Exam Questions	Aalto University School of Electrical Engineering
DISTRIBUTED GENERATION TECHNOLOGIES	COURSE CODE: **ELEC-E8424**

Q1: Explain 5 types of the supportive functionalities that can be provided by DG technologies for the power grid? (5 %)

Q2: Figure 1 shows the active power sharing between the main grid, load and DG. DG is connected to the grid at t=0.1 sec and supply the load power.
At t=0.2 sec load increases which leads to overshoot and swing at this time (blue color). Explain why the overshoot and the swing occur at t=0.2 sec and what is your solution to minimize the overshoot and the swing. (10 %)

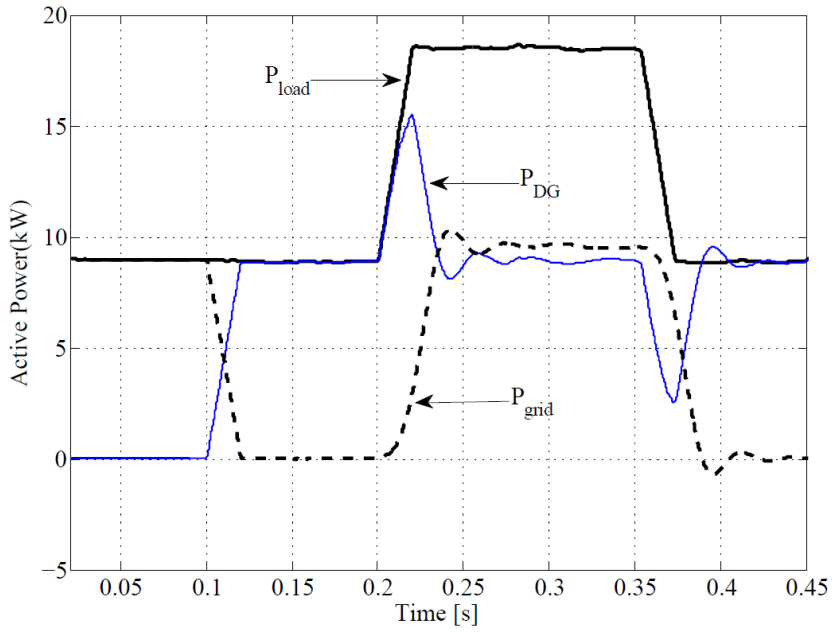

Figure 1. Active power sharing between the main grid, load, and DG.

Q3: Figure 2 shows the inner control loops of the current i_{cd} in a grid-connected converter. Calculate the values of k_p and k_i for the best transient response during the synchronization of converter with power grid. (15 %)

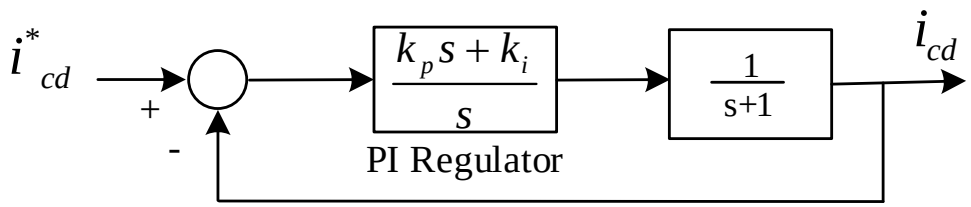

Fig. 2. Equivalent diagram of d-axis current control loop.

Q4: Figure 3 shows the general model of a grid-connected converter. Find the general dynamic equation of the proposed model. (20 %)

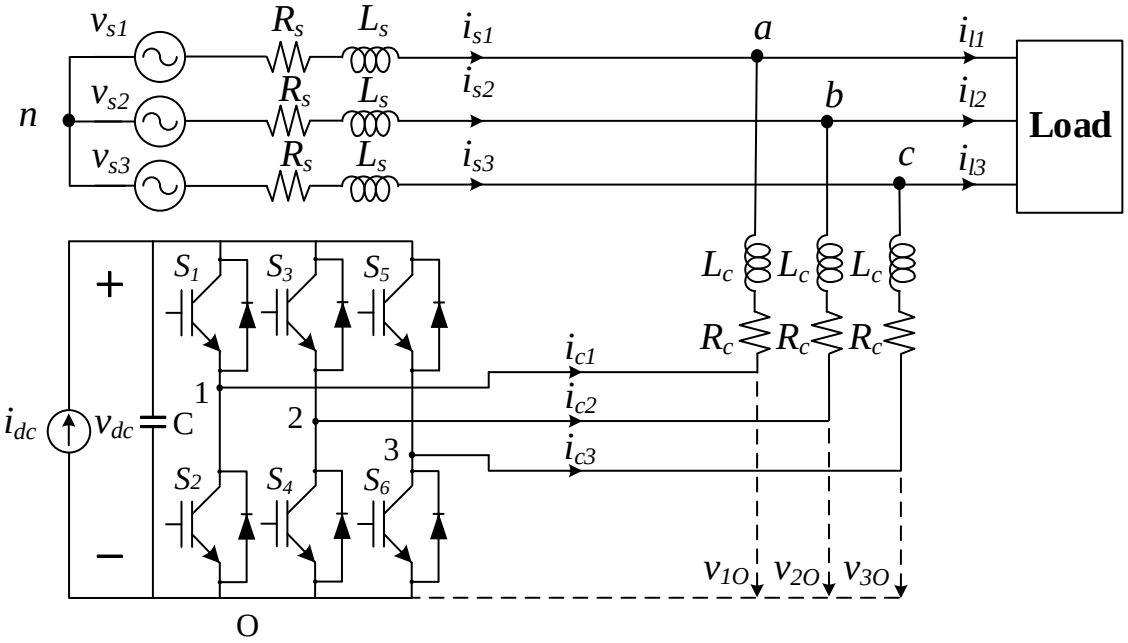

Figure 3: General model of a grid-connected converter.