Task 1
Using heuristic reasoning show the dimensions of a 3-stage switching fabric if it is to be non-blocking. Use symmetric switching fabric with equal number of inputs $(N)$ and outputs $(M)$. A switch has $m$ or $n$ inputs which are grouped to $x$ or $y$ groups. Assume that a first (and a third) stage switch may be connected only once to a single second stage switch. Start from the worst-case scenario where all of the inputs but one on a particular primary switch $A$ and all of the outputs but one on a particular tertiary switch $B$ are each connected via a different secondary switch matrix. Count also the number of cross-points for the switching matrix. Assume in all cases that $N = M$, $n = m$ and $x = y$.

Task 2
Compute the crosspoint complexity and the logical depth (the number of logical gates in a path) for the following networks:

A) The full $N \times N$ crosspoint switch.
B) The three stage rearrangeable Clos network constructed using $\sqrt{N} \times \sqrt{N}$ switches.
C) The Benes network

(Hui: Chapter 3, Exercise 1 a, b and c)

Task 3
Consider the crosspoint complexity of three-stage Clos networks.
A) Show that the strict-sense network has roughly twice the complexity of the rearrangeable network.
B) For the rearrangeable network, show that the optimal choice of $p$ (figure 12 of Hui) for minimizing crosspoint count is $\sqrt{N/2}$, which gives a crosspoint complexity $2 \cdot \sqrt{2N^{3/2}}$.
C) For the strict-sense network, show that the minimum crosspoint count is roughly given by $4 \cdot \sqrt{2N^{3/2}}$.

Hui: Chapter 2, Exercise 2abc, 5ab