ELE613 – SWITCH MODE POWER SUPPLIES

HOMEWORK 1

**Q1)** The topology to be analyzed and simulated in this homework is a buck converter with the following specifications:

For simulations, Simulink environment is preferred and the simulation model is shown in Figure 1, below.

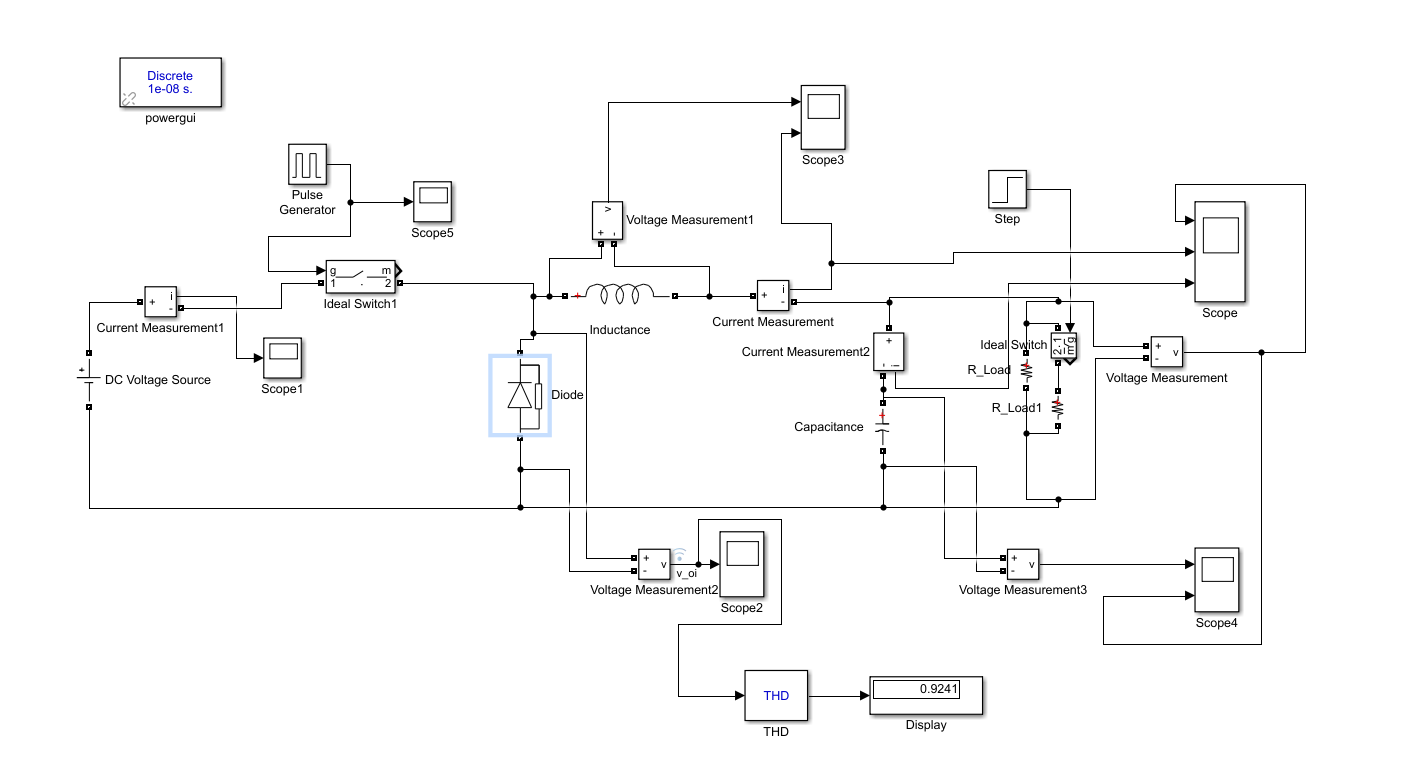


Figure 1: Simulation Model of the Buck Converter

Inductor voltage and current waveforms (for part (a)) and output voltage, inductor current and capacitor current waveforms (for part (b)) are provided in Figures 2 and 3, respectively.

