

# 國立彰化師範大學 102 學年度碩士班招生考試試題

系所：統計資訊研究所

☆☆請在答案紙上作答☆☆

科目：統計

共 4 頁，第 1 頁

1. Random variable X and Y have the following joint distribution:  $f(x,y)=\begin{cases} x+y & 0 < x, y < 1 \\ 0 & o/w \end{cases}$  (25%)

(a) Find the Correlation of coefficient for X and Y (13%)

(b) Find the conditional expectation of Y given X (12%)

2. 某醫生為驗證新手術 (A) 是否較傳統手術 (B) 更能延長心臟病患者的壽命，挑選 12 位狀況相似的病人，隨機均勻分成兩組，6 人接受 A，6 人接受 B，5 年後發現病人存活狀態如下表：(20%)

	Alive	Dead
A	5	1
B	2	4

檢定：A 手術是否較 B 手術 5 年存活率佳？(算出 p-value，以  $\alpha=0.05$  為顯著水準)

3. 一副撲克牌 (1~10, J 代表 11, Q 代表 12, K 代表 13) 共 52 張牌。隨機洗好牌後，口依序念 1 至 13，每念一數字就掀一張牌；若所念數字和所掀牌的數字相符，定義其為一次「心臟病」。唸完四次，掀完 52 張牌後，共有 X 次心臟病。求 X 的期望值。(15%)

4. 欲比較兩種教學方式的成效，隨機各選擇 50 位學生分組教學。學習結束後施予測驗並依成績分成 A, B, C, D, F 五個等級。以下是兩組學生在五個等級的人數。試檢定兩種教學方式的成效是否有顯著差異？( $\alpha = 0.05$ ). (14%)

	Grade					Totals
	A	B	C	D	F	
Group I	8	13	16	10	3	50
Group II	4	9	14	16	7	50

5. How many factors are there in a  $2^{4-1}$  fractional factorial design? How many levels for each factor? What is the total number of runs? (6%)

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共 4 頁，第 2 頁

6. A research organization wishes to determine whether four brands of batteries for transistor radios perform equally well. Three batteries of each type were randomly selected and installed in the three test radios. The number of hours of use for each battery is given below. (20%)

<u>Radio</u>	<u>Brand</u>			
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
A	25	27	20	28
B	29	38	24	37
C	21	28	16	19

- (a) Use the analysis of variance procedure for **completely randomized designs** to determine whether there is a significant difference in the mean useful life of the four types of batteries. (Ignore the fact that there are different test radios.) Use the .05 level of significance and be sure to construct the ANOVA table. (8%)
- (b) Now consider the three different test radios and carry out the analysis of variance procedure for a **randomized block design**. Include the ANOVA table. (8%)
- (c) Compare the results in Parts (a) and (b). (4%)

