國立高雄應用科技大學 100 學年度碩士班招生考試 工業工程與管理系(甲組)

准考證號碼[] [] [] [] [] (考生必須填寫)

統計學

試題 共2頁,第1頁

注意: a. 本試題共四題, 第1題32分, 第2題20分, 第3題24分, 第4題24分, 共100分。b. 作答時不必抄題。

C. 考生作答前請詳閱答案卷之考生注意事項。

- 1. If the function $f_{X,Y}$ is given by: $f_{X,Y}(x,y) = cx^2y$ for $0 < x^2 < y < 1$ (and 0 otherwise): (32 分)
 - a). Determine the constant c, so that $f_{X,Y}$ is a p.d.f.;
 - b). Calculate the probability: $P(0 < X < \frac{3}{4}, \frac{1}{4} \le Y < 1)$;
 - c). Calculate: E(X|Y = y); and
 - d). Calculate: E(Y|X=x).
- 2. The postanesthesia care area (recover room) at St. Luke's Hospital in Maumee, Ohio, was recently enlarged. The hope was that with the enlargement the mean number of patients per day would be more than 25. A random sample of 15 days revealed the following numbers of patients. (20 分)

At the 0.01 significance level, can we conclude that the mean number of patients per day is more than 25? Estimate the p-value and interpret it.

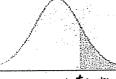
- 3. On the basis of a random sample of size $n, X_1, ..., X_n$, from each one of the p.d.f.'s given below with observed values $x_{1,...,} x_n$, determine a sufficient statistic for θ . (24 %)
 - a). $f(x;\theta) = \frac{\theta}{x^{\theta+1}}, x \ge 1, \theta \in \Omega = (0, \infty).$
 - b). $f(x;\theta) = \frac{x}{\theta}e^{-x^2/2\theta}, x > 0, \theta \in \Omega = (0, \infty).$
 - c). $f(x; \theta) = (1 + \theta)x^{\theta}, \ 0 < x < 1, \ \theta \in \Omega = (-1, \infty).$

4. In one stage of the development of a new medication for an allergy, an experiment is conducted to study how different dosages of the medication affect the duration of relief from the allergic symptoms. Ten patients are included in the experiment. Each patient receives a specific dosage of the medication and is asked to report back as soon as the protection of the medication seems to wear off. The observations are recorded in the following table, which shows the dosage (x) and respective duration of relief (y) for the 10 patients. (24分)

	x	У	x^2	y^2	xy
•	3	9	9	81	27
•	3	5	9	25	15
	4	12	16	144	48
	5	9	25	81	45
	6	14	36	196	84
	6	16	36	256	96
	7	22	49	484	154
	8	18	64	324	144
	8	24	64	576	192
	9	22	81	484	198
Totals:	59	151	389	2,651	1,003

a). Compute the estimates $\hat{\beta}_1$ and $\hat{\beta}_2$, and then find the fitted regression line for $\hat{y}_i = \hat{\beta}_1 + \hat{\beta}_2 x_i.$

b). What percentage of the total variability is explained by the linear regression and what percentage remains unexplained? c). Compute the MLE $\hat{\sigma}^2$ of σ^2 .



The following part of t-Distribution Table with right tail probabilities may

	t _(p,df)	e useiui.					
df\p	0.4	0.25	0.1	0.05	0.025	0.01	0.005
6	0.265	0.718	1.440	1.943	2.447	3.143	3.707
7	0.263	0.711	1.415	1.895	2.365	2,998	3.499
8	0.262	0.706	1.397	1.860	2.306	2.896	3.355
9	0.261	0.703	1.383	1.833	2.262	2.821	3.250
10	0.260	0.700	1.372	1.812	2.228	2.764	3.169
11	0.260	0.697	1.363	1.796	2.201	2.718	3.106
12	0.259	0.695	1.356	1.782	2.179	2.681	3.055
13	0.259	0.694	1.350	1.771	2.160	2.650	3.012
14	0.258	0.692	1.345	1.761	2.145	2.624	2.977
15	0.258	0.691	1.341	1.753	2.131	2.602	2.947
16	0.258	0.690	1.337	1.746	2.120	2.583	2.921