國立臺灣海洋大學一００學年度研究所碩士班暨碩士在職專班入學考試試題

考試科目： 統計學

系所名稱： 航運管理學系碩士班乙組、航運管理學系碩士班甲組

※可使用計算器

1.答案以橫式由左至右書寫。2.請依題號順序作答。

1. A restaurant has four different choices on its dessert menu-mille-feuille, tiramisu, cake, and ice cream. Based on past experience, the manager feels that each dessert is equally likely to be chosen. If there are 80 consumers in restaurant. What is the approximate probability that: (1) less than 19 will choose cake for a dessert? (5%) (2) If the restaurant has 25 of each type of dessert available, what is the likelihood that a consumer will not be able to get the dessert that she or he desires? (5%)

2. Serious worker injuries at a manufacturing plant average 1.5 per year. Given that safety conditions at the plant remain the same, (1) What is the probability that in two given years the number of serious injuries will be larger than 4? (4%) (2) Let X be the time between injuries. Find P (2<X<4). (4%)

3. Independent random samples of $n_1 = 40$ and $n_2 = 50$ observations were be selected from each of two populations 1 and 2. The sample means and standard deviations are $\bar{x}_1 = 100.5, s_1 = 0.8; \bar{x}_2 = 93.5, s_2 = 1.4$, respectively. (1) Find a point estimate for $\mu_1 - \mu_2$, and find the margin of error with probability 0.95. (4%) (2) Suppose you want to estimate $\mu_1 - \mu_2$ correct to within 0.2 with probability 0.95 and that you plan to use equal sample sizes. How large should n_1 and n_2 be? (4%) (3) State the process of obtaining the new point estimate of $\mu_1 - \mu_2$. (4%)

4. Consider a population consisting of the numbers of associate professors employed in the management departments at large four-year universities. Suppose that the number of department associate professors per university has a mean $\mu = 50$ and standard deviation $\sigma = 8$. (1) Assume that the population distribution is unknown; please make a statement about the percentage of universities that employ between 38 and 62 management associate professors. (4%) (2) Assume that the population is bell-shaped distribution. What fraction of the universities has more than 66 management associate professors? (3%)

5. 在一次六題是非題的測驗中，出題者設定一種決策法則，認為僅答對 1~3 題者是用猜的，答對 4~6 題者，則不是用猜的，試問在從事檢定應試者是否用猜的統計假設時，出題者所設定的此一決策法則，犯型 I 錯誤(Type I error)之機率為何? (5%)

6. 試完整陳述執行適合度檢定(Goodness-of-Fit Test)所使用之檢定統計量。(4%)

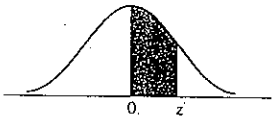
7. 在甲、乙兩貨櫃碼頭各隨機觀察 $n_1=7$ 個小時，$n_2=5$ 個小時，得裝卸量之平均數與標準差為 $\overline{x_1}=29.3\text{TEU}$, $s_1=4\text{TEU}$；$\overline{x_2}=26\text{TEU}$, $s_2=3\text{TEU}$，(1) 請問在求解下列兩小題時是否需要做什麼假設?(3%) (2)試以顯著水準 $\alpha=0.05$，檢定甲、乙貨櫃碼頭每小時裝卸量之變異數是否相等。(7%) (3)試以相同顯著水準，檢定甲貨櫃碼頭每小時平均裝卸量是否高於乙貨櫃碼 1TEU 以上。(10%) (4)若(2)之檢定之結果是成立的，試求共同變異數之 95%信賴區間。(4%)

8. 為比較 A,B,C 三個貨櫃碼頭每小時平均裝卸效率（單位：TEU/小時），今分別在三個貨櫃碼頭觀察 $n_1=2$，$n_2=3$，$n_3=4$ 個單位小時裝卸量，記為 $x_{11},x_{12};x_{21},\ldots,x_{23};x_{31},\ldots,x_{34}$，經計算得，$\sum_{i=1}^{3}\sum_{j=1}^{n_i}x_{ij}^2=4865.53$，$\sum_{j=1}^{2}x_{1j}=51.1$，$\sum_{j=1}^{3}x_{2j}=70.7$，$\sum_{j=1}^{4}x_{3j}=86.8$ (1)試以顯著水準 α=0.05，檢定三個貨櫃碼頭每小時平均裝卸效率是否相等。(10%) (2)試進一步做 A 與 C 個貨櫃碼頭每小時平均裝卸效率的差異性分析。(7%) (3)列出解本題時，所需的所有假設條件？(3%)

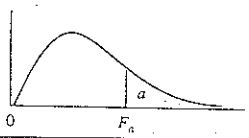
9. 有甲乙兩家民意測驗機構分別針對某項民生法案進行民意調查，甲家隨機抽訪 100 位民眾，乙家隨機訪 150 位民眾，其調查資料如下所示