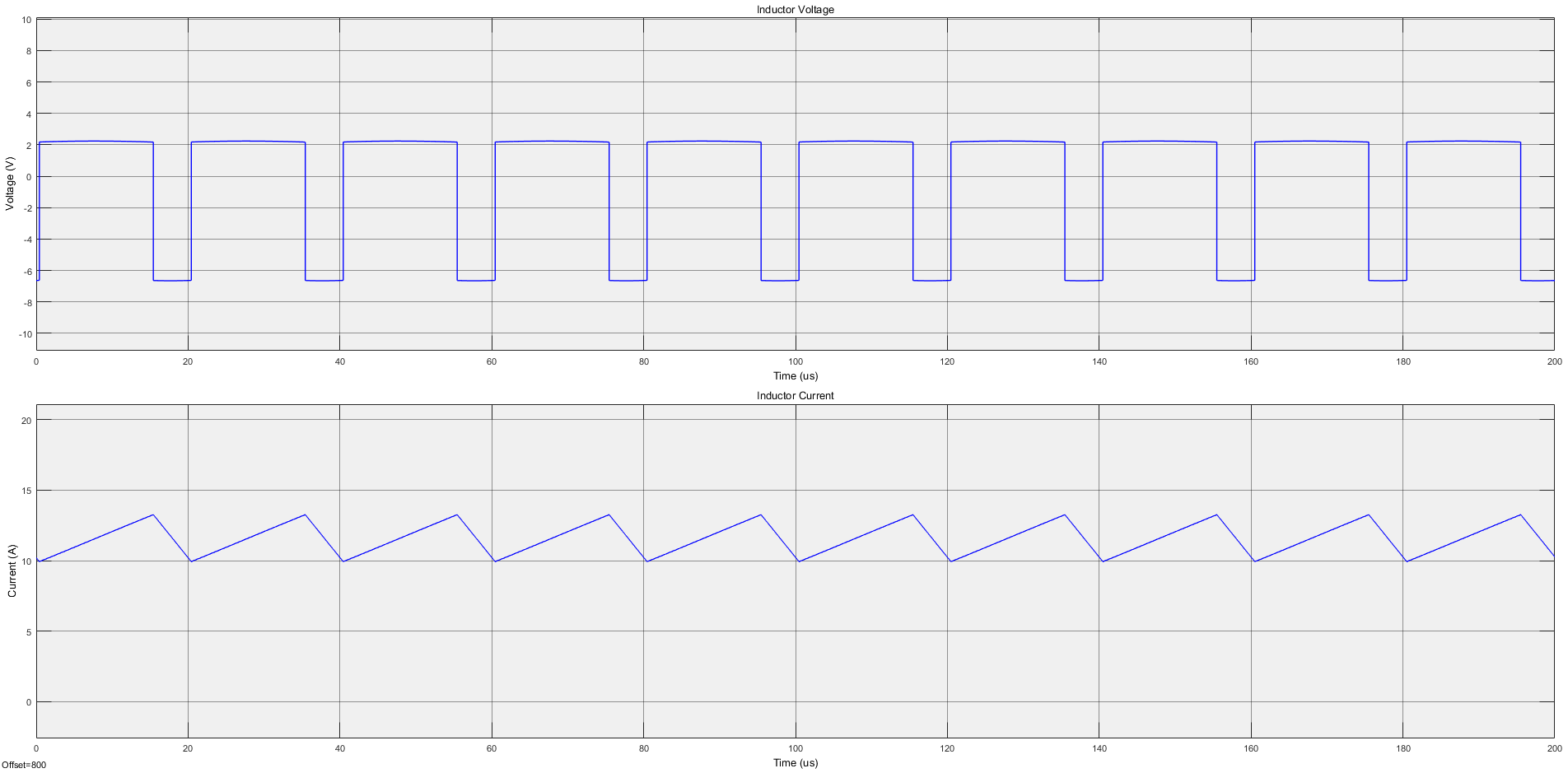


Figure 2: Inductor Voltage and Current

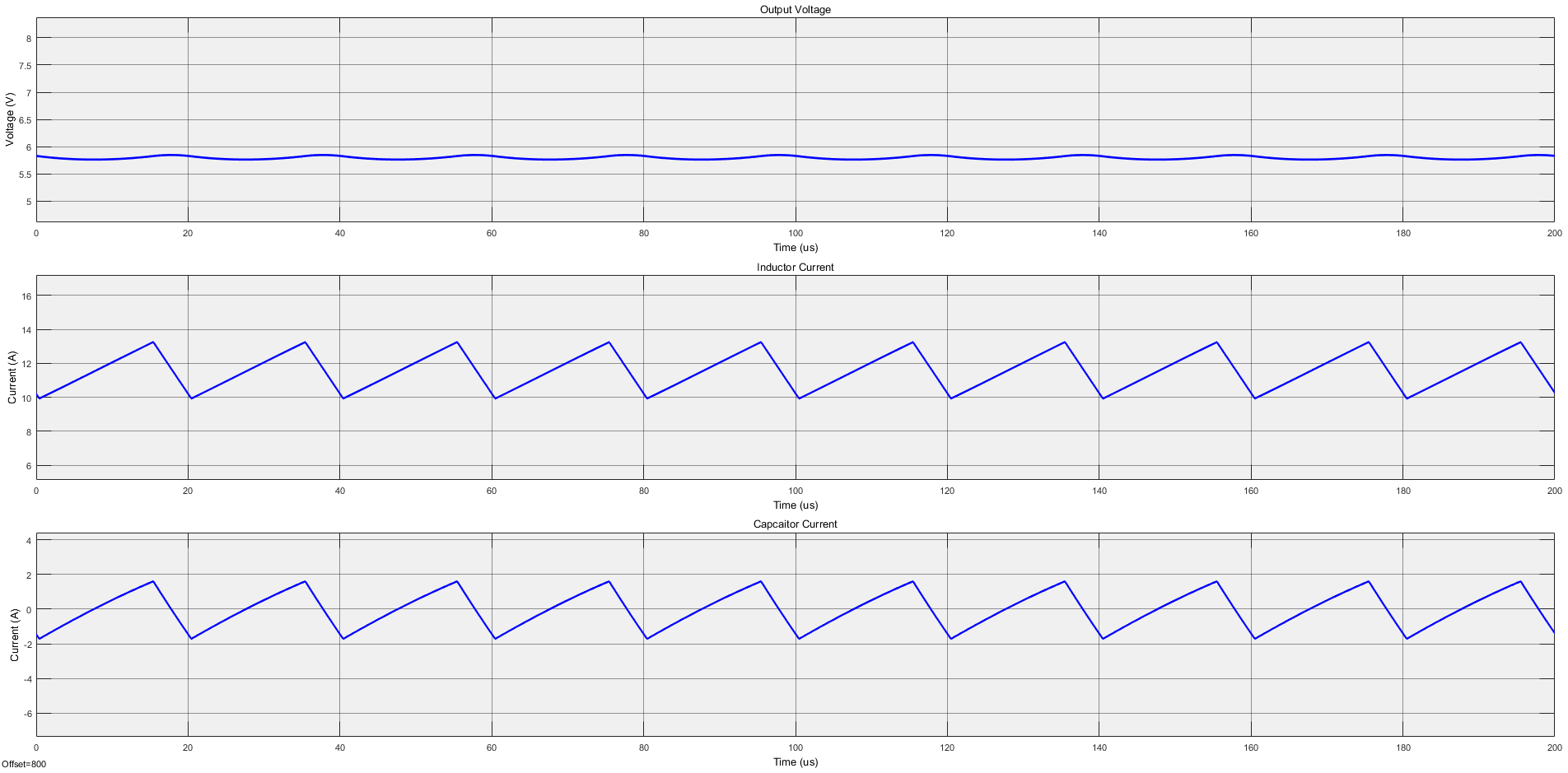


Figure 3: Output Voltage, Inductor Current and Capacitor Current

**Q2)** FFT analysis is performed using powergui toolbox of Simulink. Harmonic components are shown with respect to their orders, on the graph given in Figure 4, below.

