REGRESSION ANALYSIS

Division of Mathematical Sciences, NTU

Assignment 2

QUESTION 1.

A service center for electronic equipment has *three* technicians who specialize in repairing *two* widely used makes of disk drives for desktop computers. It was desired to study the respective effects of the technicians (factor A) and the makes of the disk drives (factor B) on the service time. The number of minutes required to complete the repair job were collected. Each technician was randomly assigned *five* jobs on each make of disk drives. Consider a two-way ANOVA model with interaction.

(i) Write down an expression of a two-way factor effects model relevant to the above study. Specify the model assumptions.

(ii) Part of the ANOVA table for fitting the two-way classification model is given. Fill in the missing entries marked by "?" in the ANOVA tale.

	df	SS	MS	F	p-value
Factor A	?	261.267	?	?	0.1010
Factor B	?	1.633	?	?	
Interaction	?	768.867	?	?	
Error	?	?	?		
Total	29	2272.967			

(iii) Test for the interaction effects between the two factors. Use a 5% level of significance.

(iv) A researcher claims that since the p-value for factor A is 0.1010, the technicians have no effect on the mean service time at 5% level of significance. Comment on the researcher's claim.

QUESTION 2.

Consider a one-way ANOVA model for the example in Question 1, in which the factor of concern is the combination of factor A and factor B.

(i) Write down an expression for a one-way factor effects model relevant to the above study. Specify the model assumptions.

(ii) Complete the following ANOVA table for the study by filling in the missing entries marked by "?", and then test for the effect of the combined factor. Use a 5% level of significance.

	df	SS	MS	F
Treatment	?	?	?	?
Error	?	?	?	
Total	?	?		

The following table gives the fitted treatment means obtained by fitting the ANOVA model.

	Technician		
Disk drive	1	2	3
1	59.8	48.4	60.2
2	47.8	61.2	60.8

(iii) Denote by σ^2 the variance of an individual service time. Show that the variance of the difference between any two fitted treatment means is $0.4\sigma^2$.

(iv) Extract from the ANOVA table an estimate of σ^2.

(v) Calculate the 95% confidence interval for the difference in the expected service time between Disk drives 1 and 2 for Technician 2.