註：◎ 每題配分 10%。

◎ **第一至五題含複選題**，答案完全正確才給分；

第六至十題為單選題，必須列出計算過程與結果，否則不予給分。

◎ 資料或條件不足時，請自行假設。

一、Which of the following statements is (are) true?

(A) If the mean of a distribution is greater than the median, then the distribution is skewed to the left

(B) The median is located nearer the 75th than the 25th percentile from a box and whisker plot, then the distribution of the data set is skewed to the left

(C) Two alternatives to adjust all kinds of gasoline price, one is increase \$2 (X) per unit, another is increase 10% (Y) per unit, then the standard deviation will be $S_X > S_Y$

(D) Nominal and ordinal data are normally used with parametric statistics

(E) None of the above.

二、Which of the following statements is (are) true?

(A) If the conclusion fails to reject a false null hypothesis, a Type I error has been committed

(B) The sum of probability of the type I error and probability of the type II error is 1

(C) If the null hypothesis is false, power is equal to α

(D) The smaller the specified value of α is, the larger the rejection region

(E) None of the above.

三、Which of the following statements regarding to multiple regression analysis is (are) correct?

(A) A dummy variable is used as an independent variable when the variable involved is quantitative

(B) When the coefficient of determination is close to 1, it means that the estimated coefficients are all significant

(C) In testing the utility of a multiple regression model, a large value of the F-test statistic indicates that most of the variation in Y is explained by the predictor variables

(D) If the model provides a poor fit, this indicates that the standard error of estimate will be large

(E) None of the above.

四、A questionnaire is designed as follows:

◎What is your gender? (1) Male (2) Female

◎What was your annual income (in thousands of dollars) _____

…

Which method can not be used to test whether there are any differences between male and female groups for mean annual income?

(背面仍有題目,請繼續作答)

(A) t-test

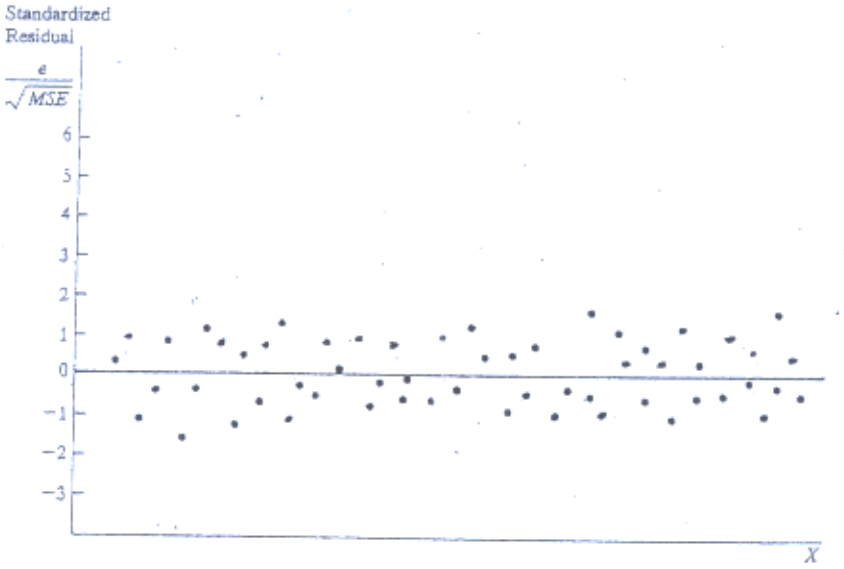
(B) ANOVA

(C) Linear regression

(D) Chi-square test（Independent test）

(E) None of the above.

五、 Based on the plot shown below (independent variable X vs. standardized residual), what assumptions of the simple linear regression can not be concluded?



(A) Linearity of regression function

(B) Constancy of error variance

(C) No outliers

(D) Independence of error terms

(E) None of the above.

六、 In a certain course, 30% of the students are freshmen, 50% are sophomores, and 20% are juniors. Records show that 60% of the freshmen, 80% of sophomores, and 50% of the juniors passed the midterm exam. If a student is selected at random, and it is learned that he (she) failed the midterm, what is the probability that the student is a sophomore?

(A) Between 0.25 and 0.30

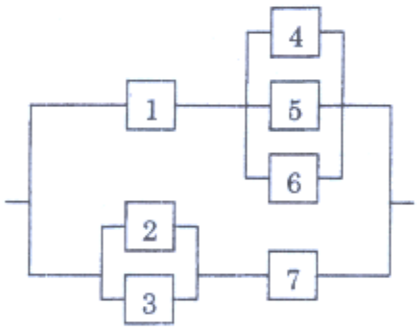
(B) Between 0.30 and 0.35

(C) Between 0.35 and 0.40

(D) Between 0.40 and 0.45

(E) None of the above.

