Hint for Monte Carlo Exercise:

Monte Carlo analysis is often used to study the finite sample properties of estimators by simulating a large number of samples from the model. In this particular question, the technique is used to study the properties of OLS, GLS, and FGLS estimators in case of homoscedastic and heteroscedastic variance covariance matrix. Along with confirming the inefficiency of OLS estimator in case of heteroscedasticity, you are also asked to compute some test statistics for hypotheses testing.

**Remark 1** *To keep your random sample "fixed or comparable" everytime you run the program, use the command in Matlab "state' or 'seed' prior to Matlab6.*

*e.g. rand('state', 0); set the state to be 0 (let's synchronize it to be 0 for grading purpose) such that each time the computer will generate the same set of random numbers. Do it ONCE on the top of the program only!*

The Monte Carlo exercise assumes we know the underlying parameters $(\beta, \sigma^2)$, and then we can generate some random samples given the distribution assumption. You are given three different sample sizes $n = 100, 400, 1600$ and three different $\sigma^2 = 0.5, 1, 2$. I believe it's more convenient to store your generated observations, as well as your output results in form of vectors, matrices or even arrays, if you like.

**Remark 2** *Remember when it comes to programming and computing time, matrix operations run much faster than loop procedures. Another advantage is that you can keep your code concise and reduce the risks of syntax errors substantially.*

Part b) will be on heteroscedasaticity where $\sigma_i^2 = x_i/c$. Again you are given three cases of $c = 1, 2$ and 4. Take the same set of observations $x_i$ from part a) to compute the $\sigma_i^2$. [otherwise the generated $\sigma_i^2$ will not only change w.r.t. $c$ but $x_i$ also].

Part c) goes further to develop the FGLS and GLS. Matlab offers some quick commands to calculate some of the statistics asked.

Part d) asks for a comparison on results you got in a and b. So, the results that you obtained should come from the same set of generated random samples given each individual pair of parameter vectors. Otherwise, you are comparing apples with oranges. Do the hypothesis testing accordingly using different standard errors you obtained from previous parts.