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:

$n = 15$ $\quad \bar{x} = 7.3$ $\quad \bar{y} = 56.4$

$S_{xx} = 5.7$ $\quad S_{xy} = -11.8$ $\quad S_{yy} = 36.1$

(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:

$\bar{y}_1 = 8.8$ $\quad \bar{y}_2 = 7.5$ $\quad \bar{y}_3 = 6.5$

$S_1 = 2.3$ $\quad S_2 = 1.9$ $\quad S_3 = 1.4$ $\quad$ where $s_i^2 = \sum_{j=1}^{n_i} (y_{ij} - \bar{y}_i)^2 / (n_i - 1)$

$n_1 = 10$ $\quad n_2 = 7$ $\quad n_3 = 8$

(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	x = 1	x = 2
y = 0	0.10	0.20	0.10
y = 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)