

國立成功大學
110學年度碩士班招生考試試題

編 號：194

系 所：製造資訊與系統研究所

科 目：統計方法

日 期：0202

節 次：第 1 節

備 註：可使用計算機

※ 考生請注意：本試題可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

一、單選題：(48%)：每題 4 分，答錯倒扣 1 分

1. In order to test for the significance of a regression model involving 3 independent variables and 47 observations, the numerator and denominator degrees of freedom (respectively) for the critical value of F are
 - a. 2 and 43
 - b. 3 and 43
 - c. 47 and 3
 - d. 3 and 47
2. In regression analysis, an outlier is an observation whose
 - a. residual is much larger than the rest of the residual values
 - b. residual is zero
 - c. mean is zero
 - d. mean is larger than the standard deviation
3. In a multiple regression analysis involving 12 independent variables and 166 observations, $SSR = 878$ and $SSE = 122$. The coefficient of determination is
 - a. 0.1389
 - b. 0.1220
 - c. 0.878
 - d. 0.7317
4. In ANOVA, which of the following is not affected by whether or not the population means are equal?
 - a. \bar{x}
 - b. between-samples estimate of σ^2
 - c. within-samples estimate of σ^2
 - d. None of these alternatives is correct.
5. An ANOVA procedure is used for data obtained from five populations. five samples, each comprised of 20 observations, were taken from the five populations. The numerator and denominator (respectively) degrees of freedom for the critical value of F are
 - a. 5 and 20
 - b. 4 and 20
 - c. 4 and 99
 - d. 4 and 95
6. To avoid the problem of not having access to Tables of F distribution with values given for the lower tail, the numerator of the test statistic should be the one with
 - a. the larger sample size
 - b. the smaller sample size
 - c. the larger sample variance
 - d. the smaller sample variance
7. The random variable for a chi-square distribution may assume
 - a. any value between -1 to 1
 - b. any value between - infinity to +infinity
 - c. any negative value
 - d. any value greater than zero

8. The bottler of a certain soft drink claims their equipment to be accurate and that the variance of all filled bottles is 0.05 or less. The null hypothesis in a test to confirm the claim would be written as
 - a. $H_0: \sigma^2 \geq 0.05$
 - b. $H_0: \sigma^2 \leq 0.05$
 - c. $H_0: \sigma^2 < 0.05$
 - d. $H_0: \sigma^2 > 0.05$
9. If a hypothesis is not rejected at the 5% level of significance, it
 - a. will also not be rejected at the 1% level
 - b. will always be rejected at the 1% level
 - c. will sometimes be rejected at the 1% level
 - d. None of these alternatives is correct.
10. From a population that is not normally distributed and whose standard deviation is not known, a sample of 6 items is selected to develop an interval estimate for the mean of the population (μ).
 - a. The normal distribution can be used.
 - b. The t distribution with 5 degrees of freedom must be used.
 - c. The t distribution with 6 degrees of freedom must be used.
 - d. The sample size must be increased.
11. Sampling distribution of \bar{x} is the
 - a. probability distribution of the sample mean
 - b. probability distribution of the sample proportion
 - c. mean of the sample
 - d. mean of the population
12. The probability distribution of all possible values of the sample proportion \bar{p} is the
 - a. probability density function of \bar{p}
 - b. sampling distribution of \bar{x}
 - c. same as \bar{p} , since it considers all possible values of the sample proportion
 - d. sampling distribution of \bar{p}

二、計算題 (52%，需列出計算式)

1. (12%) Referring to the following data set, answer the following questions.

$$SSTR = 6,750$$

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

$$SSE = 8,000$$

$$H_a: \text{at least one mean is different}$$

$$n_T = 20$$

- (a) What is the mean square between treatments (MSTR)?
 - (b) What is the mean square within treatments (MSE)?
 - (c) What is the test statistic to test the null hypothesis?
2. (12%) We are interested in determining whether or not the variances of the sales at two music stores (A and B) are equal. A sample of 26 days of sales at store A has a sample standard deviation of 30 while a sample of 16 days of sales from store B has a sample standard deviation of 20.
- (a) What is the test statistic?
 - (b) What is the p -value for this test?
 - (c) At 95% confidence the null hypothesis, what is the conclusion for the null hypothesis?

3. (16%) Referring to the following data set, answer the following questions.

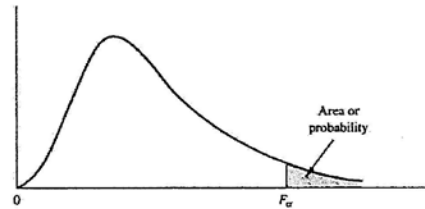
Individual	Method-1	Method-2
1.	7.	5.
2.	5.	9.
3.	6.	8.
4.	7.	7.
5.	5.	6.

- (a) What is the point estimate for the difference between the means of the two populations (Method 1 - Method 2)?
- (b) What is 95% confidence interval for the difference between the two population means?
- (c) The null hypothesis tested is $H_0: \mu_d = 0$. What is the test statistic for the difference between the two population means?
- (d) If the null hypothesis is tested at the 5% level, what is the conclusion for the null hypothesis?
4. (12%) Referring to the following data set, answer the following questions.

y (Dependent variable)	x (independent variable)
12	4
3	6
7	2
6	4

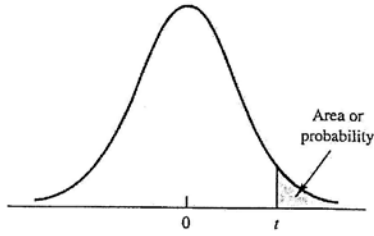
- (a) What is the least squares estimate of b_1 ?
- (b) What is the least squares estimate of b_0 ?
- (c) What is the coefficient of determination?

F DISTRIBUTION



Denominator Degree of Freedom	Area in Upper Tail	Numerator Degree of Freedom																	
		1	2	3	4	5	6	7	8	9	10	15	20	25	30	40	60	100	1000
6	.10	3.78	3.46	3.29	3.18	3.11	3.05	3.01	2.98	2.96	2.94	2.87	2.84	2.81	2.80	2.78	2.76	2.75	2.72
	.05	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	3.94	3.87	3.83	3.81	3.77	3.74	3.71	3.67
	.025	8.81	7.25	6.60	6.23	5.99	5.82	5.70	5.60	5.52	5.46	5.27	5.17	5.11	5.07	5.01	4.96	4.92	4.86
7	.10	13.75	10.92	9.78	9.15	8.75	8.47	8.26	8.10	7.98	7.87	7.56	7.40	7.30	7.23	7.14	7.06	6.99	6.89
	.05	3.59	3.35	3.07	2.96	2.88	2.83	2.78	2.75	2.72	2.70	2.63	2.59	2.57	2.56	2.54	2.51	2.50	2.47
	.025	5.59	4.74	4.25	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.51	3.44	3.40	3.38	3.34	3.30	3.27	3.23
8	.10	12.25	9.55	8.45	7.85	7.46	7.19	6.99	6.84	6.72	6.62	6.31	6.16	6.06	5.99	5.91	5.82	5.75	5.66
	.05	3.46	3.11	2.92	2.81	2.73	2.67	2.62	2.59	2.56	2.54	2.46	2.42	2.40	2.38	2.36	2.34	2.32	2.30
	.025	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.22	3.15	3.11	3.08	3.04	3.01	2.97	2.93
9	.10	11.26	8.65	7.59	7.01	6.63	6.37	6.18	6.03	5.91	5.81	5.52	5.36	5.26	5.20	5.12	5.03	4.96	4.87
	.05	3.36	3.01	2.81	2.69	2.61	2.55	2.51	2.47	2.44	2.42	2.34	2.30	2.27	2.25	2.23	2.21	2.19	2.16
	.025	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.01	2.94	2.89	2.86	2.83	2.79	2.76	2.71
10	.10	10.56	8.02	6.99	6.42	6.06	5.80	5.61	5.47	5.35	5.26	4.96	4.81	4.71	4.65	4.57	4.48	4.41	4.32
	.05	3.29	2.92	2.73	2.61	2.52	2.46	2.41	2.38	2.35	2.32	2.24	2.20	2.17	2.16	2.13	2.11	2.09	2.06
	.025	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.85	2.77	2.73	2.70	2.66	2.62	2.59	2.54
11	.10	9.65	7.56	6.55	5.99	5.64	5.39	5.20	5.06	4.94	4.85	4.56	4.41	4.31	4.25	4.17	4.08	4.01	3.92
	.05	3.23	2.86	2.66	2.54	2.45	2.39	2.34	2.30	2.27	2.25	2.17	2.12	2.10	2.08	2.05	2.03	2.01	1.98
	.025	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.72	2.65	2.60	2.57	2.53	2.49	2.46	2.41
12	.10	9.01	7.21	6.22	5.67	5.32	5.07	4.89	4.74	4.63	4.54	4.25	4.10	4.01	3.94	3.86	3.78	3.71	3.61
	.05	3.18	2.81	2.61	2.48	2.39	2.33	2.28	2.24	2.21	2.19	2.10	2.06	2.03	2.01	1.99	1.96	1.94	1.91
	.025	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.62	2.54	2.50	2.47	2.43	2.38	2.35	2.30
13	.10	8.45	6.93	5.95	5.41	5.06	4.82	4.64	4.50	4.39	4.30	4.01	3.86	3.76	3.70	3.62	3.54	3.47	3.37
	.05	3.14	2.76	2.56	2.43	2.35	2.28	2.23	2.20	2.16	2.14	2.05	2.01	1.98	1.96	1.93	1.90	1.88	1.85
	.025	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.53	2.46	2.41	2.38	2.34	2.30	2.26	2.21
14	.10	8.00	6.70	5.74	5.21	4.86	4.62	4.44	4.30	4.19	4.10	3.82	3.66	3.57	3.51	3.43	3.34	3.27	3.18
	.05	3.10	2.73	2.52	2.39	2.31	2.24	2.19	2.15	2.12	2.10	2.01	1.96	1.93	1.91	1.89	1.86	1.83	1.80
	.025	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.46	2.39	2.34	2.31	2.27	2.22	2.19	2.14
15	.10	7.68	6.51	5.56	5.04	4.69	4.46	4.28	4.14	4.03	3.94	3.66	3.51	3.41	3.35	3.27	3.18	3.11	3.02
	.05	3.07	2.70	2.49	2.36	2.27	2.21	2.16	2.12	2.09	2.06	1.97	1.92	1.89	1.87	1.85	1.82	1.79	1.76
	.025	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.40	2.33	2.28	2.25	2.20	2.16	2.12	2.07
.01	8.68	6.56	5.42	4.89	4.56	4.32	4.14	4.00	3.89	3.80	3.52	3.37	3.28	3.21	3.13	3.05	2.98	2.88	

TABLE 2 *t* DISTRIBUTION



Entries in the table give *t* values for an area or probability in the upper tail of the *t* distribution. For example, with 10 degrees of freedom and a .05 area in the upper tail, $t_{.05} = 1.812$.

Degrees of Freedom	Area in Upper Tail					
	.20	.10	.05	.025	.01	.005
1	1.376	3.078	6.314	12.706	31.821	63.656
2	1.061	1.886	2.920	4.303	6.965	9.925
3	.978	1.638	2.353	3.182	4.541	5.841
4	.941	1.533	2.132	2.776	3.747	4.604
5	.920	1.476	2.015	2.571	3.365	4.032
6	.906	1.440	1.943	2.447	3.143	3.707
7	.896	1.415	1.895	2.365	2.998	3.499
8	.889	1.397	1.860	2.306	2.896	3.355
9	.883	1.383	1.833	2.262	2.821	3.250
10	.879	1.372	1.812	2.228	2.764	3.169
11	.876	1.363	1.796	2.201	2.718	3.106
12	.873	1.356	1.782	2.179	2.681	3.055
13	.870	1.350	1.771	2.160	2.650	3.012
14	.868	1.345	1.761	2.145	2.624	2.977
15	.866	1.341	1.753	2.131	2.602	2.947
16	.865	1.337	1.746	2.120	2.583	2.921
17	.863	1.333	1.740	2.110	2.567	2.898
18	.862	1.330	1.734	2.101	2.552	2.878
19	.861	1.328	1.729	2.093	2.539	2.861
20	.860	1.325	1.725	2.086	2.528	2.845
21	.859	1.323	1.721	2.080	2.518	2.831
22	.858	1.321	1.717	2.074	2.508	2.819
23	.858	1.319	1.714	2.069	2.500	2.807
24	.857	1.318	1.711	2.064	2.492	2.797
25	.856	1.316	1.708	2.060	2.485	2.787
26	.856	1.315	1.706	2.056	2.479	2.779
27	.855	1.314	1.703	2.052	2.473	2.771
28	.855	1.313	1.701	2.048	2.467	2.763
29	.854	1.311	1.699	2.045	2.462	2.756
30	.854	1.310	1.697	2.042	2.457	2.750
31	.853	1.309	1.696	2.040	2.453	2.744
32	.853	1.309	1.694	2.037	2.449	2.738
33	.853	1.308	1.692	2.035	2.445	2.733
34	.852	1.307	1.691	2.032	2.441	2.728