國立臺北大學107學年度日間學士班暨進修學士班轉學生招生考試試題

系（所）組別：統計學系日間學士班2、3年級

科　　目：統計學

☑可 ☐不可使用計算機

I. 選擇題(單選) 50%

(1) Which of the following would be an appropriate alternative hypothesis?

a. The mean of a population is equal to 70.
b. The mean of a sample is equal to 70.
c. The mean of a population is greater than 70.
d. The mean of a sample is greater than 70.

(2) Two independent simple random samples are taken to test the difference between the means of two populations whose variances are not known, but are assumed to be equal. The sample sizes are $n_1 = 32$ and $n_2 = 40$. The correct distribution to use is the

a. t distribution with 73 degrees of freedom.
b. t distribution with 72 degrees of freedom.
c. t distribution with 71 degrees of freedom.
d. t distribution with 70 degrees of freedom.

(3) Based on the sample evidence below, we want to test the hypothesis that population A has a larger variance than population B.

	Sample A	Sample B
n	11	10
s^2	12.1	5

The test statistic for this problem equals

a. 1.4.
b. 1.1.
c. 2.42.
d. 2.

(4) Two events, A and B, are mutually exclusive and each have a nonzero probability. If event A is known to occur, the probability of the occurrence of event B is

a. one
b. any positive value
c. zero
d. any value between 0 to 1

(5) If the mean of a normal distribution is negative,

a. the standard deviation must also be negative
b. the variance must also be negative
c. a mistake has been made in the computations, because the mean of a normal distribution cannot be negative
d. None of these alternatives is correct.

(6) The random variable x is the number of occurrences of an event over an interval of ten minutes. It can be assumed that the probability of an occurrence is the same in any two time periods of an equal length. It is known that the mean number of occurrences in ten minutes is 5.3. The random variable x satisfies which of the following probability distributions?

a. normal
b. Poisson
c. binomial
d. Not enough information is given to answer this question.

(7) As the sample size becomes larger, the sampling distribution of the sample mean approaches a
a. binomial distribution
b. Poisson distribution
c. normal distribution
d. chi-square distribution

(8) The owner of a local nightclub has recently surveyed a random sample of n = 300 customers of the club. She would now like to determine whether or not the mean age of her customers is over 35. If so, she plans to alter the entertainment to appeal to an older crowd. If not, no entertainment changes will be made. The appropriate hypotheses to test are:
a. H_0: $\mu \geq 35$ vs. H_a: $\mu < 35$.
b. H_0: $\mu \leq 35$ vs. H_a: $\mu > 35$.
c. H_0: $\bar{X} \geq 35$ vs. H_a: $\bar{X} < 35$.
d. H_0: $\bar{X} \leq 35$ vs. H_a: $\bar{X} > 35$.

(9) When the following hypotheses are being tested at a level of significance of α
H_0: $\mu \geq 500$
H_a: $\mu < 500$
the null hypothesis will be rejected, if the p-value is
a. $\leq \alpha$.
b. $> \alpha$.
c. $= \alpha/2$.
d. $\leq 1 - \alpha/2$.

(10) An estimator that has small variance (but may be biased) is called precise. An estimator that has small MSE (Mean squared error) is called accurate. To illustrate: A standard 100-gm mass was weighted many, many times, on scale A. Similarly, on scale B, and finally on scale C. The distribution of measurements is summarized below

Scale A: μ=100.08, σ=0.01

Scale B: μ= 99.98, σ=0.02

Scale C: μ=100.00, σ=0.05

Which scale is most precise? Which scale is most accurate?
a. B is most precise, A is most accurate
b. A is most precise, B is most accurate
c. A is most precise and is also most accurate
d. B is most precise and is also most accurate
e. Since the population mean is not given, there is no answer to this question.

II. 50%

(10%) (1) On the average, 6 cars arrive at the drive-up window of a bank every hour. Define the random variable X to be the number of cars arriving in any hour.
a. Define the random variable Y to be the time between arrivals of customers at the drive-up window of a bank. Write the probability density function for Y.
b. Find the mean and variance of Y.

