NAME _____ NOVEMBER 2, 2012

MATH 445 - STATISTICAL METHODS LONG EXAM II

Instructions: *For p-values, write exactly what you get from R (do not round it off). For confidence intervals, all lower and upper limits should be round off to 2 decimal places.*

1. Consider the Health Exam data from the U.S. Department of Health and Human Services, National Center for Health Statistics, Third National Health and Nutrition Examination Survey. It has a total of 80 cases (40 males and 40 females) with each case having values for 14 variables. These variables are: Gender, Age (in years), Height (in inches), Weight (in pounds), Waist (circumference in cm.), Pulse (pulse rate in beats per minute), SysBP (systolic blood pressure in mmHg), DiasBP (diastolic blood pressure in mmHg), Cholesterol (in mg), BodyMass (body mass index), Leg (upper leg length in cm), Elbow (elbow breadth in cm), Wrist (wrist breadth in cm), Arm (arm circumference in cm).

a. Obtain the regression line to model BodyMass using Arm as predictor. [3]

b. Using the Bonferroni adjustment, construct 95% joint confidence intervals for β_0 and β_1. Interpret your confidence intervals [5]

c. Using the Working-Hotelling procedure, construct 95% joint confidence intervals for the mean BodyMass of three new individuals with Arm values of 25, 36, and 42. Interpret your confidence intervals [8]

d. Using the Scheffe procedure, construct 95% joint prediction intervals for the BodyMass of three new individuals with Arm values of 25, 36, and 42. Interpret your confidence intervals [8]

e. Using the model in part (a), fill in the ANOVA Table below: [12]

Source	DF	Sum of Squares	Mean Square	F	p-value
Regression					
Error					
Lack of Fit					
Pure Error					
Total					

ANOVA Table for Testing Lack of Fit of Simple Linear Regression

f. Determine the estimate for the slope parameter if you decide to use regression through the origin to model BodyMass using Arm as predictor. [3]

g. Use the Brown-Forsythe Test to determine if the residuals you obtained using the regression through the origin have constant variance or not. Give the value of the statistic and its corresponding p-value (*Check the attached 'bf.R' function and then modify it accordingly*). Using $\alpha = .10$, write your conclusion. Does your conclusion matches with what you see in the residual plot? [8]

h. Use regression to model BodyMass using Arm and Waist as predictors. Write the regression equation. [4]

i. What is the value of the coefficient of multiple determination for the model in part (h)? Interpret the meaning of this coefficient. [4]

j. Using the regression equation you obtained in part (h), predict the BodyMass of three new individuals with Arm values of 25, 36, and 42, and Waist values of 78, 102, and 108, respectively. [5]

k. Obtain the 95% Bonferroni joint prediction intervals for the BodyMass of three new individuals with Arm values of 25, 36, and 42, and Waist values of 78, 102, and 108, respectively. Interpret your confidence intervals [6]

l. Use regression to model BodyMass using Arm, Waist, and Age as predictors. Write the regression equation. [4]

m. Using the model in part (l), fill in the ANOVA Table below: [12]

Source	Sum of Squares	DF	Mean Square	F	p-value
Regression					
Arm					
$Waist \vert Arm$					
$Age \vert Arm, Waist$					
Error					
Total					

ANOVA Table with Decomposition of SSR for 3 Variables.

n. Obtain the values of SSR($Age|Arm, Waist$) and SSR($Age, Waist|Arm$) and explain their meaning. [6]

o. Using the ANOVA table in part (m), test $H_0 : \beta_3 = 0$. Give the value of statistic and its corresponding p-value. Using $\alpha = 0.05$, write an appropriate conclusion. [5]

p. Using the ANOVA table in part (m), test $H_0 : \beta_2 = 0$ and $\beta_3 = 0$. Give the value of statistic and its corresponding p-value. Using $\alpha = 0.05$, write an appropriate conclusion. [8]