

* 注意：計算題請寫出計算式，否則不予計分

1. Explain the following terms: (35%)

- (1) Central Limit Theorem (2) Type II error (3) standard error (4) ANOVA
 (5) Kolmogorov-Smirnov test (6) Kruskal-Wallis test (7) coefficient of determination

2. Please list the assumptions of simple linear regression. (10%)

3. Fifteen tobacco plants of the same age and genetic strain were randomly assigned to 3 groups of 5 plants each. One group was untreated, one was infected with tobacco mosaic virus (TMV), and one was infected with tobacco ringspot virus (TRSV). After one week the activity of odiphenol oxidase was determined in each plant. Does infection by either virus affect the activity of this enzyme? (10%)

Enzyme Activity (μ g/ml protein/min) $F_{0.95, 2, 12} = 3.88$

Control	1.4	1.6	1.0	0.9	1.5
TMV-Infected	2.4	2.3	1.9	1.5	2.1
TRSV-Infected	2.8	3.0	2.4	2.0	3.0

4. To help assess the health risks of second-hand smoke, the levels of cotinine (a metabolite of nicotine) were measured in mmol/l in the urine of seven subjects prior to exposure to second-hand smoke and shortly after a two-hour exposure to secondary cigarette smoke. Did the exposure significantly increase the cotinine level? Assume cotinine levels are normally distributed and analyze with an appropriate test. (10%) $t_{0.05, 6} = 2.45$ $t_{0.05, 12} = 2.18$

	Subject	1	2	3	4	5	6	7
Cotinine level (mmol/l)	Before	13	16	9	20	15	8	32
	After	18	21	18	27	20	14	40

5. One ecologist samples 25 plants and measures their height. He finds that the sample has a mean of 15 cm and a sample variance of 16 cm². What is the 95% confidence interval for the population mean μ ? (10%) $t_{0.05, 24} = 2.06$

6. A plant physiologist grew 9 individually potted soybean seedlings in a greenhouse. The table gives measurements of the total leaf area (cm²) and total plant dry weight (g) for each plant after 16 days of growth. Calculate the correlation coefficient for these data. Test its significance via a t test, and interpret the result. (15 %) $t_{0.05, 7} = 2.36$

Plant	1	2	3	4	5	6	7	8	9
Leaf area, X	410	551	472	393	421	435	362	472	493
Dry weight, Y	2.0	2.5	2.1	1.8	2.1	2.2	1.9	2.4	2.5

7. Coal mining records from the period 1851 to 1962 revealed 180 explosions that killed 10 or more workers. If the distribution of accidents by day of the week were uniform, then approximately one-sixth of the accidents could be expected to have occurred on any work day. Do the data support the uniform hypothesis? (10 %) $\chi^2_{0.95, 5} = 11.1$

Day	Mon	Tue	Wed	Thu	Fri	Sat
Frequency	18	33	31	31	33	34

試題隨卷繳回