國立高雄應用科技大學
九十五學年度研究所碩士班招生考試
人力資源發展系(乙組)

准考證號碼□□□□□□□□□□ （考生必須填寫）

統計學

本試題共三頁，第 1 頁

注意：a. 本試題共五題，每題之配分見各題題目，共 100 分。
b. 作答時不必抄題。
c. 考生作答前請詳閱答案卷之考生注意事項。
d. 考生可用計算器（答案經四捨五入後取至小數點以下第三位）。

1. Table 1 is the sample statistics for the weights (in pounds) of regular Coke and diet Coke. (30 points)

   a. Use a 0.05 significance level to test the claim that the weights of regular Coke and the weights of diet Coke have the same standard deviation.

   b. Construct a 95% confidence interval estimate of $\mu_1 - \mu_2$, the difference between the mean weight of regular Coke and mean weight of diet Coke.

   c. Use a 0.05 significance level to test the claim that cans of regular Coke and diet Coke have the same mean weight.

   Table 1 The sample statistics of the weights of the regular/diet Coke

Regular Coke	Diet Coke
$n_1 = 36$	$n_2 = 36$
$\bar{x}_1 = 0.81682$	$\bar{x}_2 = 0.78479$
$s_1 = 0.007507$	$s_2 = 0.004391$

2. In studying the effects of heredity and environment on intelligence, it has been helpful to analyze the IQs of identical twins who were separated soon after birth. Identical twins share identical genes inherited from the same fertilized egg. By studying identical twins raised apart, we can eliminate the variable of heredity and

better isolate the effects of the environment. The accompanying table shows the IQs of pairs of identical twins (older twins is x). (20 points)

a. Is there a relationship between IQs of twins (find the correlation coefficient $\gamma = ?$)? And, write the simple linear regression equation $Y = \hat{\alpha}_0 - \hat{\alpha}_1 x$.

b. Use a 0.05 significance level to test the claim that the mean IQ score of older twins reared apart is different from the mean IQ of 100.

Table 2 IQ scores of twins

x (older twins)	107	96	103	90	96	113	86	99	109	105	96	89
y (younger twins)	111	97	116	107	99	111	85	108	102	105	100	93

3. The data in Table 3 are matched pairs of times (in seconds) obtained from a random sample of children who were given blocks and instructed to build a tower as tall as possible. This procedure is used to measure intelligence in children. Use the Wilcoxon signed-ranks test and a 0.05 significance level to test the claim that there is no difference between the times of the first and second trials. (15 points)

H_0 : There is no difference between the times of the first and second trials.

H_1 : There is a difference between the times of the first and second trials.

Table 3 Times for building towers of blocks

Child	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
First trial	30	19	19	23	29	178	42	20	12	39	14	81	17	31	52
Second trial	30	6	14	8	14	52	14	22	17	8	11	30	14	17	15

4. Refer to the *Titanic* mortality data in Table 4. We will treat the 2223 people aboard the *Titanic* as a *sample*. We could take the position that the *Titanic* data constitute a *population* and therefore should not be treated as a sample, so that methods of inferential statistics do not apply. Let's stipulate that the data are sample data randomly selected from the population of all theoretical people who would find themselves in the same conditions. Realistically, no other people will actually find themselves in the same conditions, but we will make that assumption for the purposed of this discussion and analysis. We can then determine whether the observed differences have statistical significance.

Using a 0.05 significance level, test the claim that when the *Titanic* sank, whether someone survived or died is independent of whether the person is a man, woman, boy, or girl. (15 points)

The null hypothesis and alternative hypothesis are as follows:

H_0: Whether a person survived is independent of whether the person is a man, woman, boy, or girl.

H_1: Surviving the *Titanic* sinking and being a man, woman, boy, or girl are dependents.

Table 4 *Titanic* mortality data

	Gender/Age Category			
	Men	Women	Boys	Girls
Survived	332	318	29	27
Died	1360	104	35	18

5. Table 5 lists pulse rates. Are pulse rates affected by an interaction between gender and age? Are pulse rated affected by gender? Are pulse rates affected by age? Using a 0.05 significance level, test the above three matters. (20 points)

Table 5 Data of pulse rates

	Age								
	Under 20			20-40			Over 40		
Male	96	64	68	64	88	64	68	72	60
Female	76	64	76	72	83	68	60	68	72

Appendix

$F_{0.975}(35,35) = 0.509921$

$F_{0.975}(36,36) = 0.514902$

$WilCoxon_{0.025}(11) = 21$

$WilCoxon_{0.025}(15) = 25$

$F_{0.05}(1,12) = 4.74722$

$F_{0.05}(2,12) = 3.8853$

$F_{0.05}(4,12) = 3.2592$

$F_{0.05}(6,12) = 2.9961$

$Z_{0.025} = -1.9599$

$Z_{0.05} = -1.6448$

$\chi^2_{0.05}(3) = 7.81473$

$\chi^2_{0.05}(4) = 9.4877$

$\chi^2_{0.05}(5) = 11.0705$

$\chi^2_{0.05}(6) = 12.5916$

$\chi^2_{0.05}(8) = 15.5073$

$t_{0.025}(10) = 2.228$

$t_{0.025}(11) = 2.201$

$t_{0.05}(10) = 1.812$

$t_{0.05}(11) = 1.796$