

國立嘉義大學九十七學年度 生物事業管理學系碩士班招生考試試題

科目：統計學

※僅可使用試務單位提供之計算機

1. Computing from a data set of (x, y) values, the following summary statistics are obtained:

$$\begin{array}{lll} n = 15 & \bar{x} = 7.3 & \bar{y} = 56.4 \\ S_{xx} = 5.7 & S_{xy} = -11.8 & S_{yy} = 36.1 \end{array}$$

- (1) Obtain the equation of the least squares regression line. (5 points)
- (2) Compute the error sum of squares and estimate σ^2 . (5 points)
- (3) Determine the proportion of variation in y that is explained by linear regression. (5 points)
- (4) Test the null hypothesis $H_0: \beta_1 = -1.5$ against the alternative $H_1: \beta_1 < -1.5$, with $\alpha = 0.05$. (5 points)
- (5) Estimate the expected fiber strength for droplet size $x = 10$ and set a 95% confidence interval. (5 points)
(Hint: $t_{13,0.05} = 1.771$, $t_{13,0.025} = 2.160$)

2. Given the summary statistics from three samples:

$$\begin{array}{lll} \bar{y}_1 = 8.8 & \bar{y}_2 = 7.5 & \bar{y}_3 = 6.5 \\ S_1 = 2.3 & S_2 = 1.9 & S_3 = 1.4 \\ n_1 = 10 & n_2 = 7 & n_3 = 8 \end{array} \quad \text{where } s_i^2 = \sum_{j=1}^{n_i} (y_{ij} - \bar{y}_i)^2 / (n_i - 1)$$

- (1) What is the ANOVA? (5 points)
- (2) Present the ANOVA table for these data. (15 points)
- (3) Carry out the F test for equality of means taking $\alpha = 0.05$. (5 points)
(Hint: $F_{2,22,0.05} = 3.44$, $F_{2,24,0.05} = 3.40$)

3. Randomly sampling from two independent population, then the number of samples, averages, and variances of these two sample groups are $n_1 = 80$, $n_2 = 64$; $\bar{x}_1 = 30$, $\bar{x}_2 = 25$; $s_1^2 = 60$, $s_2^2 = 32$, respectively. Please find confidence interval of two population mean difference $(\mu_1 - \mu_2)$ at 95% level. (25 points)

4. X and Y are the discrete random variables; $f(x, y)$ is the joint pdf of X and Y. The values of $f(x, y)$ are provided as following Table:

$f(x,y)$	x		
	0	1	2
0	0.10	0.20	0.10
1	0.15	0.25	0.20

1. Please find $V(X)$, $V(Y)$, and $Cov(X, Y)$. (5 points)
2. What is $V(2X+3Y)$? (5 points)
3. If $X=x$, please find the conditional probability distribution of Y. (10 points)
4. Please find $E(Y|X=2)$. (5 points)