Hand your completed quiz in before the due date. Do not forget to write down your name and student ID number. Marks will be awarded for this quiz based on the clarity of your answers. The marker will pay close attention to the logic of your answers. Please show all your working.

Q.1 Suppose that you fit the model\[ \hat{y} = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 \]
to 15 data points and found $F$ equal to 57.44.

(a) Do the data provide sufficient evidence to indicate that the model contributes information for the prediction of $y$? Test using the 5% level of significance. (Use $F$-test.)

(b) Use the value of $F$ to calculate $R^2$.

Q.2 In order to study the relationship of advertising and capital investment with corporate profits, the following data, recorded in units of $100000$, were collected for 10 medium-sized firms in the same year. The variable $y$ represents profit for the year, $x_1$ represents capital investment, and $x_2$ represents advertising expenditures.

\[
\begin{array}{c|cccccccccc}
 & 15 & 16 & 2 & 3 & 12 & 1 & 16 & 18 & 13 & 2 \\
\hline
y & 25 & 1 & 6 & 30 & 29 & 20 & 12 & 15 & 6 & 16 \\
x_1 & 4 & 5 & 3 & 1 & 2 & 0 & 4 & 5 & 4 & 2 \\
x_2 & & & & & & & & & & \\
\end{array}
\]

(a) Using the model $\hat{y} = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3$ and Excel (Regression), find the least-squares prediction equation for these data.

(b) Use the $F$-test to determine whether the model explains the data well at the level of significance 0.99.

(c) Does advertising expenditure $x_2$ contribute significant information for the prediction of $y$ at the 95% significance level? (Use $t$-test.)

(d) Calculate the coefficient of determination $R^2$ (or just read off from your Excel output). What percentage of the total variation is explained by the model?

Q.3 (Submit this part in January, up to 3 students/pairs have a chance to win) Pick any data you like (from internet, books, papers, etc.). Formulate a multiple regression model and conduct a regression analysis with Excel. Try to find interesting data. If your result looks interesting, you will be asked to present the result in class and will get extra 5 marks to your final grade. You can work individually or in a pair. If you work in a pair, only one student in the pair needs to write the answer: the other just writes the name of your collaborator.