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共 4 頁，第 3 頁

## Appendix A

附錄

**Table A.2 The  $t$  Distribution—Values of  $t$  Exceeded with Given Probability**

df	$P = 0.25$	$P = 0.10$	$P = 0.05$	$P = 0.025$	$P = 0.01$	$P = 0.005$	$P = 0.001$	$P = 0.0005$	df
1	1.0000	3.0777	6.3138	12.706	31.821	63.657	318.31	636.62	1
2	0.8165	1.8856	2.9200	4.3027	6.9646	9.9248	22.327	31.599	2
3	0.7649	1.6377	2.3534	3.1824	4.5407	5.8409	10.215	12.924	3
4	0.7407	1.5332	2.1318	2.7764	3.7469	4.6041	7.1732	8.6103	4
5	0.7267	1.4759	2.0150	2.5706	3.3649	4.0321	5.8934	6.8688	5
6	0.7176	1.4398	1.9432	2.4469	3.1427	3.7074	5.2076	5.9588	6
7	0.7111	1.4149	1.8946	2.3646	2.9980	3.4995	4.7853	5.4079	7
8	0.7064	1.3968	1.8595	2.3060	2.8965	3.3554	4.5008	5.0413	8
9	0.7027	1.3830	1.8331	2.2622	2.8214	3.2498	4.2968	4.7809	9
10	0.6998	1.3722	1.8125	2.2281	2.7638	3.1693	4.1437	4.5869	10
11	0.6974	1.3634	1.7959	2.2010	2.7181	3.1058	4.0247	4.4370	11
12	0.6955	1.3562	1.7823	2.1788	2.6810	3.0545	3.9296	4.3178	12
13	0.6938	1.3502	1.7709	2.1604	2.6503	3.0123	3.8520	4.2208	13
14	0.6924	1.3450	1.7613	2.1448	2.6245	2.9768	3.7874	4.1405	14
15	0.6912	1.3406	1.7531	2.1314	2.6025	2.9467	3.7329	4.0728	15
16	0.6901	1.3368	1.7459	2.1199	2.5835	2.9208	3.6862	4.0150	16
17	0.6892	1.3334	1.7396	2.1098	2.5669	2.8982	3.6458	3.9652	17
18	0.6884	1.3304	1.7341	2.1009	2.5524	2.8784	3.6105	3.9217	18
19	0.6876	1.3277	1.7291	2.0930	2.5395	2.8609	3.5794	3.8834	19
20	0.6870	1.3253	1.7247	2.0860	2.5280	2.8453	3.5518	3.8495	20
21	0.6864	1.3232	1.7207	2.0796	2.5176	2.8314	3.5272	3.8193	21
22	0.6858	1.3212	1.7171	2.0739	2.5083	2.8188	3.5050	3.7922	22
23	0.6853	1.3195	1.7139	2.0687	2.4999	2.8073	3.4850	3.7677	23
24	0.6848	1.3178	1.7109	2.0639	2.4922	2.7969	3.4668	3.7454	24
25	0.6844	1.3163	1.7081	2.0595	2.4851	2.7874	3.4502	3.7252	25
26	0.6840	1.3150	1.7056	2.0555	2.4786	2.7787	3.4350	3.7066	26
27	0.6837	1.3137	1.7033	2.0518	2.4727	2.7707	3.4210	3.6896	27
28	0.6834	1.3125	1.7011	2.0484	2.4671	2.7633	3.4082	3.6739	28
29	0.6830	1.3114	1.6991	2.0452	2.4620	2.7564	3.3963	3.6594	29
30	0.6828	1.3104	1.6973	2.0423	2.4573	2.7500	3.3852	3.6460	30
35	0.6816	1.3062	1.6896	2.0301	2.4377	2.7238	3.3401	3.5912	35
40	0.6807	1.3031	1.6839	2.0211	2.4233	2.7045	3.3069	3.5510	40
45	0.6800	1.3006	1.6794	2.0141	2.4121	2.6896	3.2815	3.5203	45
50	0.6794	1.2987	1.6759	2.0086	2.4033	2.6778	3.2614	3.4960	50
55	0.6790	1.2971	1.6730	2.0040	2.3961	2.6682	3.2452	3.4764	55
60	0.6786	1.2958	1.6706	2.0003	2.3901	2.6603	3.2317	3.4602	60
65	0.6783	1.2947	1.6686	1.9971	2.3851	2.6536	3.2204	3.4466	65
70	0.6780	1.2938	1.6669	1.9944	2.3808	2.6479	3.2108	3.4350	70
75	0.6778	1.2929	1.6654	1.9921	2.3771	2.6430	3.2025	3.4250	75
90	0.6772	1.2910	1.6620	1.9867	2.3685	2.6316	3.1833	3.4019	90
105	0.6768	1.2897	1.6595	1.9828	2.3624	2.6235	3.1697	3.3856	105
120	0.6765	1.2886	1.6577	1.9799	2.3578	2.6174	3.1595	3.3735	120
$\infty$	0.6745	1.2816	1.6449	1.9600	2.3263	2.5758	3.0902	3.2905	$\infty$

