Exam No. 2 on Topics from 2 through Chapter 4 (1 hour)

Using data for 40 top television markets, the following model was estimated:

$$\text{SUB} = b_1 + b_2\text{HOME} + b_3\text{INST} + b_4\text{SVC} + b_5\text{TV} + b_6\text{AGE} + b_7\text{AIR} + b_8\text{Y} + u$$

where

SUB = Number of subscribers to cable TV (thousands)
HOME = Number of homes passed by each system (thousands)
INST = Installation fee ($)
SVC = Monthly service charge ($)
TV = Number of signals carried by each cable system
AGE = Age of the system in years
AIR = Number of TV signals received with good signals without cable
Y = Per capita income in the area

1. (3 + 3 points) State the null and alternative hypotheses that will enable you to test the model for overall significance.

2. (3 points) You are given that TSS = 43865.001 and ESS = 4923.914. Derive the numerical value of the test statistic for that hypothesis. (Note: you have all the information needed).

3. (2+2 points) State the statistical distribution and d.f. for the test statistic.

4. (2+2+3 points) Obtain the relevant critical value or range (for a 1 percent level of significance) and state whether you accept the null hypothesis or not. Describe in words what your conclusion from this is.

5. (7 points) Consider the hypotheses H_0: $b_i = 0$ and H_1: $b_i \neq 0$, separately for i = 2, 3, ..., 8. The following table gives the estimated coefficients and the corresponding standard errors. In each case compute the appropriate test statistic and write it in the proper column. [For the present, ignore the last column.]

	Coefficient	**Std. Error**	**Test statistic**	**Signif./Insign.**
$\hat{b}_1$	-6.808	26.7	Ignore	Ignore
$\hat{b}_2$	0.406	0.035		
$\hat{b}_3$	-0.526	0.476		
$\hat{b}_4$	2.039	2.127		
$\hat{b}_5$	0.757	0.688		
$\hat{b}_6$	1.194	0.502		
$\hat{b}_7$	-5.111	1.518		
$\hat{b}_8$	0.0017	0.00347		

6. (2+2+2 points) The test statistic has the ______ distribution with d.f. ________. The critical value or range for a 10 percent level of significance is ___________.

7. (7 points) In the above table write down for each case whether the coefficient is significant or insignificant.

8. (4 points) Based on your results, write down the names of variables which are candidates for omission from the model.

A second model was also estimated and the results are as follows:

$$\text{SUB} = 12.869 + 0.412\ \text{HOME} + 1.140\ \text{AGE} - 3.462\ \text{AIR} \qquad \text{ESS} = 5595.615$$

Use the two models to test a relevant hypothesis.

9. (2 + 2 points) First state the null and alternative hypotheses.

10. (3 points) Derive the numerical value of the test statistic.

11. (3 points) State its distribution and d.f.

12. (3 + 3 points) Derive the critical value or range and the test criterion (use 10 percent level this time) and state the conclusion in words.