淡江大學 101 學年度轉學生招生考試試題

系別：統計學系三年級　　　　科目：統 計 學

考試日期：7 月 17 日(星期二) 第 1 節　　　　本試題共 6 大題， 4 頁

本試題雙面印刷

1. Multiple Choice (20%)

(a) For a continuous random variable X with mean μ, what is the P[X = μ]?
(1) .5　(2) 1　(3) 0　(4) μ

(b) The standard error of the sample mean, $\overline{X}$ is
(1) μ　(2) σ^2　(3) σ^2/n　(4) $\sigma/\sqrt{n}$

(c) Which of the following is a parameter?
(1) μ　(2) S^2　(3) $\overline{X}$　(4) All of the above

(d) As the sample size increases, the width of the confidence interval
(1) increases　(2) decreases　(3) stays the same　(4) none of the above

(e) A 95% confidence interval for the population mean has been found to be (12, 14). Would $H_0: \mu = 15$ be rejected in favor of $H_1: \mu \neq 15$ at $\alpha = .05$?
(1) yes　(2) no　(3) cannot tell　(4) none of the above

2. Suppose the number of parking tickets X issued during a police officer's shift has the probability distribution

x	0	1	2	3	4
$f(x)$	.10	.25	.30	.20	.15

(a) Find the mean and standard deviation of the number of parking tickets issued. (7%)
(b) Calculate $P(\mu - \sigma \le X \le \mu + \sigma)$. (4%)
(c) Let $A = [X \le 2]$ and $B = [X \ge 1]$. Find $P(A \mid B) = P(X \le 2 \mid X \ge 1)$. (4%)
(d) Assume that the numbers of tickets issued on different days are independent. What is the probability that, over the next four days, no parking tickets will be issued on exactly two of the days? (5%)

3. Suppose you wish to compare the means of four populations based on independent random samples, each of which contains six observations. The values of total sum of squares and treatment sum of squares for this experiment are $SS_{Total} = 490$ and $SS_{Treatment} = 330$, respectively.
(a) Complete the ANOVA Table. (8%)
(b) State the null and alternative hypotheses for the ANOVA F test. (3%)
(c) Determine whether there is a difference among the population means at $\alpha = .05$. (3%)
(d) Approximate the p-value for the test. Does it reach the same conclusion as part (c)? (3%)
(e) State the required assumptions for the ANOVA F test. (3%)

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4. A study of iron deficiency among infants compared samples of infants following different feeding regimens. One group contained breast-fed infants, while the children in another group were fed a standard baby formula without any iron supplements. Here are the summary results on blood hemoglobin levels at 12 months of age:

Group	n	$\bar{x}$	s^2
Breast-fed	6	15	2.8
Formula	6	12	3.2

(a) Use the *p*-value approach to test whether the mean hemoglobin level is higher among breast-fed babies. (8%)

(b) Give a 90% confidence interval for the mean difference in hemoglobin level between the two populations of infants. (6%)

(c) State the assumptions that your procedures in (a) and (b) require in order to be valid. (3%)

5. To compare the effectiveness of two drugs in relieving postoperative pain, an experiment was done by randomly assigning 100 surgical patients to drugs A and B under study, and the results were shown as follows:

	Free of Pain	Number of Patients Assigned
Drug A	23	50
Drug B	19	50

Use the χ^2 test and Z test to determine whether drugs A and B have the same effectiveness in controlling postoperative pain. (15%)

6. Consider the problem of testing $H_0: \mu = 15$ versus $H_1: \mu > 15$ with $n = 36$, $\sigma = 3$ and $\alpha = .10$. Calculate the power of this test at the alternative $\mu_1 = 16.5$. (8%)

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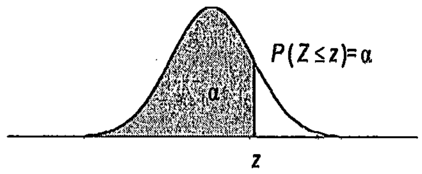
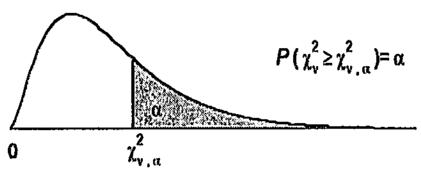


z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990



df	$\chi^2_{.995}$	$\chi^2_{.990}$	$\chi^2_{.975}$	$\chi^2_{.950}$	$\chi^2_{.900}$	$\chi^2_{.100}$	$\chi^2_{.050}$	$\chi^2_{.025}$	$\chi^2_{.010}$	$\chi^2_{.005}$
1	0.0000	0.0002	0.0010	0.0039	0.0158	2.7055	3.8415	5.0239	6.6349	7.8794
2	0.0100	0.0201	0.0506	0.1026	0.2107	4.6052	5.9915	7.3778	9.2103	10.5966
3	0.0717	0.1148	0.2158	0.3518	0.5844	6.2514	7.8147	9.3484	11.3449	12.8382
4	0.2070	0.2971	0.4844	0.7107	1.0636	7.7794	9.4877	11.1433	13.2767	14.8603
5	0.4117	0.5543	0.8312	1.1455	1.6103	9.2364	11.0705	12.8325	15.0863	16.7496

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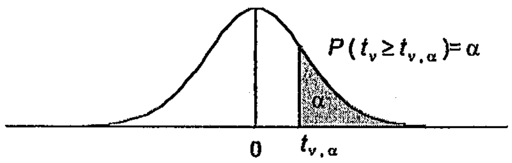
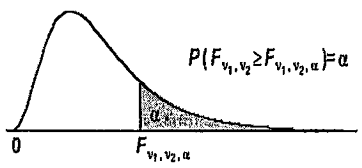


df	$t_{.100}$	$t_{.050}$	$t_{.025}$	$t_{.010}$	$t_{.005}$
1	3.078	6.314	12.706	31.821	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	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



df_2	α	df_1									
		1	2	3	4	5	6	7	8	9	10
18	0.100	3.01	2.62	2.42	2.29	2.20	2.13	2.08	2.04	2.00	1.98
	0.050	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41
	0.025	5.98	4.56	3.95	3.61	3.38	3.22	3.10	3.01	2.93	2.87
	0.010	8.29	6.01	5.09	4.58	4.25	4.01	3.84	3.71	3.60	3.51
	0.005	10.22	7.21	6.03	5.37	4.96	4.66	4.44	4.28	4.14	4.03
19	0.100	2.99	2.61	2.40	2.27	2.18	2.11	2.06	2.02	1.98	1.96
	0.050	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38
	0.025	5.92	4.51	3.90	3.56	3.33	3.17	3.05	2.96	2.88	2.82
	0.010	8.18	5.93	5.01	4.50	4.17	3.94	3.77	3.63	3.52	3.43
	0.005	10.07	7.09	5.92	5.27	4.85	4.56	4.34	4.18	4.04	3.93
20	0.100	2.97	2.59	2.38	2.25	2.16	2.09	2.04	2.00	1.96	1.94
	0.050	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35
	0.025	5.87	4.46	3.86	3.51	3.29	3.13	3.01	2.91	2.84	2.77
	0.010	8.10	5.85	4.94	4.43	4.10	3.87	3.70	3.56	3.46	3.37
	0.005	9.94	6.99	5.82	5.17	4.76	4.47	4.26	4.09	3.96	3.85
21	0.100	2.96	2.57	2.36	2.23	2.14	2.08	2.02	1.98	1.95	1.92
	0.050	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32
	0.025	5.83	4.42	3.82	3.48	3.25	3.09	2.97	2.87	2.80	2.73
	0.010	8.02	5.78	4.87	4.37	4.04	3.81	3.64	3.51	3.40	3.31
	0.005	9.83	6.89	5.73	5.09	4.68	4.39	4.18	4.01	3.88	3.77
22	0.100	2.95	2.56	2.35	2.22	2.13	2.06	2.01	1.97	1.93	1.90
	0.050	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30
	0.025	5.79	4.38	3.78	3.44	3.22	3.05	2.93	2.84	2.76	2.70
	0.010	7.95	5.72	4.82	4.31	3.99	3.76	3.59	3.45	3.35	3.26
	0.005	9.73	6.81	5.65	5.02	4.61	4.32	4.11	3.94	3.81	3.70