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共 4 頁，第 4 頁

Appendix A

## Appendix A

**Table A.3  $\chi^2$  Distribution— $\chi^2$  Values Exceeded with Given Probability**

df	0.995	0.99	0.975	0.95	0.90	0.75	0.50	0.25	0.10	0.05	0.025	0.01	0.005
1	0.000	0.000	0.001	0.004	0.016	0.102	0.455	1.323	2.706	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	0.575	1.386	2.773	4.605	5.991	7.378	9.210	10.579
3	0.072	0.115	0.216	0.352	0.584	1.213	2.366	4.108	6.251	7.815	9.348	11.345	12.838
4	0.207	0.297	0.484	0.711	1.064	1.923	3.357	5.385	7.779	9.488	11.143	13.277	14.860
5	0.412	0.554	0.831	1.145	1.610	2.675	4.351	6.626	9.236	11.070	12.833	15.086	16.750
6	0.676	0.872	1.237	1.635	2.204	3.455	5.348	7.841	10.645	12.592	14.449	16.812	18.548
7	0.989	1.239	1.690	2.167	2.833	4.255	6.346	9.037	12.017	14.067	16.013	18.475	20.278
8	1.344	1.646	2.180	2.733	3.490	5.071	7.344	10.219	13.362	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	4.168	5.899	8.343	11.389	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	4.865	6.737	9.342	12.549	15.987	18.307	20.483	23.209	25.188
11	2.603	3.053	3.816	4.575	5.578	7.584	10.341	13.701	17.275	19.675	21.920	24.725	26.757
12	3.074	3.571	4.404	5.226	6.304	8.438	11.340	14.845	18.549	21.026	23.337	26.217	28.300
13	3.565	4.107	5.009	5.892	7.042	9.299	12.340	15.984	19.812	22.362	24.736	27.688	29.819
14	4.075	4.660	5.629	6.571	7.790	10.165	13.339	17.117	21.064	23.685	26.119	29.141	31.319
15	4.601	5.229	6.262	7.261	8.547	11.037	14.339	18.245	22.307	24.996	27.488	30.578	32.801
16	5.142	5.812	6.908	7.962	9.312	11.912	15.338	19.369	23.542	26.296	28.845	32.000	34.267
17	5.697	6.408	7.564	8.672	10.085	12.792	16.338	20.489	24.769	27.587	30.191	33.409	35.718
18	6.265	7.015	8.231	9.390	10.865	13.675	17.338	21.605	25.989	28.869	31.526	34.805	37.156
19	6.844	7.633	8.907	10.117	11.651	14.562	18.338	22.718	27.204	30.144	32.852	36.191	38.582
20	7.434	8.260	9.591	10.851	12.443	15.452	19.337	23.828	28.412	31.410	34.170	37.566	39.997
21	8.034	8.897	10.283	11.591	13.240	16.344	20.337	24.935	29.615	32.671	35.479	38.932	41.401
22	8.643	9.542	10.982	12.338	14.041	17.240	21.337	26.039	30.813	33.924	36.781	40.289	42.796
23	9.260	10.196	11.689	13.091	14.848	18.137	22.337	27.141	32.007	35.172	38.076	41.638	44.181
24	9.886	10.856	12.401	13.848	15.659	19.037	23.337	28.241	33.196	36.415	39.364	42.980	45.559
25	10.520	11.524	13.120	14.611	16.473	19.939	24.337	29.339	34.382	37.652	40.646	44.314	46.928
26	11.160	12.198	13.844	15.379	17.292	20.843	25.336	30.435	35.563	38.885	41.923	45.642	48.290
27	11.808	12.879	14.573	16.151	18.114	21.749	26.336	31.528	36.741	40.113	43.195	46.963	49.645
28	12.461	13.565	15.308	16.928	18.939	22.657	27.336	32.620	37.916	41.337	44.461	48.278	50.993
29	13.121	14.256	16.047	17.708	19.768	23.567	28.336	33.711	39.087	42.557	45.722	49.588	52.336
30	13.787	14.953	16.791	18.493	20.599	24.478	29.336	34.800	40.256	43.773	46.979	50.892	53.672
35	17.192	18.509	20.569	22.465	24.797	29.054	34.336	40.223	46.059	49.802	53.203	57.342	60.275
40	20.707	22.164	24.433	26.509	29.051	33.660	39.335	45.616	51.805	55.758	59.342	63.691	66.766
45	24.311	25.901	28.366	30.612	33.350	38.291	44.335	50.985	57.505	61.656	65.410	69.957	73.166
50	27.991	29.707	32.357	34.764	37.689	42.942	49.335	56.334	63.167	67.505	71.420	76.154	79.490
55	31.735	33.570	36.398	38.958	42.060	47.610	54.335	61.665	68.796	73.311	77.380	82.292	85.749
60	35.534	37.485	40.482	43.188	46.459	52.294	59.335	66.981	74.397	79.082	83.298	88.379	91.952
65	39.383	41.444	44.603	47.450	50.883	56.990	64.335	72.285	79.973	84.821	89.177	94.422	98.105
70	43.275	45.442	48.758	51.739	55.329	61.698	69.334	77.577	85.527	90.531	95.023	100.425	104.215
75	47.206	49.475	52.942	56.054	59.795	66.417	74.334	82.858	91.061	96.217	100.839	106.393	110.286
80	51.172	53.540	57.153	60.391	64.278	71.145	79.334	88.130	96.578	101.879	106.629	112.329	116.321
85	55.170	57.634	61.389	64.749	68.777	75.881	84.334	93.394	102.079	107.522	112.393	118.236	122.325
90	59.196	61.754	65.647	69.126	73.291	80.625	89.334	98.650	107.565	113.145	118.136	124.116	128.299
95	63.250	65.898	69.925	73.520	77.818	85.376	94.334	103.899	113.038	118.752	123.858	129.973	134.247
100	67.328	70.065	74.222	77.929	82.358	90.133	99.334	109.141	118.498	124.342	129.561	135.807	140.169