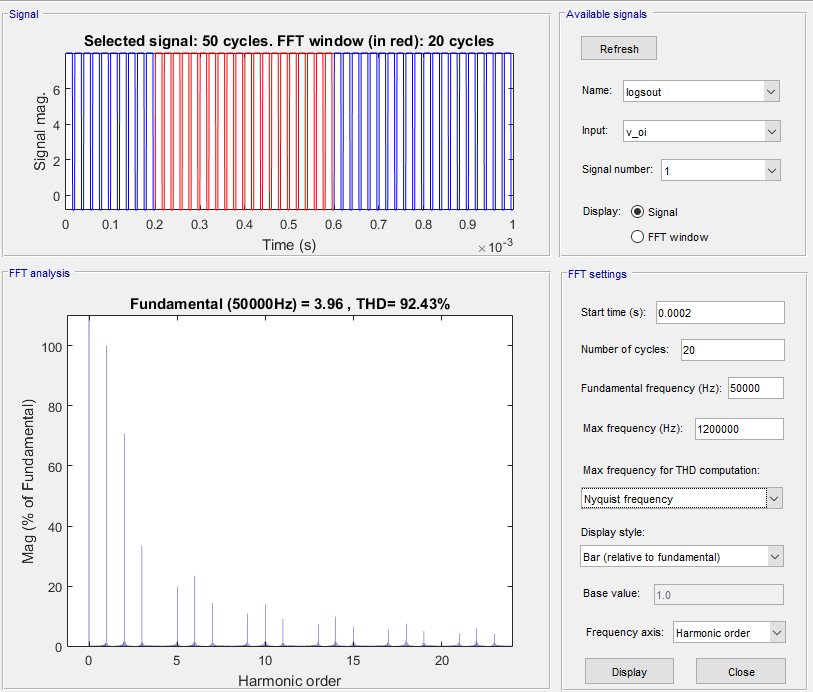


Figure 4: FFT Analysis Results

**Q3)** Discontinuous mode inductor voltage and current waveforms are given in Figure 5.

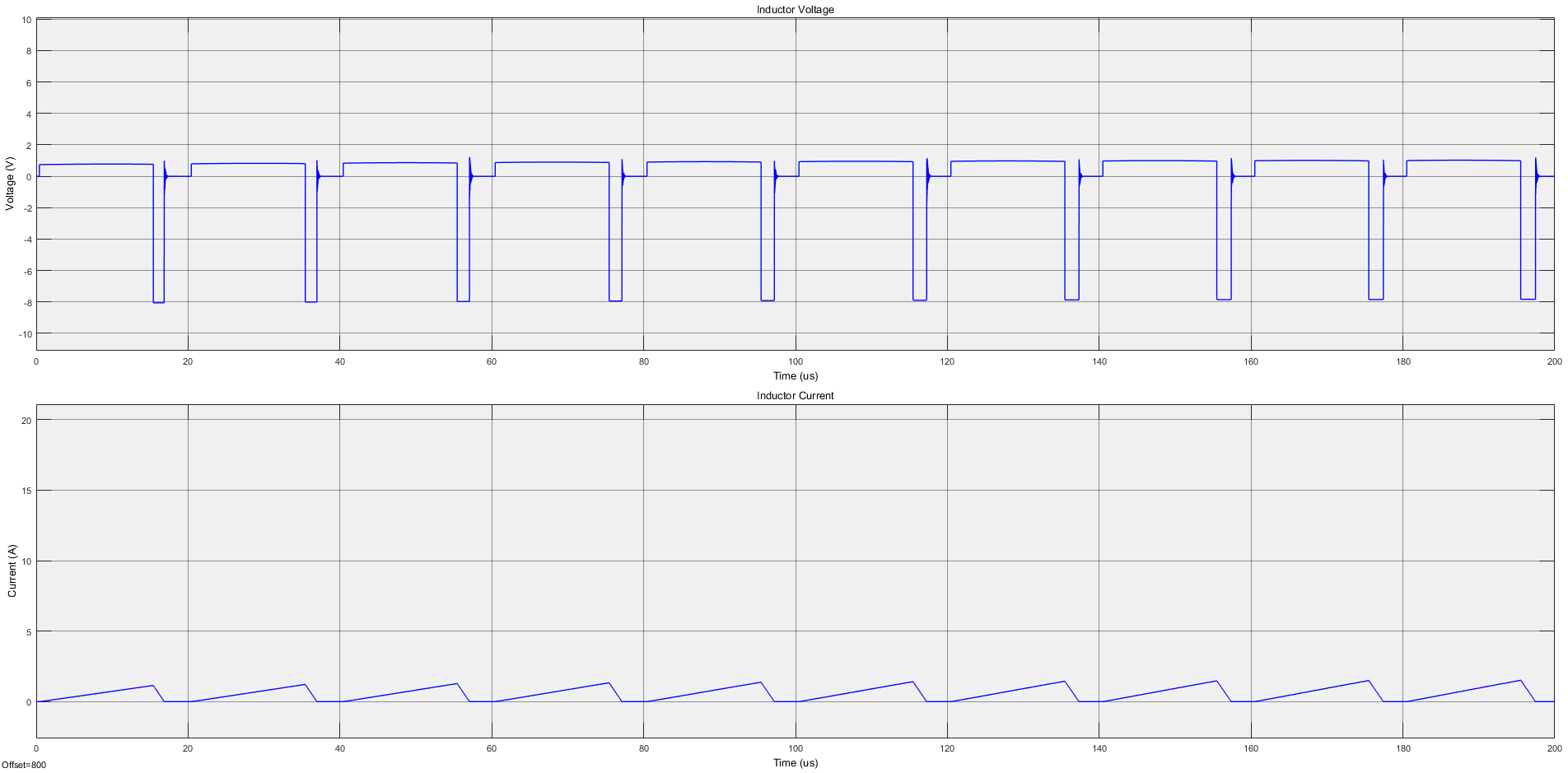


Figure 4: Discontinuous Mode Inductor Voltage and Current

Simulation results should agree with the following equation: