CIVL 7012/8012
Probabilistic Methods for Engineers
Makeup Exam
Duration: 90 Minutes; Total Points: 40
Each question carries equal points

Question 1

Use the given dataset to answer the following questions:

a) Determine the ANOVA tables for the following:

i) dry weight (Y) on Age (X)

ii) $\log_{10}$dry weight (Z) on Age (X)

b) Use the tables in part (a) to perform F test on the means for the significance. Use alpha = 0.05. Interpret your results

Question 2

a) The given paired data include 15 pairs of individuals matched on age and sex involving change scores in self-perception of health among hypertensives. Perform sign test at alpha=0.05 to determine if the change in self-perception score for the treatment group is better than that for the control group.

i) Using the small sample method. State the alternatives, decision rule and conclusion.

ii) Using the large sample procedure. State the alternatives, decision rule and conclusion.

iii) State the difference in results between the two methods

b) The ordinal data given shows forty people asked to rate two different types of services of Comcast (Internet and TV) on a scale from 1 to 10. Use the data shown below to test the hypothesis that the internet service is better than the TV service. Use alpha = 0.05

i) Using the small sample method. State the alternatives, decision rule and conclusion.

ii) Using the large sample procedure. State the alternatives, decision rule and conclusion.

iii) State the difference in results between the two methods

Question 3

a) Speed data were collected from two highway locations. Find whether the speeds at the two locations are identical using Wilcoxon's Rank Sum test,

i) Using the small sample method. State the alternatives, decision rule and conclusion.

ii) Using the large sample procedure. State the alternatives, decision rule and conclusion.

iii) State the difference in results between the two methods

b) Find whether the speed data collected belong to the same location or different using Wald Wolfowitz test:

i) Using the small sample method. State the alternatives, decision rule and conclusion. (Instead of 12, use the first 10 observations in the dataset)

ii) Using the large sample procedure. State the alternatives, decision rule and conclusion.

iii) State the difference in results between the two methods

Question 4

a) The data shows normalized loads in tons on a continuous slab bridge on Route 701 across the Little River in Louisa County, Virginia given by 21 different trucks in an hour. Given this data, test the hypothesis that the median truck load on the bridge is 15 tons using the Wilcoxon Signed-Rank Test. Use alpha=0.05

i) Using the small sample method. State the alternatives, decision rule and conclusion.

ii) Using the large sample procedure. State the alternatives, decision rule and conclusion.

iii) State the difference in results between the two methods

b) The data shows the total number of cups of 2 types of coffee (latte and mocha) sold by Starbucks over a period of 30 days. Use the Wilcoxon Signed-Rank Test to test the hypothesis that the two types of coffee are identical in popularity against the alternative that Mocha is more popular than Latte. Use alpha=0.05

i) Using the small sample method. State the alternatives, decision rule and conclusion.

ii) Using the large sample procedure. State the alternatives, decision rule and conclusion.

iii) State the difference in results between the two methods

Question 5

The Tri-City Office Equipment Corporation sells an imported copier on a franchise basis and performs preventive maintenance and repair service on this copier. The data below have been collected from 45 recent calls on users to perform routine preventive maintenance service; for each call, X is the number of copiers serviced and Y is the total number of minutes spent by the service person.

a) Set up the ANOVA table

b) Conduct an F test to determine whether or not there is any linear association between means of time spent and number of copiers serviced. Use alpha=0.1. State the alternatives, decision rule and conclusion.