所別：經濟學系碩士班 不分組(一般生)　科目：統計學　共 3 頁　第 1 頁

本科考試禁用計算器　　＊請在試卷答案卷（卡）內作答

1. (10 points, 5 points for each problem) A manufacturer conducted an analysis of a large number of consumer complaints and found that they fell into the six categories shown in the following table.

	Reason for Complaint		
	Electrical	Mechanical	Appearance
During Guarantee Period	20%	14%	30%
After Guarantee Period	10%	21%	5%

(a). If a consumer complaint is received, what is the probability that the cause of the complaint was product appearance given that the complaint originated after the guarantee period?

(b). Are the events "Cause of complaint is product electrical" and "Complaint occurred during the guarantee period" independent?

2. (25 points, 5 points for each problem)

Suppose that x is distributed uniformly over the interval $[a, b]$, where $a < b$.

(a). Find the probability density function $f(x)$ and graph it.

(b). Find the cumulative distribution function $F(x)$ and graph it.

(c). Find the mean and standard deviation of x.

(d). If y is independent of x and distributed uniformly over the interval $[a, b]$, find the probability $P(y > x)$.

(e). If z is independent of x and distributed uniformly over the interval $[a+\varepsilon, b+\varepsilon]$, find the probability $P(z > x)$ when $0 < \varepsilon < b - a$.

3. (10 points, 5 points for each problem)

(a). Suppose that y is a random variable whose probability distribution is binomial. Let n and p denote the number of trials and the probability of a success on a single trial. Derive the variance for y.

(b). Suppose that only 8% of cigarette smokers ever enter into a treatment program to help them quit smoking. In a random sample of 300 smokers, let x be the number who enter into a treatment program. What is the expected value of x?

4. A hospital claims that its four-week weight reduction treatment is effective that can reduce weight at least 10 Kg. The data for a random sample of six observations are shown in the table

Pair	Before the treatment	After the treatment
1	87	74
2	83	71
3	89	77
4	86	72
5	84	74
6	88	77

注意：背面有試題

(a). Use the differences to calculate $\bar{d}$ and s_d^2 (6 points)

(b). Please test whether the hospital's claim is true. Use α=0.05. (6 points)

(c). What assumptions you make when you conduct the above test? (4 points)

5. Consider the following model that estimate the rationality of assessments of housing prices (thousand),

$$PRICE = \beta_0 + \beta_1 ASSESS + u.$$

(a) Please derive the ordinary least square (OLS) estimators of β_0 and β_1. (8 points)

(b). The assessment is rational if $\beta_1 = 1$ and $\beta_0 = 0$. A student use 88 observations to estimate the above equation and obtain the following results

$$PRICE = \underset{\text{s.e}}{-14.47} + \underset{(0.049)}{0.976}\ ASSESS \qquad R^2 = 0.820,\ SSR = 165{,}644.51$$
(16.27)

Test $H_0 : \beta_1 = 1$ against the two sided alternatives ($\alpha = 0.05$). What do you conclude? (6%)

(c). To test the joint hypothesis that and , we need the *SSR* in the restricted model. This amount to computing $\sum_{i=1}^{n}(PRICE_i - ASSESS_i)^2$, where n = 88. Since the residuals in the restricted model are just $(PRICE_i - ASSESS_i)$. [No estimation is needed for the restricted model because both parameters are specified under H0.] This turns out to yield SSR = 209,448.99. Carry out the F test for the joint hypothesis. (8 points)

(d). Now, if we add another independent variable, *AREA* (square meter) to implement estimations and obtain the new results

$$PRICE = \underset{\text{s.e}}{-14.47} + \underset{(0.049)}{0.976}\ ASSESS + \underset{(20.8)}{100}\ AREA \qquad R^2 = 0.920$$
(16.27)

Please interpret the estimated coefficient of *AREA*. (6 points)

6. An experiment has been conducted for four treatments with eight blocks. Please complete the analysis of variance table and then use α=0.05 to test for any significant differences in treatments. (11 points)

Source of Variance	Sum of Squares	Degree of Freedom	Mean Square	F
Treatment	900	(b)	---	
Blocks	400	---	(e)	
Error	(a)	(c)	---	
Total	1800	(d)		

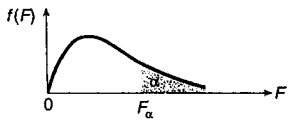
NOTE: If you can not find the correct "degree of freedom", please adopt the nearest one.

注意：背面有試題

v_2 \ v_1	NUMERATOR DEGREES OF FREEDOM 1	2	3	4	5	6	7	8	9
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04
120	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96
∞	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88

DENOMINATOR DEGREES OF FREEDOM

TABLE A.7 Percentage points of the F distribution. (b) $\alpha = .05$



Percentile of the t-distribution

df \ α	80%	90%	95%	98%	99%
1	3.078	6.314	12.706	31.821	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
31	1.309	1.696	2.040	2.453	2.744
32	1.309	1.694	2.037	2.449	2.738
33	1.308	1.692	2.035	2.445	2.733
34	1.307	1.691	2.032	2.441	2.728
35	1.306	1.690	2.030	2.438	2.724
36	1.306	1.688	2.028	2.434	2.719
37	1.305	1.687	2.026	2.431	2.715
38	1.304	1.686	2.024	2.429	2.712
39	1.304	1.685	2.023	2.426	2.708
40	1.303	1.684	2.021	2.423	2.704
50	1.299	1.676	2.009	2.403	2.678
75	1.292	1.665	1.992	2.377	2.643
100	1.290	1.660	1.984	2.364	2.626