

<注意:本試題僅供作 F 分配表,其他統計量請自行查表換算取得>

一. 兩隨機變數 X 和 Y 之聯合機率函數為:

$$f(x, y) = 7x^2y^3 \quad 0 < y < x < 1$$

$$= 0 \quad \text{其他情形}$$

試求 Y 之條件期望值及變異數於 $X=x, 0 < x < 1$. (15分)

二. 為研究某產品之使用量是否因地區而異, 在甲、乙兩地區各抽查 16, 13 份

得:

$$\bar{x}_1 = 4.2 \text{ 公斤} \quad s_1^2 = 1.34$$

$$\bar{x}_2 = 3.5 \text{ 公斤} \quad s_2^2 = 1.50$$

- (1) 試求甲、乙兩地區均數差之 90% 的信賴區間。(6分)
- (2) 請問兩地區之使用量是否有差異。(4分)
- (3) 第(2)題之答案可否由變異數分析獲得? 如果可以, 請利用該分析進行檢定。(12分)

三. 構建三個迴歸方程如下:

Model I: $\hat{y} = b_0 + b_1x_1$
 Model II: $\hat{y} = b_0 + b_1x_1 + b_2x_2$
 Model III: $\hat{y} = b_0 + b_1x_1 + b_2x_2 + b_3x_3$

經電腦套裝軟件運算, 結果如右表。

- (1) 請利用 Model I 之資料:
 - a. 以 $\alpha = 0.05$, 檢定 β_1 是否為 0
 - b. 求 β_1 之 95% 信賴區間。(8分)
- (2) 利用 Model II 與 Model I 之資料:
 - a. 求偏判別係數 (係指引進 x_2 時) (7分)
- (3) 利用 Model III 與 Model II 之資料:
 - a. 說明 x_3 是否值得引入 (請利用 t 及 F 統計量分別說明之)。(13分)

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	1	66336.469	66336.469	201.873	0.0001
ERROR	17	5586.293	328.605		
C TOTAL	18	71922.762			
ROOT MSE		18.127478	R-SQUARE	0.9223	
DEP MEAN		69.767474	ADJ R-SQ	0.9178	
C.V.		25.98271			
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T FOR HO: PARAMETER=0	PROB> T
INTERCEP	1	-1958.366	142.805	-13.714	0.0001
x_1	1	1.078795	0.075928	14.208	0.0001
SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	2	71799.016	35899.508	4641.719	0.0001
ERROR	16	123.746	7.734098		
C TOTAL	18	71922.762			
ROOT MSE		2.781025	R-SQUARE	0.9983	
DEP MEAN		69.767474	ADJ R-SQ	0.9981	
C.V.		3.986133			
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T FOR HO: PARAMETER=0	PROB> T
INTERCEP	1	20450.438	843.475	24.245	0.0001
x_1	1	-22.780606	0.897849	-25.372	0.0001
x_2	1	0.006345585	0.0002387695	26.576	0.0001
SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	3	71909.581	23969.860	27277.636	0.0001
ERROR	15	13.181051	0.878737		
C TOTAL	18	71922.762			
ROOT MSE		0.937410	R-SQUARE	0.9998	
DEP MEAN		69.767474	ADJ R-SQ	0.9998	
C.V.		1.34362			
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T FOR HO: PARAMETER=0	PROB> T
INTERCEP	1	20982.754	288.247	72.794	0.0001
x_1	1	-21.366377	0.307114	-76.084	0.0001
x_2	1	0.004506678	0.0008175416	79.588	0.0001
x_3	1	-8.741519	0.779307	-11.217	0.0001

四. 某公司為試驗不同的包裝對產品銷售量是否有影響, 乃於若干家百貨公司試銷, 不知試銷幾次, 但得一部分變異數分析表如下:

變異來源	包裝向	公司向	誤差	總和
離均差平方和	196.222	468.222	257.333	1000.222
自由度		3	24	35

- 請說明百貨公司家數, 試銷次數, 包裝種類數 (8分)
 - 以 $\alpha=0.1$, 同時檢定在包裝方式, 公司向是否有顯著差異; (6分)
 - 上述中遺漏之項平方和, 請說明該項之意義; 又是否有顯著差異 ($\alpha=0.1$); (10分)
- 五. 請借自變數, 應變數的性質, 說明變異數分析, 迴歸分析, 卡方分析及羅特特 (Logit) 模型向之差異性, 又迴歸分析可否取代變異數分析; 理由; (4分)