調查機構	支持	無意見	反對	合計
甲	52	35	13	100
乙	76	64	10	150

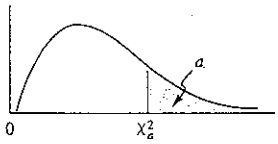
試以顯著水準 α=0.05，檢定甲、乙兩家的調查結果是否一致。(10%)



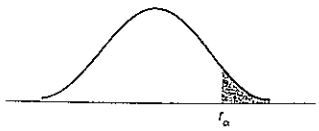
z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817



		ν_1					
ν_2	a	1	2	3	4	5	6
2	.100	8.53	9.00	9.16	9.24	9.29	9.33
	.050	18.51	19.00	19.16	19.25	19.30	19.33
	.025	38.51	39.00	39.17	39.25	39.30	39.33
	.010	98.50	99.00	99.17	99.25	99.30	99.33
	.005	198.5	199.0	199.2	199.2	199.3	199.3
3	.100	5.54	5.46	5.39	5.34	5.31	5.28
	.050	10.13	9.55	9.28	9.12	9.01	8.94
	.025	17.44	16.04	15.44	15.10	14.88	14.73
	.010	34.12	30.82	29.46	28.71	28.24	27.91
	.005	55.55	49.80	47.47	46.19	45.39	44.84
4	.100	4.54	4.32	4.19	4.11	4.05	4.01
	.050	7.71	6.94	6.59	6.39	6.26	6.16
	.025	12.22	10.65	9.98	9.60	9.36	9.20
	.010	21.20	18.00	16.69	15.98	15.52	15.21
	.005	31.33	26.28	24.26	23.15	22.46	21.97
5	.100	4.06	3.78	3.62	3.52	3.45	3.40
	.050	6.61	5.79	5.41	5.19	5.05	4.95
	.025	10.01	8.43	7.76	7.39	7.15	6.98
	.010	16.26	13.27	12.06	11.39	10.97	10.67
	.005	22.78	18.31	16.53	15.56	14.94	14.51
6	.100	3.78	3.46	3.29	3.18	3.11	3.05
	.050	5.99	5.14	4.76	4.53	4.39	4.28
	.025	8.81	7.26	6.60	6.23	5.99	5.82
	.010	13.75	10.92	9.78	9.15	8.75	8.47
	.005	18.63	14.54	12.92	12.03	11.46	11.07
7	.100	3.59	3.26	3.07	2.96	2.88	2.83
	.050	5.59	4.74	4.35	4.12	3.97	3.87
	.025	8.07	6.54	5.89	5.52	5.29	5.12
	.010	12.25	9.55	8.45	7.85	7.46	7.19
	.005	16.24	12.40	10.88	10.05	9.52	9.16
8	.100	3.46	3.11	2.92	2.81	2.73	2.67
	.050	5.32	4.46	4.07	3.84	3.69	3.58
	.025	7.57	6.06	5.42	5.05	4.82	4.65
	.010	11.26	8.65	7.59	7.01	6.63	6.37
	.005	14.69	11.04	9.60	8.81	8.30	7.95
9	.100	3.36	3.01	2.81	2.69	2.61	2.55
	.050	5.12	4.26	3.86	3.63	3.48	3.37
	.025	7.21	5.71	5.08	4.72	4.48	4.32
	.010	10.56	8.02	6.99	6.42	6.06	5.80
	.005	13.61	10.11	8.72	7.96	7.47	7.13



d.f.	$\chi^2_{0.975}$	$\chi^2_{0.950}$	$\chi^2_{0.050}$	$\chi^2_{0.025}$
1	0.0009821	0.0039321	3.84146	5.02389
2	0.0506356	0.102587	5.99147	7.37776
3	0.215795	0.351846	7.81473	9.34840
4	0.484419	0.710721	9.48773	11.1433
5	0.831211	1.145476	11.0705	12.8325
6	1.237347	1.63539	12.5916	14.4494
7	1.68987	2.16735	14.0671	16.0128
8	2.17973	2.73264	15.5073	17.5346
9	2.70039	3.32511	16.9190	19.0228
10	3.24697	3.94030	18.3070	20.4831
11	3.81575	4.57481	19.6751	21.9200
12	4.40379	5.22603	21.0261	23.3367
13	5.00874	5.89186	22.3621	24.7356
14	5.62872	6.57063	23.6848	26.1190



d.f.	$t_{.100}$	$t_{.050}$	$t_{.025}$
1	3.078	6.314	12.706
2	1.886	2.920	4.303
3	1.638	2.353	3.182
4	1.533	2.132	2.776
5	1.476	2.015	2.571
6	1.440	1.943	2.447
7	1.415	1.895	2.365
8	1.397	1.860	2.306
9	1.383	1.833	2.262
10	1.372	1.812	2.228
11	1.363	1.796	2.201
12	1.356	1.782	2.179
13	1.350	1.771	2.160

x	0.5	1.5	2	2.5
e^{-x}	0.472	0.223	0.135	0.082

x	3	4.5	6	1
e^{-x}	0.049	0.011	0.003	0.368