七、 A system includes 7 components shown below. Each component has equal reliability 0.8. When at least one out of components 2 through 3 and one out of components 4 through 6 are needed for successful operation, the reliability for the system is



(A) between 0.80 and 0.85
(B) between 0.85 and 0.90
(C) between 0.90 and 0.95
(D) between 0.95 and 1.00
(E) none of the above.

八、 Suppose the study reveals that the average number of accidents per person per year is 0.05. Using the Poisson distribution, the probability of two randomly selected persons without accidents during next two years is
(A) between 0.10 and 0.15
(B) between 0.15 and 0.20
(C) between 0.20 and 0.25
(D) between 0.25 and 0.30
(E) none of the above.

九、 Data from an experiment are shown in the following table. If the null hypothesis is $H_0 : \mu_A = \mu_B = \mu_C$, For a one-way ANOVA using $\alpha = 0.05$, the F value and the appropriate decision are

Treatment Level		
A	B	C
23	21	25
24	22	27
26	23	27
27	26	29

(A) F value is between 1 and 5; null hypothesis is rejected
(B) F value is between 1 and 5; null hypothesis is not rejected
(C) F value is between 5 and 10; null hypothesis is rejected
(D) F value is between 5 and 10; null hypothesis is not rejected
(E) none of the above.

(背面仍有題目,請繼續作答)

十、 A survey was conducted to examine the relative attitudes of gender about transportation policy. The data are summarized below, the appropriate null hypothesis and conclusion are ($\alpha = 0.05$)

	Support	Do Not Support
Female	70	10
Male	20	50

(A) H_0 : gender has no effect on opinion; null hypothesis is rejected

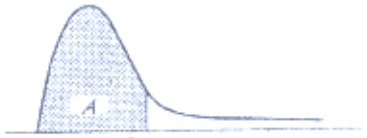
(B) H_0 : gender has no effect on opinion; null hypothesis is not rejected

(C) H_0 : gender affects opinion; null hypothesis is rejected

(D) H_0 : gender affects opinion; null hypothesis is not rejected

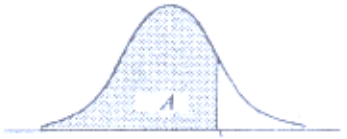
(E) none of the above.

Entry is $\chi^2(A;\nu)$ where $P\{\chi^2(\nu) \le \chi^2(A;\nu)\} = A$.



ν	.005	.010	.025	.050	.100	.900	.950	.975	.990	.995
1	0.0^4393	0.0^3157	0.0^3982	0.0^2393	0.0158	2.71	3.84	5.02	6.63	7.88
2	0.0100	0.0201	0.0506	0.103	0.211	4.61	5.99	7.38	9.21	10.60
3	0.072	0.115	0.216	0.352	0.584	6.25	7.81	9.35	11.34	12.84
4	0.207	0.297	0.484	0.711	1.064	7.78	9.49	11.14	13.28	14.86
5	0.412	0.554	0.831	1.145	1.61	9.24	11.07	12.83	15.09	16.75
6	0.676	0.872	1.24	1.64	2.20	10.64	12.59	14.45	16.81	18.55
7	0.989	1.24	1.69	2.17	2.83	12.02	14.07	16.01	18.48	20.28
8	1.34	1.65	2.18	2.73	3.49	13.36	15.51	17.53	20.09	21.96
9	1.73	2.09	2.70	3.33	4.17	14.68	16.92	19.02	21.67	23.59
10	2.16	2.56	3.25	3.94	4.87	15.99	18.31	20.48	23.21	25.19
11	2.60	3.05	3.82	4.57	5.58	17.28	19.68	21.92	24.73	26.76
12	3.07	3.57	4.40	5.23	6.30	18.55	21.03	23.34	26.22	28.30
13	3.57	4.11	5.01	5.89	7.04	19.81	22.36	24.74	27.69	29.82
14	4.07	4.66	5.63	6.57	7.79	21.06	23.68	26.12	29.14	31.32
15	4.60	5.23	6.26	7.26	8.55	22.31	25.00	27.49	30.58	32.80
16	5.14	5.81	6.91	7.96	9.31	23.54	26.30	28.85	32.00	34.27
17	5.70	6.41	7.56	8.67	10.09	24.77	27.59	30.19	33.41	35.72
18	6.26	7.01	8.23	9.39	10.86	25.99	28.87	31.53	34.81	37.16
19	6.84	7.63	8.91	10.12	11.65	27.20	30.14	32.85	36.19	38.58
20	7.43	8.26	9.59	10.85	12.44	28.41	31.41	34.17	37.57	40.00
21	8.03	8.90	10.28	11.59	13.24	29.62	32.67	35.48	38.93	41.40
22	8.64	9.54	10.98	12.34	14.04	30.81	33.92	36.78	40.29	42.80
23	9.26	10.20	11.69	13.09	14.85	32.01	35.17	38.08	41.64	44.18
24	9.89	10.86	12.40	13.85	15.66	33.20	36.42	39.36	42.98	45.56
25	10.52	11.52	13.12	14.61	16.47	34.38	37.65	40.65	44.31	46.93
26	11.16	12.20	13.84	15.38	17.29	35.56	38.89	41.92	45.64	48.29
27	11.81	12.88	14.57	16.15	18.11	36.74	40.11	43.19	46.96	49.64
28	12.46	13.56	15.31	16.93	18.94	37.92	41.34	44.46	48.28	50.99
29	13.12	14.26	16.05	17.71	19.77	39.09	42.56	45.72	49.59	52.34
30	13.79	14.95	16.79	18.49	20.60	40.26	43.77	46.98	50.89	53.67
40	20.71	22.16	24.43	26.51	29.05	51.81	55.76	59.34	63.69	66.77
50	27.99	29.71	32.36	34.76	37.69	63.17	67.50	71.42	76.15	79.49
60	35.53	37.48	40.48	43.19	46.46	74.40	79.08	83.30	88.38	91.95
70	43.28	45.44	48.76	51.74	55.33	85.53	90.53	95.02	100.4	104.2
80	51.17	53.54	57.15	60.39	64.28	96.58	101.9	106.6	112.3	116.3
90	59.20	61.75	65.65	69.13	73.29	107.6	113.1	118.1	124.1	128.3
100	67.33	70.06	74.22	77.93	82.36	118.5	124.3	129.6	135.8	140.2