附表 F 分配表 (7分)



$\alpha = .05$

$v_1 \backslash v_2$	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	∞
1	161.45	199.50	215.71	224.58	230.16	233.99	236.77	238.88	240.56	241.88	243.91	245.95	248.01	249.05	250.09	251.14	252.20	253.25	254.32
2	18.513	19.000	19.164	19.247	19.296	19.330	19.353	19.371	19.385	19.396	19.407	19.417	19.427	19.436	19.445	19.454	19.462	19.470	19.477
3	10.128	9.552	9.276	9.172	9.015	8.906	8.822	8.752	8.693	8.643	8.598	8.557	8.518	8.481	8.446	8.412	8.379	8.347	8.316
4	7.208	6.943	6.594	6.383	6.250	6.131	6.024	5.928	5.842	5.765	5.694	5.627	5.563	5.501	5.441	5.382	5.325	5.269	5.214
5	6.6079	5.7861	5.4095	5.1922	5.0503	4.930	4.8239	4.7306	4.648	4.574	4.504	4.437	4.373	4.311	4.251	4.192	4.135	4.079	4.024
6	5.9874	5.1433	4.7351	4.5177	4.3758	4.2555	4.1529	4.0626	3.9826	3.912	3.842	3.775	3.711	3.649	3.589	3.530	3.473	3.417	3.362
7	5.5914	4.7374	4.3466	4.1293	3.9874	3.8671	3.7645	3.6742	3.5942	3.5238	3.4538	3.387	3.323	3.261	3.200	3.141	3.083	3.026	2.970
8	5.3177	4.4590	4.0662	3.8489	3.7070	3.5867	3.4841	3.3938	3.3138	3.2434	3.1734	3.107	3.043	2.981	2.920	2.861	2.803	2.745	2.688
9	5.1174	4.2565	3.8626	3.6453	3.4834	3.3631	3.2605	3.1692	3.0892	3.0188	2.9488	2.882	2.818	2.756	2.695	2.636	2.577	2.518	2.460
10	4.9646	4.1028	3.7089	3.4916	3.3297	3.2094	3.1068	3.0155	2.9355	2.8651	2.7951	2.729	2.665	2.603	2.542	2.483	2.424	2.365	2.306
11	4.8443	3.9825	3.5886	3.3713	3.2094	3.0891	2.9865	2.8952	2.8152	2.7448	2.6748	2.608	2.544	2.482	2.421	2.362	2.303	2.244	2.185
12	4.7477	3.8859	3.4920	3.2747	3.1128	2.9925	2.8899	2.8006	2.7206	2.6502	2.5802	2.514	2.449	2.387	2.326	2.267	2.208	2.149	2.090
13	4.6672	3.8054	3.4115	3.1942	3.0323	2.9120	2.8094	2.7201	2.6401	2.5697	2.5007	2.434	2.369	2.307	2.246	2.187	2.128	2.069	2.010
14	4.6001	3.7383	3.3444	3.1271	2.9652	2.8449	2.7423	2.6530	2.5730	2.5026	2.4336	2.367	2.302	2.240	2.179	2.120	2.061	2.002	1.943
15	4.5431	3.6813	3.2874	3.0701	2.9082	2.7879	2.6853	2.5960	2.5160	2.4456	2.3766	2.310	2.245	2.183	2.122	2.063	2.004	1.945	1.886
16	4.4940	3.6322	3.2383	3.0210	2.8591	2.7388	2.6362	2.5469	2.4669	2.3965	2.3275	2.261	2.196	2.134	2.073	2.014	1.955	1.896	1.837
17	4.4513	3.5915	3.1976	2.9803	2.8184	2.6981	2.5955	2.5062	2.4262	2.3558	2.2868	2.220	2.155	2.093	2.032	1.973	1.914	1.855	1.796
