Chapter 6: Multiple Regression 1 **Name**___________________________

Brand preference. In a small-scale study of the relation between degree of brand liking (Y) and moisture content (X_1) and sweetness (X_2) of the product, the following results were obtained (data are coded):

i:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
X_{i1}:	4	4	4	4	6	6	6	6	8	8	8	8	10	10	10	10
X_{i2}:	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Y_i:	64	73	61	76	72	80	71	83	83	89	86	93	88	95	94	100

Assume that the (additive) regression model (7.1) with independent normal error terms is appropriate.

a. Find the estimated regression coefficients. $\mathbf{b}' = [$ $]$

State the estimated regression function. $\hat{Y} =$

Interpret b_1:

b. Test whether there is a regression relation using a level of significance of .01 .

H_o:

H_a:

Decision rule:

Test statistic:

P-value and conclusion:

c. Estimate β_1 and β_2 jointly by the Bonferroni procedure using 99% family confidence level.

$\mathbf{s^2\{b\}} = \begin{bmatrix} & & \\ & & \\ & & \end{bmatrix}$

Hence $s\{b_1\} =$ and $s\{b_2\} =$

Also $t(1 - \frac{\alpha}{2g}, n - p) =$

Therefore

$\leq \beta_1 \leq$

$\leq \beta_2 \leq$

d. Coefficient of multiple determination: $R^2 =$

Interpret R^2:

e. Find coefficient of simple determination between Y_i and $\hat{Y}_i$: $r^2_{Y\hat{Y}} =$

f. Obtain an interval estimate of the mean response $E\{Y_h\}$ when $X_{h1} = 5$ and $X_{h2} = 4$. Use a 99 percent confidence coefficient.

point estimate: $\hat{Y}_h =$ $s\{\hat{Y}_h\} =$

$t(1 - \alpha/2, n - p) =$ ______ $\leq E\{Y_h\} \leq$ _______

Interpret your interval estimate (in plain English):

g. Obtain a prediction interval for a new observation $Y_{h(new)}$ when $X_{h1} = 5$ and $X_{h2} = 4$.
Use a 99 percent confidence coefficient.

point estimate: $\hat{Y}_h =$ $s\{Y_{h(new)}\} =$

$t(1 - \alpha/2, n - p) =$ ______ $\leq Y_{h(new)} \leq$ _______

h. Obtain the residuals. (Do not list then here.)

i. Plot the residuals against $\hat{Y}$, X_1, and X_2 on separate graphs. Also prepare a normal probability plot. Print the residuals and do the above plots on a separate sheet.

$Corr(e_{(i)}, E\{e_{(i)}\}) =$

Analysis of plots and summary of findings:

j. Lack of fit test. H_o:

H_a:

Decision rule:

Conclusion: