

國立高雄大學 102 學年度研究所碩士班招生考試試題

科目：統計學
 考試時間：100 分鐘

系所：經營管理研究所(甲組、乙組) 是否使用計算機：是
 本科原始成績：100 分

1. The gamma function is defined as $\Gamma(\alpha) = \int_0^{\infty} x^{\alpha-1} \exp\{-x\} dx$, $0 < \alpha$. (25%)

(a) Show that $\Gamma(\alpha + 1) = \alpha\Gamma(\alpha)$.

(b) Show that $\Gamma(0.5) = \sqrt{\pi}$

(c) Find $\Gamma(9/2)$.

2. An ANOVA procedure is applied to data obtained from 6 samples where each sample contains 20 observations. A portion of the ANOVA table follows. (25%)

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F
Treatments			40	
Error				
Total		1340		

(a) State the assumption(s) of ANOVA.

(b) Write down the null and alternative hypothesis.

(c) Provide the missing entries for the ANOVA table.

(d) Describe why the rejection region of the F-test is always on the right tail.

3. Use the following joint probability distribution, (25%)

		X		
		0	1	2
Y	0	0.05	0.1	0.03
	1	0.21	0.11	0.19
	2	0.08	0.15	0.08

to compute the following.

(a) Compute the probability of $[Y < 2, X > 0]$.

(b) Find the marginal distribution of X.

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(c) $\text{Cov}[Y, X^2]$.

(d) Find $E[Y | X]$ and $\text{Var}[Y | X]$.

4. Let X_1, X_2, \dots, X_n be a random sample from a distribution with p.d.f. (25%)

$$f(x; \theta) = (1/\theta) \exp\{-x/\theta\}, \quad 0 < x < \infty, \quad 0 < \theta < \infty.$$

(a) Find the maximum likelihood estimator (MLE) of θ .

(b) Find the sufficient statistic of θ .

(c) Derive the most powerful test for $H_0 : \theta = \theta_0$ against $H_a : \theta = \theta_a$ where $\theta_a < \theta_0$.