

國立臺灣海洋大學 100 學年度博士班招生考試試題



考試科目：統計學

系所名稱：航運管理學系博士班

※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。

(以下各題求解過程凡遇加減乘除開根號一律取小數點 2 位，即第 3 位四捨五入)

1. Please write down the probability function and their means and variances of the following distributions. (1)Poisson (6%); (2)Hypergeometric (6%)

2. Studies show that gasoline use for compact cars sold in market is normally distributed, with a mean use of 32 miles per gallon (mpg) and a standard deviation of 3.8 mpg. If a manufacturer wishes to develop a compact car that outperforms 90% of the current compacts in fuel economy, what must the gasoline use rate for the new car be? (8%)

3. 經檢定得知 A 與 B 兩條生產線生產產品之重量(單位:公克)皆呈常態分配。今分別自 A 與 B 兩條生產線隨機抽出 $n_1 = 6, n_2 = 4$ 件產品做量測, 得下列資料: $\bar{X}_1 = 19.2$ 公克, $S_1 = 2.5$ 公克; $\bar{X}_2 = 23.5$ 公克, $S_2 = 3.5$ 公克, (1)試以顯著水準 $\alpha = 0.05$ 檢定 A 與 B 兩條生產線生產產品重量之變異數是否相等? (10%)(2)試利用(1)之檢定結果, 並以相同顯著水準, 檢定 A 生產線生產產品之平均重量是否低於 B 生產線 2 公克以上? (10%)(3)題目言及「經檢定得知 A 與 B 兩條生產線生產產品之重量(單位:公克)皆呈常態分配」, 請問這是如何檢定的? (5%)

4. 由過去資料顯示, 某電子公司組裝人員平均每小時組裝 10 個電子產品, 今隨機挑選 50 位組裝人員, 檢測其組裝 1 個電子產品所花的時間(單位:分鐘), 得組裝時間之次數分配表如下:

時間	0-4	4-8	8-12	12-16	16-20	20 以上
人數	25	12	6	4	3	0

試以顯著水準 $\alpha = 0.05$ 檢定組裝人員組裝該種電子產品所花時間是否具指數分配。(15%)

5. 某機構調查甲乙兩港員工對政府所推行之港務措施的支持比例差異, 若欲自甲乙兩港抽取一樣多之員工調查, 且欲使調查結果之 95% 誤差界限至多 5%, (1)試問應分別從甲乙兩港抽出多少位員工加以調查, (5%)(2)試以文數字配合數學式說明如何得到滿足前述條件之 $p_1 - p_2$ 的不偏估計值。(5%)

6. 為比較相同裝卸條件下 A, B, C 三個貨櫃碼頭每小時之平均裝櫃效率, 今分別在三個貨櫃碼頭依序觀察 3, 3, 5 個單位小時, 得裝櫃量 (TUE/小時) 如下: A 貨櫃碼頭: 31, 32, 34; B 貨櫃碼頭: 27, 28, 30; C 貨櫃碼頭: 24, 24, 25, 28, 26。

(1) 請補足欲求解第 (2) 小題時, 所欠缺之假設或須先加以驗證之條件。(5%)

(2) 試以顯著水準 $\alpha = 0.05$, 檢定 A, B, C 三個貨櫃碼頭之每小時平均裝櫃量是否相等。(10%)



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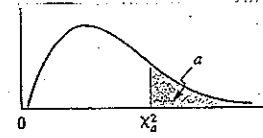
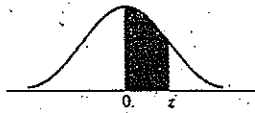
7. 假設某航空貨運承攬公司每月攬貨量 Y (單位:公噸) 與每月所花廣告費用 X (單位:萬元) 呈線性迴歸關係 $Y = \beta_0 + \beta_1 X + \epsilon$, $\epsilon \sim N(0, \sigma)$, 今隨機調查過去 5 個月之資料, 得資料

$$(x_i, y_i), i = 1, 2, \dots, 5, \text{ 經計算得 } \sum_{i=1}^5 x_i = 5, \sum_{i=1}^5 y_i = 7, \sum_{i=1}^5 x_i^2 = 5.4,$$

$$\sum_{i=1}^5 y_i^2 = 10.46, \sum_{i=1}^5 x_i y_i = 7.34. (1) \text{ 試以顯著水準 } \alpha = 0.05, \text{ 檢定母群體相關係數 } \rho_{XY} \text{ 是否}$$

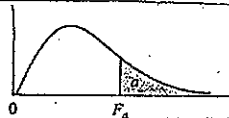
大 0。(7%) (2) 試求 Y 對 X 之樣本迴歸方程式 $\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x$, 並解釋 $\hat{\beta}_1$ 之意義。(4%) (3) 試

求判定係數(coefficient of determination), 並說明其在本題之意義。(4%)



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

d.f.	$\chi^2_{0.975}$	$\chi^2_{0.950}$	$\chi^2_{0.900}$	$\chi^2_{0.025}$
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

ν_2	σ	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

χ	0.3	0.38	0.5	0.67
$e^{-\chi}$	0.7408	0.6839	0.6065	0.5117

χ	0.75	1.33	1.5	2
$e^{-\chi}$	0.4724	0.2645	0.2231	0.1353

χ	2.67	3.33
$e^{-\chi}$	0.0693	0.0358