(10%) (2) The data shown below were taken from a 3 × 2 factorial experiment to examine the effects of factor A (keyboard configuration, 3 levels) and factor B (word processing package, 2 levels) on typing speed. Each cell consists of the times needed for each of 4 randomly assigned keyboardists to type a standard document under each set of conditions (in minutes).

	Factor B	
Factor A	1	2
1	26 19 20 21	24 21 20 23
2	30 24 25 29	33 27 31 29
3	26 22 27 17	31 23 24 26

Given SSA=184.33, SSB=28.17, SSAB=8.33, SST=405.83

a. Create the ANOVA table.
b. Test at the 5% significance level to determine if time differences exist among the different keyboard configurations.

(10%) (3) Assume you have noted the following prices for books and the number of pages that each book contains.

Book	**Pages (x)**	**Price (y)**
A	500	$7.00
B	700	7.50
C	750	9.00
D	590	6.50
E	540	7.50
F	650	7.00
G	480	4.50
Sample mean	601.43	7.00
Sample standard deviation	102.54	1.35
Sample variance	10514.29	1.83
Sample covariance (x, y)	104.17	

a. Develop a least-squares estimated regression line.
b. Develop a 90% confidence interval for estimating the average price of books that contain 800 pages.

(20%)(4) The following results were obtained from a multiple regression analysis of supermarket profitability. The dependent variable, y, is the profit (in thousands of dollars) and the independent variables, x_1 and x_2, are the food sales and nonfood sales (also in thousands of dollars).

ANOVA Table

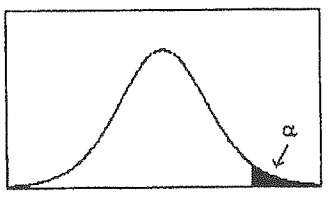
	df	***SS***
Regression	-	562
Residual	9	225
Total		

	Coefficients	***Standard Error***
Intercept	-15.06	
x_1	0.10	0.05
x_2	0.25	0.09

a. Write the estimated regression equation for the relationship between the variables.
b. Compute the multiple coefficient of determination and fully interpret its meaning.
c. Carry out a test to determine whether y is significantly related to the independent variables. Use a .05 level of significance.
d. Carry out a test to determine if there is a significant relationship between x_1 and y. Use a .05 level of significance.

表1 t分配表

$P(t_k \geq t_{k,\alpha}) = \alpha$



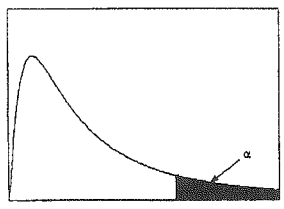
$t_{k,\alpha}$

自由度	單尾顯著水準						
	0.1	0.05	0.025	0.01	0.005	0.0025	0.001
1	3.0777	6.3138	12.7062	31.8205	63.6567	127.3213	318.3088
2	1.8856	2.9200	4.3027	6.9646	9.9248	14.0890	22.3271
3	1.6377	2.3534	3.1824	4.5407	5.8409	7.4533	10.2145
4	1.5332	2.1318	2.7764	3.7469	4.6041	5.5976	7.1732
5	1.4759	2.0150	2.5706	3.3649	4.0321	4.7733	5.8934
6	1.4398	1.9432	2.4469	3.1427	3.7074	4.3168	5.2076
7	1.4149	1.8946	2.3646	2.9980	3.4995	4.0293	4.7853
8	1.3968	1.8595	2.3060	2.8965	3.3554	3.8325	4.5008
9	1.3830	1.8331	2.2622	2.8214	3.2498	3.6897	4.2968
10	1.3722	1.8125	2.2281	2.7638	3.1693	3.5814	4.1437
11	1.3634	1.7959	2.2010	2.7181	3.1058	3.4966	4.0247
12	1.3562	1.7823	2.1788	2.6810	3.0545	3.4284	3.9296
13	1.3502	1.7709	2.1604	2.6503	3.0123	3.3725	3.8520
14	1.3450	1.7613	2.1448	2.6245	2.9768	3.3257	3.7874
15	1.3406	1.7531	2.1314	2.6025	2.9467	3.2860	3.7328
16	1.3368	1.7459	2.1199	2.5835	2.9208	3.2520	3.6862
17	1.3334	1.7396	2.1098	2.5669	2.8982	3.2224	3.6458
18	1.3304	1.7341	2.1009	2.5524	2.8784	3.1966	3.6105
19	1.3277	1.7291	2.0930	2.5395	2.8609	3.1737	3.5794
20	1.3253	1.7247	2.0860	2.5280	2.8453	3.1534	3.5518
21	1.3232	1.7207	2.0796	2.5176	2.8314	3.1352	3.5272
22	1.3212	1.7171	2.0739	2.5083	2.8188	3.1188	3.5050
23	1.3195	1.7139	2.0687	2.4999	2.8073	3.1040	3.4850
24	1.3178	1.7109	2.0639	2.4922	2.7969	3.0905	3.4668
25	1.3163	1.7081	2.0595	2.4851	2.7874	3.0782	3.4502
26	1.3150	1.7056	2.0555	2.4786	2.7787	3.0669	3.4350
27	1.3137	1.7033	2.0518	2.4727	2.7707	3.0565	3.4210
28	1.3125	1.7011	2.0484	2.4671	2.7633	3.0469	3.4082
29	1.3114	1.6991	2.0452	2.4620	2.7564	3.0380	3.3962
30	1.3104	1.6973	2.0423	2.4573	2.7500	3.0298	3.3852
35	1.3062	1.6896	2.0301	2.4377	2.7238	2.9960	3.3400
40	1.3031	1.6839	2.0211	2.4233	2.7045	2.9712	3.3069
45	1.3006	1.6794	2.0141	2.4121	2.6896	2.9521	3.2815
50	1.2987	1.6759	2.0086	2.4033	2.6778	2.9370	3.2614
60	1.2958	1.6706	2.0003	2.3901	2.6603	2.9146	3.2317
70	1.2938	1.6669	1.9944	2.3808	2.6479	2.8987	3.2108
80	1.2922	1.6641	1.9901	2.3739	2.6387	2.8870	3.1953
90	1.2910	1.6620	1.9867	2.3685	2.6316	2.8779	3.1833
100	1.2901	1.6602	1.9840	2.3642	2.6259	2.8707	3.1737
200	1.2858	1.6525	1.9719	2.3451	2.6006	2.8385	3.1315
300	1.2844	1.6499	1.9679	2.3388	2.5923	2.8279	3.1176
400	1.2837	1.6487	1.9659	2.3357	2.5882	2.8227	3.1107
500	1.2832	1.6479	1.9647	2.3338	2.5857	2.8195	3.1066
600	1.2830	1.6474	1.9639	2.3326	2.5840	2.8175	3.1039
700	1.2828	1.6470	1.9634	2.3317	2.5829	2.8160	3.1019
800	1.2826	1.6468	1.9629	2.3310	2.5820	2.8148	3.1005
900	1.2825	1.6465	1.9626	2.3305	2.5813	2.8140	3.0993
1000	1.2824	1.6464	1.9623	2.3301	2.5808	2.8133	3.0984

表2 F分配表(續3)

