	2.01	1.96	1.92	1.87	1.82	1.77	1.71
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27	2.22	2.15	2.07	1.99	1.95	1.90	1.85	1.80	1.75	1.69
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25	2.20	2.13	2.06	1.97	1.93	1.88	1.84	1.79	1.73	1.67
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24	2.19	2.12	2.04	1.96	1.91	1.87	1.82	1.77	1.71	1.65
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22	2.18	2.10	2.03	1.94	1.90	1.85	1.81	1.75	1.70	1.64
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68	1.62
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58	1.51
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99	1.92	1.84	1.75	1.70	1.65	1.59	1.53	1.47	1.39
120	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96	1.91	1.83	1.75	1.66	1.61	1.55	1.55	1.43	1.35	1.25
∞	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83	1.75	1.67	1.57	1.52	1.46	1.39	1.32	1.22	1.00

Degrees of freedom of the denominator (v_2)

二、單選題 (每題3分，共60分)

1) The estimation of the population average family expenditure on food based on the sample average expenditure of 1,000 families is an example of _____
A) descriptive statistics.   B) a statistic.   C) a parameter.   D) inferential statistics.

2) Which of the following is most likely a parameter as opposed to a statistic?
A) the proportion of females registered to vote in a county
B) the average height of people randomly selected from a database
C) the average score of the first five students completing an assignment
D) the proportion of trucks stopped yesterday that were cited for bad brakes

TABLE 3
A survey was conducted to determine how people rated the quality of programming available on television. Respondents were asked to rate the overall quality from 0 (no quality at all) to 100 (extremely good quality). The stem-and-leaf display of the data is shown below.

Stem	Leaves
3	24
4	03478999
5	0112345
6	12566
7	01
8	
9	2

3) Referring to Table 3, what percentage of the respondents rated overall television quality with a rating of 80 or above?
A) 100 B) 0   C) 4   D) 96

4) Referring to Table 3, what percentage of the respondents rated overall television quality with a rating between 50 and 75?
A) 44   B) 56   C) 40   D) 11

5) You have collected data on the approximate retail price (in $) and the energy cost per year (in $) of 15 refrigerators. Which of the following is the best for presenting the data?
A) a contingency table   B) a scatter diagram
C) a side-by-side bar chart   D) a pie chart

6) You have collected data on the responses to two questions asked in a survey of 40 college students majoring in business. What is your gender (Male = M; Female = F) and What is your major (Accountancy = A; Computer Information Systems = C; Marketing = M). Which of the following is the best for presenting the data?
A) a contingency table   B) a stem-and-leaf display
C) a Pareto diagram D) a time-series plot

7) Which measure of central tendency can be used for both numerical and categorical variables?
A) geometric mean   B) median   C) arithmetic mean   D) mode

8) In a right-skewed distribution, _____
A) the median equals the arithmetic mean.
B) the median is larger than the arithmetic mean.
C) the median is less than the arithmetic mean.
D) none of the above

9) Which of the following is sensitive to extreme values?
A) the interquartile range   B) the arithmetic mean
C) the median   D) the 1st quartile

10) The employees of a company were surveyed on questions regarding their educational background and marital status. Of the 600 employees, 400 had college degrees, 100 were single, and 60 were single college graduates. What is the probability that an employee of the company is single or has a college degree?
A) 0.10 B) 0.667   C) 0.733   D) 0.25

TABLE 4
Mothers Against Drunk Driving is a very visible group whose main focus is to educate the public about the harm caused by drunk drivers. A study was recently done that emphasized the problem we all face with drinking and driving. Four hundred accidents that occurred on a Saturday night were analyzed. Two items noted were the number of vehicles involved and whether alcohol played a role in the accident. The numbers are shown below:

| | Number of Vehicles Involved | | | |
Did alcohol play a role?	1	2	3	Totals
Yes	50	100	20	170
No	25	175	30	230
Totals	75	275	50	400

11) Referring to Table 4, what proportion of accidents involved more than one vehicle?
A) 75/400 or 18.75%   B) 275/400 or 68.75%
C) 325/400 or 81.25%   D) 50/400 or 12.5%

12) Referring to Table 4, given that alcohol was not involved, what proportion of the accidents were single vehicle?
A) 50/170 or 29.41% B) 25/75 or 33.33%
C) 25/230 or 10.87% D) 50/75 or 66.67%

13) The method of moving averages is used   _____
A) to plot a series.   B) in regression analysis.
C) to exponentiate a series.   D) to smooth a series.

14) The method of least squares is used on time-series data for   _____
A) obtaining the trend equation.   B) eliminating irregular movements.
C) exponentially smoothing a series.   D) deseasonalizing the data.

15) The covariance   _____
A) must be less than +1.   B) must be positive.
C) must be between -1 and +1.   D) can be positive or negative.

16) A professor receives, on average, 24.7 e-mails from students the day before the midterm exam. To compute the probability of receiving at least 10 e-mails on such a day, he will use what type of probability distribution?
A) hypergeometric distribution   B) Poisson distribution
C) binomial distribution D) none of the above

17) If the expected value of a sample statistic is equal to the parameter it is estimating, then we call that sample statistic   _____
A) biased.   B) minimum variance.   C) random. D) unbiased.

18) Suppose a sample of $n = 50$ items is drawn from a population of manufactured products and the weight, X, of each item is recorded. Prior experience has shown that the weight has a probability distribution with $\mu = 6$ ounces and $\sigma = 2.5$ ounces. Which of the following is true about the sampling distribution of the sample mean if a sample of size 15 is selected?
A) The mean of the sampling distribution is 6 ounces.
B) The shape of the sample distribution is approximately normal.
C) The standard deviation of the sampling distribution is 2.5 ounces.
D) All of the above are correct.

19) The width of a confidence interval estimate for a proportion will be _____
A) narrower for 90% confidence than for 95% confidence.
B) narrower for 99% confidence than for 95% confidence.
C) wider for a sample size of 100 than for a sample size of 50.
D) narrower when the sample proportion is 0.50 than when the sample proportion is 0.20.

20) If an economist wishes to determine whether there is evidence that average family income in a community equals $25,000 _____
A) either a one-tailed or two-tailed test could be used with equivalent results.
B) a two-tailed test should be utilized.
C) a one-tailed test should be utilized.
D) none of the above