

國立成功大學  
110學年度碩士班招生考試試題

編 號： 257

系 所： 交通管理科學系

科 目： 統計學

日 期： 0202

節 次： 第 2 節

備 註： 不可使用計算機

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. (20%) An experiment was carried out to compare lifetimes for six different electric car batteries. There were 26 measurements on life expectancy for each battery. A partial ANOVA table for this data follows:

Source	df	Sum of Squares	Mean Square	F
Mixture	_____	_____	_____	_____
Error	_____	_____	13.929	_____
Total	_____	5664.415	_____	_____

- (a) Fill in the missing entries in the ANOVA table.  
 (b) State the null and alternative hypotheses of interest in this experiment.
2. (20%) Recently there has been increased use of titanium and its alloys in automotive applications. These alloys are highly durable and have a high strength-to-weight ratio. However, machining of titanium is difficult due to its low thermal conductivity. A characteristic of interest was surface roughness (in  $\mu\text{m}$ ) of the metal after machining. In one particular investigation, a sample of 54 surface roughness observations gave a sample mean of 1.9042  $\mu\text{m}$  and a sample standard deviation of 0.1455  $\mu\text{m}$ . List the calculations necessary to determine the upper confidence bound for true average surface roughness  $\mu$  with confidence 95%, showing your formulas clearly.

Table - Z-Scores for Commonly Used Confidence Intervals

Desired Confidence Interval	Z Score
90%	1.645
95%	1.96
99%	2.576

3. (20%) A research worker wants to determine the average time it takes a mechanic to rotate the tires of a car, and she wants to be able to assert with 95% confidence that the mean of her sample is off by at most 0.50 minute. If she can presume from past experience that  $\sigma = 1.6$  minutes, how large a sample will she have to take?
4. (20%) Consider the following Excel regression of perceived ride quality as a function of price for 27 scooter models available in Taiwan.
- (a) Is the coefficient of Price significantly different from zero at  $\alpha = 0.05$ ?  
 (b) What does the  $R^2$  tell you?  
 (c) Given these results, would you conclude that a higher price implies higher ride quality?

<to be continued>

*Regression Statistics*

R Square	0.01104					
Standard Error	4.02545					
Observations	27					
<i>Statistic</i>	<i>Coefficients</i>	<i>Std Error</i>	<i>t Stat</i>	<i>p-Value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	88.4902	1.67814	52.731	0.0000	85.0340	91.9464
Price	-0.00239	0.00453	-0.528	0.6019	-0.01172	0.00693

5. (20%) Analysis of a Detroit Marathon (n = 1,015 men, n = 150 women) produced the regression results shown below, with dependent variable *Time* (the marathon time in minutes) and predictors *Age* (runner's age), *Weight* (runner's weight in pounds), *Height* (runner's height in inches), and *Exp* (1 if runner had prior marathon experience, 0 otherwise).

- (a) Interpret the coefficient of *Exp*.
- (b) Does the intercept have any meaning?
- (c) Why do you suppose squared predictors were included?

<i>Variable</i>	Men (n=1,015)		Women (n=150)	
	<i>Coefficient</i>	<i>t</i>	<i>Coefficient</i>	<i>t</i>
<i>Intercept</i>	-366		-2,820	
<i>Age</i>	-4.827	-6.1	-3.593	-2.5
<i>Age</i> <sup>2</sup>	0.07671	7.1	0.05240	2.6
<i>Weight</i>	-1.598	-1.9	3.000	0.7
<i>Weight</i> <sup>2</sup>	0.008961	3.4	-0.004041	-2.0
<i>Height</i>	24.65	1.5	96.13	1.6
<i>Height</i> <sup>2</sup>	-0.2074	-1.7	-0.8040	-1.8
<i>Exp</i>	-41.74	-17.0	-28.65	-4.3
	<i>R</i> <sup>2</sup> =0.423		<i>R</i> <sup>2</sup> =0.334	