18	4.4139	3.5546	3.1607	2.9434	2.7815	2.6612	2.5586	2.4693	2.3893	2.3189	2.2499	2.183	2.118	2.056	1.995	1.936	1.877	1.818	1.759
19	4.3808	3.5219	3.1280	2.9107	2.7488	2.6285	2.5259	2.4366	2.3566	2.2862	2.2172	2.151	2.086	2.024	1.963	1.904	1.845	1.786	1.727
20	4.3513	3.4928	3.0989	2.8816	2.7197	2.5994	2.4968	2.4075	2.3275	2.2571	2.1881	2.122	2.057	1.995	1.934	1.875	1.816	1.757	1.698
21	4.3248	3.4668	3.0729	2.8556	2.6937	2.5734	2.4708	2.3815	2.3015	2.2311	2.1621	2.096	2.031	1.969	1.908	1.849	1.790	1.731	1.672
22	4.3009	3.4434	3.0491	2.8318	2.6699	2.5496	2.4470	2.3577	2.2777	2.2073	2.1383	2.072	2.007	1.945	1.884	1.825	1.766	1.707	1.648
23	4.2793	3.4221	3.0280	2.8107	2.6488	2.5285	2.4259	2.3366	2.2566	2.1862	2.1172	2.051	1.986	1.924	1.863	1.804	1.745	1.686	1.627
24	4.2597	3.4028	3.0088	2.7914	2.6295	2.5092	2.4066	2.3173	2.2373	2.1669	2.0979	2.031	1.966	1.904	1.843	1.784	1.725	1.666	1.607
25	4.2421	3.3852	2.9912	2.7739	2.6120	2.4917	2.3891	2.3008	2.2208	2.1504	2.0814	2.015	1.950	1.888	1.827	1.768	1.709	1.650	1.591
26	4.2257	3.3690	2.9751	2.7566	2.5947	2.4744	2.3718	2.2835	2.2035	2.1331	2.0641	1.998	1.933	1.871	1.810	1.751	1.692	1.633	1.574
27	4.2100	3.3541	2.9604	2.7418	2.5799	2.4596	2.3570	2.2687	2.1887	2.1183	2.0493	1.983	1.918	1.856	1.795	1.736	1.677	1.618	1.559
28	4.1960	3.3404	2.9467	2.7281	2.5662	2.4459	2.3433	2.2550	2.1750	2.1046	2.0356	1.969	1.904	1.842	1.781	1.722	1.663	1.604	1.545
29	4.1830	3.3277	2.9340	2.7144	2.5525	2.4322	2.3296	2.2413	2.1613	2.0909	2.0219	1.955	1.890	1.828	1.767	1.708	1.649	1.590	1.531
30	4.1709	3.3158	2.9223	2.6996	2.5381	2.4178	2.3152	2.2269	2.1469	2.0765	2.0075	1.941	1.876	1.814	1.753	1.694	1.635	1.576	1.517
40	4.0848	3.2317	2.8387	2.6060	2.4445	2.3242	2.2216	2.1333	2.0533	1.9829	1.9139	1.847	1.782	1.720	1.659	1.599	1.540	1.481	1.422
60	4.0012	3.1504	2.7574	2.5247	2.3632	2.2429	2.1403	2.0520	1.9720	1.9016	1.8326	1.766	1.701	1.639	1.578	1.519	1.460	1.401	1.342
120	3.9201	3.0718	2.6788	2.4461	2.2846	2.1643	2.0617	1.9734	1.8934	1.8230	1.7540	1.688	1.623	1.561	1.500	1.441	1.382	1.323	1.264
∞	3.8415	2.9932	2.6002	2.3675	2.2060	2.0857	1.9831	1.8948	1.8148	1.7444	1.6754	1.609	1.544	1.482	1.421	1.362	1.303	1.244	1.185

