

ELEC-E8422 An Introduction to Electric Energy

Homework 5 – Power Electronics:

- a) Explain shortly the basic operating principle of power electronics.
- b) Why the efficiency can be high in power electronic converters?

Solution of Homework 5:

- a) Power electronic devices are used to convert the voltage or current of the supply system suitable for the load. They consist of semiconductor devices such as diodes, thyristors, and transistors. Usually BJTs and MOSFETs are used as switches. They are made ON and OFF by using a control signal. The main operating principle of the power electronic devices can be shown in Fig. 1.

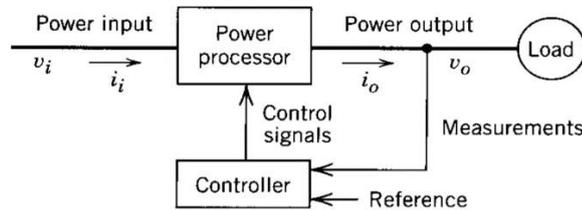


Figure 1: Block Diagram of a Power Electronic System

Power input is given to the power processor and by using the applied control signal, a power output is produced. This power output is compared with a reference signal, which is the desired power output, inside a controller. According to the comparison, new control signal is given to power processor to obtain the desired power output.

- b) In power electronics, semiconductor devices are used for the switching purposes. Ideally, these devices do not have voltage drops and they do not cause any losses. On the other hand, there is a small voltage drop across them in practice. However, they just cause small amount of losses in the system. Therefore, high efficiency can be reached in power electronic devices.