Quantum Information course 2019
Second hand-in assignment
Chapters 2, 3 & 4
Hand-in deadline Friday May 10th *[1]

Exercises 2.70, 2.72 & 3.8 (please hand in your solutions to Peter Samuelsson)

Exercise 4.39, page 139 (please hand in your solution to Stefan Kröll)
Please note that your solution should consist of only CNOTs and single qubit operations as requested. (In particular note that C-C-NOT is a three-qubit operation and your answer should not contain any three-qubit operations!) However, you do not need to explicitly decompose the matrix

$$U = \begin{pmatrix} a & c \\ b & d \end{pmatrix}$$

into single qubit operations. Instead you may base your answer on a generic U.

Exercise 4.51, page 210 (please hand in your solution to Stefan Kröll)
There may be several ways to solve this problem. If part of your approach is to rewrite exp(-iΔtH), where H is of the form H=A⊗B⊗C, as

$$e^{-i\Delta tH} = 1 + (-i\Delta tH) + (-i\Delta tH)(-i\Delta tH)/2! + \ldots,$$

it can be useful to know that

$(A \otimes B \otimes C)(D \otimes E \otimes F) = (AD) \otimes (BE) \otimes (CF)$, where A, B, C, D, E and F are matrices and ⊗ stands for tensor product.

[1] *If handed in too late you might have to solve and hand in additional problems