(ii) $\alpha = 0.05$

$P(F_{m,n} \geq F_{m,n,\alpha}) = \alpha$



$F_{m,n,\alpha}$

分母自由度 n	分子自由度 m								
	1	2	3	4	5	6	7	8	9
1	161.448	199.500	215.707	224.583	230.162	233.986	236.768	238.883	240.543
2	18.5128	19.0000	19.1643	19.2468	19.2964	19.3295	19.3532	19.3710	19.3848
3	10.1280	9.5521	9.2766	9.1172	9.0135	8.9406	8.8867	8.8452	8.8123
4	7.7086	6.9443	6.5914	6.3882	6.2561	6.1631	6.0942	6.0410	5.9988
5	6.6079	5.7861	5.4095	5.1922	5.0503	4.9503	4.8759	4.8183	4.7725
6	5.9874	5.1433	4.7571	4.5337	4.3874	4.2839	4.2067	4.1468	4.0990
7	5.5914	4.7374	4.3468	4.1203	3.9715	3.8660	3.7870	3.7257	3.6767
8	5.3177	4.4590	4.0662	3.8379	3.6875	3.5806	3.5005	3.4381	3.3881
9	5.1174	4.2565	3.8625	3.6331	3.4817	3.3738	3.2927	3.2296	3.1789
10	4.9646	4.1028	3.7083	3.4780	3.3258	3.2172	3.1355	3.0717	3.0204
11	4.8443	3.9823	3.5874	3.3567	3.2039	3.0946	3.0123	2.9480	2.8962
12	4.7472	3.8853	3.4903	3.2592	3.1059	2.9961	2.9134	2.8486	2.7964
13	4.6672	3.8056	3.4105	3.1791	3.0254	2.9153	2.8321	2.7669	2.7144
14	4.6001	3.7389	3.3439	3.1122	2.9582	2.8477	2.7642	2.6987	2.6458
15	4.5431	3.6823	3.2874	3.0556	2.9013	2.7905	2.7066	2.6408	2.5876
16	4.4940	3.6337	3.2389	3.0069	2.8524	2.7413	2.6572	2.5911	2.5377
17	4.4513	3.5915	3.1968	2.9647	2.8100	2.6987	2.6143	2.5480	2.4943
18	4.4139	3.5546	3.1599	2.9277	2.7729	2.6613	2.5767	2.5102	2.4563
19	4.3807	3.5219	3.1274	2.8951	2.7401	2.6283	2.5435	2.4768	2.4227
20	4.3512	3.4928	3.0984	2.8661	2.7109	2.5990	2.5140	2.4471	2.3928
21	4.3248	3.4668	3.0725	2.8401	2.6848	2.5727	2.4876	2.4205	2.3660
22	4.3009	3.4434	3.0491	2.8167	2.6613	2.5491	2.4638	2.3965	2.3419
23	4.2793	3.4221	3.0280	2.7955	2.6400	2.5277	2.4422	2.3748	2.3201
24	4.2597	3.4028	3.0088	2.7763	2.6207	2.5082	2.4226	2.3551	2.3002
25	4.2417	3.3852	2.9912	2.7587	2.6030	2.4904	2.4047	2.3371	2.2821
26	4.2252	3.3690	2.9752	2.7426	2.5868	2.4741	2.3883	2.3205	2.2655
27	4.2100	3.3541	2.9604	2.7278	2.5719	2.4591	2.3732	2.3053	2.2501
28	4.1960	3.3404	2.9467	2.7141	2.5581	2.4453	2.3593	2.2913	2.2360
29	4.1830	3.3277	2.9340	2.7014	2.5454	2.4324	2.3463	2.2783	2.2229
30	4.1709	3.3158	2.9223	2.6896	2.5336	2.4205	2.3343	2.2662	2.2107
35	4.1213	3.2674	2.8742	2.6415	2.4851	2.3718	2.2852	2.2167	2.1608
40	4.0847	3.2317	2.8387	2.6060	2.4495	2.3359	2.2490	2.1802	2.1240
45	4.0566	3.2043	2.8115	2.5787	2.4221	2.3083	2.2212	2.1521	2.0958
50	4.0343	3.1826	2.7900	2.5572	2.4004	2.2864	2.1992	2.1299	2.0734
60	4.0012	3.1504	2.7581	2.5252	2.3683	2.2541	2.1665	2.0970	2.0401
70	3.9778	3.1277	2.7355	2.5027	2.3456	2.2312	2.1435	2.0737	2.0166
80	3.9604	3.1108	2.7188	2.4859	2.3287	2.2142	2.1263	2.0564	1.9991
90	3.9469	3.0977	2.7058	2.4729	2.3157	2.2011	2.1131	2.0430	1.9856
100	3.9361	3.0873	2.6955	2.4626	2.3053	2.1906	2.1025	2.0323	1.9748
120	3.9201	3.0718	2.6802	2.4472	2.2899	2.1750	2.0868	2.0164	1.9588

試題隨卷繳交