$\alpha = .10$

$v_1 \backslash v_2$	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	∞
1	39.864	49.500	53.593	55.833	57.241	58.204	58.906	59.439	59.858	60.195	60.705	61.220	61.740	62.002	62.265	62.529	62.794	63.061	63.328
2	8.5263	9.0000	9.1688	9.2434	9.2926	9.3255	9.3491	9.3668	9.3795	9.3916	9.4031	9.4141	9.4246	9.4346	9.4441	9.4531	9.4616	9.4696	9.4771
3	5.5383	5.6244	5.7098	5.7827	5.8422	5.8892	5.9247	5.9517	5.9700	5.9825	5.9944	6.0058	6.0167	6.0271	6.0371	6.0466	6.0556	6.0641	6.0721
4	4.5448	4.3246	4.1908	4.1073	4.0506	4.0098	3.9790	3.9549	3.9353	3.9199	3.9085	3.8999	3.8938	3.8887	3.8843	3.8804	3.8769	3.8735	3.8702
5	4.0604	3.7977	3.6195	3.5202	3.4530	3.4045	3.3679	3.3393	3.3163	3.2974	3.2822	3.2696	3.2591	3.2503	3.2429	3.2364	3.2302	3.2242	3.2184
6	3.7760	3.4633	3.2848	3.1808	3.1075	3.0546	3.0145	2.9820	2.9557	2.9337	2.9159	2.9011	2.8889	2.8789	2.8708	2.8634	2.8564	2.8496	2.8430
7	3.5894	3.2574	3.0781	2.9685	2.8883	2.8274	2.7819	2.7456	2.7157	2.6907	2.6696	2.6517	2.6368	2.6247	2.6141	2.6047	2.5956	2.5867	2.5780
8	3.4579	3.1131	2.9238	2.8064	2.7265	2.6643	2.6211	2.5885	2.5611	2.5380	2.5181	2.5001	2.4841	2.4700	2.4579	2.4467	2.4358	2.4251	2.4146
9	3.3603	2.9965	2.8129	2.6927	2.6096	2.5464	2.5042	2.4726	2.4451	2.4210	2.3991	2.3791	2.3611	2.3450	2.3309	2.3177	2.3047	2.2919	2.2792
10	3.2850	2.9245	2.7377	2.6145	2.5286	2.4654	2.4232	2.3916	2.3641	2.3400	2.3181	2.2981	2.2791	2.2630	2.2489	2.2347	2.2207	2.2068	2.1930
11	3.2252	2.8657	2.6759	2.5487	2.4598	2.3966	2.3544	2.3228	2.2953	2.2712	2.2493	2.2293	2.2103	2.1942	2.1791	2.1640	2.1490	2.1341	2.1192
12	3.1765	2.8068	2.6090	2.4768	2.3839	2.3207	2.2785	2.2469	2.2194	2.1953	2.1734	2.1534	2.1344	2.1183	2.1032	2.0881	2.0731	2.0581	2.0432
13	3.1362	2.7632	2.5603	2.4231	2.3262	2.2630	2.2208	2.1892	2.1617	2.1376	2.1157	2.0957	2.0767	2.0606	2.0455	2.0304	2.0154	2.0004	1.9854
14	3.1022	2.7265	2.5222	2.3797	2.2767	2.2135	2.1713	2.1397	2.1122	2.0881	2.0662	2.0462	2.0272	2.0111	1.9960	1.9809	1.9658	1.9507	1.9356
15	3.0732	2.6952	2.4889	2.3414	2.2330	2.1698	2.1276	2.0960	2.0685	2.0444	2.0225	2.0025	1.9835	1.9674	1.9523	1.9372	1.9221	1.9070	1.8919
16	3.0481	2.6682	2.4588	2.3113	2.2029	2.1397	2.0975	2.0659	2.0384	2.0143	1.9924	1.9724	1.9534	1.9373	1.9222	1.9071	1.8920	1.8769	1.8618
17	3.0262	2.6446	2.4311	2.2786	2.1652	2.1020	2.0598	2.0282	2.0007	1.9766	1.9547	1.9347	1.9157	1.8996	1.8845	1.8694	1.8543	1.8392	1.8241
18	3.0070	2.6239	2.4064	2.2489	2.1315	2.0683	2.0261	1.9945	1.9670	1.9429	1.9210	1.9010	1.8820	1.8659	1.8508	1.8357	1.8206	1.8055	1.7904
19	2.9899	2																	