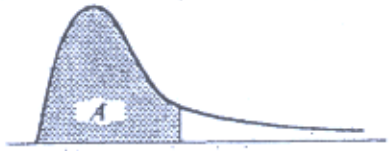
Entry is $t(A;\nu)$ where $P\{t(\nu) \le t(A;\nu)\} = A$.



ν	.90	.95	.975	.99	.9925	.995	.9975
1	3.078	6.314	12.706	31.821	42.434	63.657	127.322
2	1.886	2.920	4.303	6.965	8.073	9.925	14.089
3	1.638	2.353	3.182	4.541	5.047	5.841	7.453
4	1.533	2.132	2.776	3.747	4.088	4.604	5.598
5	1.476	2.015	2.571	3.365	3.634	4.032	4.773
6	1.440	1.943	2.447	3.143	3.372	3.707	4.317
7	1.415	1.895	2.365	2.998	3.203	3.499	4.029
8	1.397	1.860	2.306	2.896	3.085	3.355	3.833
9	1.383	1.833	2.262	2.821	2.998	3.250	3.690
10	1.372	1.812	2.228	2.764	2.932	3.169	3.581
11	1.363	1.796	2.201	2.718	2.879	3.106	3.497
12	1.356	1.782	2.179	2.681	2.836	3.055	3.428
13	1.350	1.771	2.160	2.650	2.801	3.012	3.372
14	1.345	1.761	2.145	2.624	2.771	2.977	3.326
15	1.341	1.753	2.131	2.602	2.746	2.947	3.286
16	1.337	1.746	2.120	2.583	2.724	2.921	3.252
17	1.333	1.740	2.110	2.567	2.706	2.898	3.222
18	1.330	1.734	2.101	2.552	2.689	2.878	3.197
19	1.328	1.729	2.093	2.539	2.674	2.861	3.174
20	1.325	1.725	2.086	2.528	2.661	2.845	3.153
21	1.323	1.721	2.080	2.518	2.649	2.831	3.135
22	1.321	1.717	2.074	2.508	2.639	2.819	3.119
23	1.319	1.714	2.069	2.500	2.629	2.807	3.104
24	1.318	1.711	2.064	2.492	2.620	2.797	3.091
25	1.316	1.708	2.060	2.485	2.612	2.787	3.078
26	1.315	1.706	2.056	2.479	2.605	2.779	3.067
27	1.314	1.703	2.052	2.473	2.598	2.771	3.057
28	1.313	1.701	2.048	2.467	2.592	2.763	3.047
29	1.311	1.699	2.045	2.462	2.586	2.756	3.038
30	1.310	1.697	2.042	2.457	2.581	2.750	3.030
40	1.303	1.684	2.021	2.423	2.542	2.704	2.971
60	1.296	1.671	2.000	2.390	2.504	2.660	2.915
120	1.289	1.658	1.980	2.358	2.468	2.617	2.860
∞	1.282	1.645	1.960	2.326	2.432	2.576	2.807

（背面仍有題目，請繼續作答）

Entry is $F(A;\ \nu_1,\ \nu_2)$ where $P\{F(\nu_1,\ \nu_2) \le F(A;\ \nu_1,\ \nu_2)\} = A$



$F(A;\ \nu_1,\ \nu_2)$ A=0.95

ν_2 \ ν_1	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	248·0	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	2·13	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	1·50	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