

系所組別 資源工程學系丙組

考試科目 統計學

考試日期 0307 節次 3

※ 考生請注意：本試題 可 不可 使用計算機

請勿在本試題紙上作答，否則不予計分

選擇題（選出正確答案，單選題，每題四分）

- 1 Stratified random sampling is a method of selecting a sample in which
  - a. the sample is first divided into strata, and then random samples are taken from each stratum
  - b. various strata are selected from the sample
  - c. the population is first divided into strata, and then random samples are drawn from each stratum
  - d. None of these alternatives is correct.
- 2 A variable that takes on the values of 0 or 1 and is used to incorporate the effect of qualitative variables in a regression model is called
  - a. an interaction
  - b. a constant variable
  - c. a dummy variable
  - d. None of these alternatives is correct.
- 3 A random sample of 121 bottles of cologne showed an average content of 4 ounces. It is known that the standard deviation of the contents (i.e., of the population) is 0.22 ounces. In this problem the 0.22 is
  - a. a parameter
  - b. a statistic
  - c. the standard error of the mean
  - d. the average content of colognes in the long run
4. The level of significance is the
  - a. maximum allowable probability of Type II error
  - b. maximum allowable probability of Type I error
  - c. same as the confidence coefficient
  - d. same as the p-value
- 5 For a one-tailed test (upper tail), a sample size of 18 at 95% confidence,  $t =$ 
  - a. 2.12
  - b. -2.12
  - c. -1.740
  - d. 1.740

**Exhibit AA**

Salary information for a random sample of male and female employees of a large company is shown below.

	Male	Female
Sample Size	64	36
Sample Mean Salary (in \$1,000)	44	41
Sample Variance	128	72

6. Refer to Exhibit AA. The standard error for the difference between the two means is
  - a. 4
  - b. 7.46
  - c. 4.24
  - d. 2.0

(背面仍有題目,請繼續作答)

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- 7 Refer to Exhibit AA The 95% confidence interval for the difference between the means of the two populations is
- 0 to 6.92
  - 2 to 2
  - 1.96 to 1.96
  - 0.92 to 6.92
- 8 The producer of a certain medicine claims that their bottling equipment is very accurate and that the standard deviation of all their filled bottles is 0.1 ounce or less. A sample of 20 bottles showed a standard deviation of 0.11. The test statistic to test the claim is
- 400
  - 22.99
  - 4.85
  - 20

**Exhibit BB**

The table below gives beverage preferences for random samples of teens and adults.

	Teens	Adults	Total
Coffee	50	200	250
Tea	100	150	250
Soft Drink	200	200	400
Other	<u>50</u>	<u>50</u>	<u>100</u>
	400	600	1,000

We are asked to test for independence between age (i.e., adult and teen) and drink preferences.

- 9 Refer to Exhibit BB. With a .05 level of significance, the critical value for the test is
- 1.645
  - 7.815
  - 14.067
  - 15.507
- 10 Refer to Exhibit BB The expected number of adults who prefer coffee is
- 0.25
  - 0.33
  - 150
  - 200

**Exhibit CC**

SSTR = 6,750

$H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4$

SSE = 8,000

$H_a$ : at least one mean is different

$n_T = 20$

- 11 Refer to Exhibit CC The test statistic to test the null hypothesis equals
- 0.22

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- b. 0.84  
c. 4.22  
d. 4.5
- 12 Refer to Exhibit CC The null hypothesis is to be tested at the 5% level of significance. The critical value from the table is  
a. 2.87  
b. 3.24  
c. 4.08  
d. 8.7
- 13 In regression analysis, if the dependent variable is measured in dollars, the independent variable  
a. must also be in dollars  
b. must be in some unit of currency  
c. can be any units  
d. can not be in dollars

**Exhibit DD**

You are given the following information about y and x.

y Dependent Variable	x Independent Variable
5	15
7	12
9	10
11	7

- 14 Refer to Exhibit DD The least squares estimate of  $b_0$  equals  
a. -0.7647  
b. -1.3  
c. 164.1176  
d. 16.41176
- 15 Refer to Exhibit DD The coefficient of determination equals  
a. -0.99705  
b. -0.9941  
c. 0.9941  
d. 0.99705
- 16 If the coefficient of correlation is a positive value, then  
a. the intercept must also be positive  
b. the coefficient of determination can be either negative or positive, depending on the value of the slope  
c. the regression equation could have either a positive or a negative slope  
d. the slope of the line must be positive
- 17 In multiple regression analysis, the general linear model  
a. can not be used to accommodate curvilinear relationships between dependent variables and independent variables  
b. can be used to accommodate curvilinear relationships between the independent variables and

(背面仍有題目,請繼續作答)

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dependent variable

- c. must contain more than 2 independent variables  
d. None of these alternatives is correct.

- 18 In an analysis of variance problem involving 3 treatments and 10 observations per treatment,  $SSE = 399.6$  The MSE for this situation is
- a. 133.2  
b. 13.32  
c. 14.8  
d. 30.0
- 19 When an analysis of variance is performed on samples drawn from K populations, the mean square between treatments (MSTR) is
- a.  $SSTR/n_T$   
b.  $SSTR/(n_T - 1)$   
c.  $SSTR/K$   
d.  $SSTR/(K - 1)$   
e. None of these alternatives is correct.

#### Exhibit EE

$$f(x) = (1/10) e^{-x/10} \quad x \geq 0$$

- 20 Refer to Exhibit EE The mean of x is
- a. 0.10  
b. 10  
c. 100  
d. 1,000
- 21 Refer to Exhibit EE. The probability that x is between 3 and 6 is
- a. 0.4512  
b. 0.1920  
c. 0.2592  
d. 0.6065
22. In a regression model involving more than one independent variable, which of the following tests must be used in order to determine if the relationship between the dependent variable and the set of independent variables is significant?
- a. t test  
b. F test  
c. Either a t test or a chi-square test can be used.  
d. chi-square test
- 23 In simple linear regression analysis, which of the following is not true?
- a. The F test and the t test yield the same results.  
b. The F test and the t test may or may not yield the same results.  
c. The relationship between X and Y is represented by means of a straight line  
d. The value of  $F = t^2$

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**Exhibit FF**

You want to test whether or not the following sample of 30 observations follows a normal distribution. The mean of the sample equals 11.83, and the standard deviation equals 4.53. The number of intervals or categories used to test the hypothesis for this problem is 6.

2	3	5	5	7	8	8	9	9	10
11	11	12	12	12	12	13	13	13	14
15	15	15	16	16	17	17	18	18	19

- 24 Refer to Exhibit FF. The calculated value for the test statistic equals
- 0
  - 1.67
  - 2
  - 6
- 25 Refer to Exhibit FF. The hypothesis is to be tested at the 5% level of significance. The critical value from the table equals
- 1.645
  - 1.96
  - 7.815
  - 12.592

(背面仍有題目,請繼續作答)

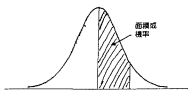
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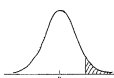
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表 標準常態機率分配之面積或機率



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2518	0.2549
0.7	0.2580	0.2612	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3211	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4986	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990

表 右尾面積的 z 分配表 - 例題 若自由度為 10 則  $t_{0.025, 10} = 2.228$



自由度	0.10	0.05	0.025	0.01	0.005
1	2.078	2.314	2.706	3.183	4.047
2	1.886	2.202	2.447	2.924	3.500
3	1.638	2.015	2.306	2.747	3.183
4	1.533	2.012	2.278	2.747	3.183
5	1.476	2.015	2.271	2.747	3.183
6	1.440	1.943	2.247	2.747	3.183
7	1.415	1.889	2.247	2.747	3.183
8	1.397	1.860	2.247	2.747	3.183
9	1.383	1.833	2.247	2.747	3.183
10	1.372	1.812	2.247	2.747	3.183
11	1.363	1.796	2.247	2.747	3.183
12	1.356	1.782	2.247	2.747	3.183
13	1.350	1.771	2.247	2.747	3.183
14	1.345	1.761	2.247	2.747	3.183
15	1.341	1.753	2.247	2.747	3.183
16	1.337	1.746	2.247	2.747	3.183
17	1.333	1.740	2.247	2.747	3.183
18	1.330	1.734	2.247	2.747	3.183
19	1.328	1.729	2.247	2.747	3.183
20	1.325	1.725	2.247	2.747	3.183
21	1.323	1.721	2.247	2.747	3.183
22	1.321	1.717	2.247	2.747	3.183
23	1.319	1.714	2.247	2.747	3.183
24	1.318	1.711	2.247	2.747	3.183
25	1.316	1.708	2.247	2.747	3.183
26	1.315	1.706	2.247	2.747	3.183
27	1.314	1.703	2.247	2.747	3.183
28	1.313	1.701	2.247	2.747	3.183
29	1.311	1.699	2.247	2.747	3.183
30	1.310	1.697	2.247	2.747	3.183
40	1.303	1.684	2.247	2.747	3.183
60	1.296	1.671	2.247	2.747	3.183
120	1.289	1.658	2.247	2.747	3.183
∞	1.282	1.645	1.960	2.326	2.576

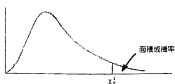
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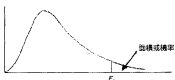
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卡方分配表

表中的數值是  $\chi_{\alpha}^2$ ，其中  $\alpha$  代表卡方分配右尾的面積或機率。例如：若自由度為 10 且右尾面積為 0.01，則  $\chi_{0.01}^2 = 23.2093$ 

自由度	右尾面積									
	0.995	0.99	0.975	0.95	0.90	0.10	0.05	0.025	0.01	0.005
1	392.704 × 10 <sup>-10</sup>	157.088 × 10 <sup>-10</sup>	982.069 × 10 <sup>-10</sup>	393.214 × 10 <sup>-10</sup>	0.0157908	2.70554	3.84146	5.02389	6.63490	7.87947
2	0.0100251	0.0201007	0.0506356	0.102587	0.210720	4.60517	5.99147	7.37776	9.21034	10.5966
3	0.0717212	0.114832	0.215795	0.351746	0.584375	6.25139	7.81473	9.34840	11.3449	12.8381
4	0.206990	0.297110	0.484419	0.710721	1.063623	7.77944	9.48773	11.1433	13.2767	14.8602
5	0.411740	0.554300	0.831211	1.145476	1.61031	9.23635	11.0705	12.8325	15.0863	16.7496
6	0.675727	0.872085	1.237347	1.63539	2.20413	10.6446	12.5916	14.4494	16.8119	18.5476
7	0.989265	1.239043	1.68987	2.16735	2.83311	12.0170	14.0671	16.0128	18.4753	20.2777
8	1.344419	1.664482	2.17973	2.73264	3.48954	13.3616	15.5073	17.5346	20.0902	21.9550
9	1.734926	2.087912	2.70039	3.32511	4.16816	14.6837	16.9190	19.0228	21.6660	23.5893
10	2.15585	2.55821	3.24697	3.94030	4.86518	15.9871	18.3070	20.4831	23.2093	25.1882
11	2.60321	3.05347	3.81575	4.57481	5.57779	17.2750	19.6751	21.9200	24.7250	26.7569
12	3.07382	3.57056	4.40379	5.22603	6.30380	18.5494	21.0261	23.3367	26.2170	28.2995
13	3.56503	4.10691	5.00874	5.89186	7.04150	19.8119	22.3621	24.7356	27.6883	29.8194
14	4.07468	4.66043	5.62872	6.57063	7.78953	21.0642	23.6848	26.1190	29.1433	31.3193
15	4.60094	5.22935	6.26214	7.26094	8.54675	22.3072	24.9958	27.4884	30.5779	32.8013
16	5.14224	5.81221	6.90766	7.96164	9.31223	23.5418	26.2962	28.8454	31.9999	34.2672
17	5.69724	6.40776	7.56418	8.67176	10.0852	24.7690	27.5871	30.1910	33.4087	35.7185
18	6.26481	7.01491	8.23075	9.39046	10.8649	25.9894	28.8693	31.5264	34.8053	37.1564
19	6.84398	7.63273	8.90553	10.1170	11.6509	27.2036	30.1435	32.8523	36.1908	38.5822

表 4 F 分配

表中的數值是  $F_{\alpha}$  值，其中  $\alpha$  代表  $F$  分配右尾之面積或機率。例如：若分子自由度為 12，分母自由度為 15 且右尾面積為 0.05，則  $F_{0.05} = 2.48$ 

分母自由度	$F_{\alpha}$ 值之表																		
	分子自由度																		
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