Midterm

Duration: 110 Minutes
Name: ____
Student I.D.:__________________________________
____
Questions
1:__________________

2:__________________

3:__________________

4:__________________

5:__________________

6:__________________

7:__________________

8:__________________

TOTAL:__________________

Instructions: Show work and formulas used. Final answers with no work/formulas shown receive 0 credit.

1) If two random variables x and y have covariance equal to 2; x has mean 7; y has mean 3; then what is the expected value of xy? If instead x and y were independent of each other, what would be the expected value of xy? Be careful to write out the formulas and derivations you use. Marks will not be given for guesses.
[10pts]

2) Consider the regression $y = X\beta + \epsilon$ where y is n by 1, and X is n by 3.
a) Suppose you had estimated β with $\hat{\beta}$. How would you estimate $\gamma = \beta_2 + 2\beta_3$ without re-running the regression?
b) Prove your estimator of γ is unbiased, stating clearly any assumptions you need to make.
[10pts]

3) State with reason whether the following statements are true, false or uncertain. Be precise.
a) If I had a normally distributed statistic which was 2 standard deviations from what I expected, I would not be surprised.
b) If a null hypothesis is not rejected, it is true.
c) The conditional and unconditional means of a random variable are the same things.
d) If the disturbance term in the equation $y = x\beta + \epsilon$ is normally distributed then the OLS estimators will be unbiased.
e) Under the CLRM conditions the OLS estimator is BLUE. That means there is no better estimator that could be used.
[20pts]

4) Write down a model you can use OLS to estimate, and one you cannot estimate with OLS. Explain.
[10pts]

5) In what way are dummy variables and the Chow test related?
[10pts]

6) What is the difference between maximum likelihood estimation (MLE) and OLS estimation? Is there a case where the two are the same? Are there differences between MLE and OLS estimators' properties?
[10pts]

7) Suppose

$$lnQ = \beta_1 + \beta_2 lnL + \beta_3 lnK + \beta_4 lnI + \epsilon$$

and we wished to test the restrictions $\beta_2 + \beta_3 + \beta_4 = 2$ and $\beta_1 = 0$. Write down these restrictions in the $R\beta = c$ form making explicit what R, β and c are. If Q was quantity, L labour, K capital and I investment, do these restrictions make any economic sense? Explain.
[10pts]

8) Suppose I were interested in whether or not the Molson Indy, a race run every summer in Vancouver for the past 5 years, significantly increased annual tourism in Vancouver and I had annual tourism data for the last 30 years. Suppose I believed tourism revenues (R_i) in Vancouver were a function only of the number of hotel beds (h_i) in the lower mainland and the number of sunny days per year (s_i). Write down a sensible model which could be used to test the significance of the Molson Indy. As an economist, would you think that this analysis of the Indy's impact on Vancouver — this assessment of its benefits to tourism revenues — be sufficient? Suggest a further step you could take if you think a further step should be taken.
[10pts]