Control System Laboratory Report

Name and ID no. of the Student:

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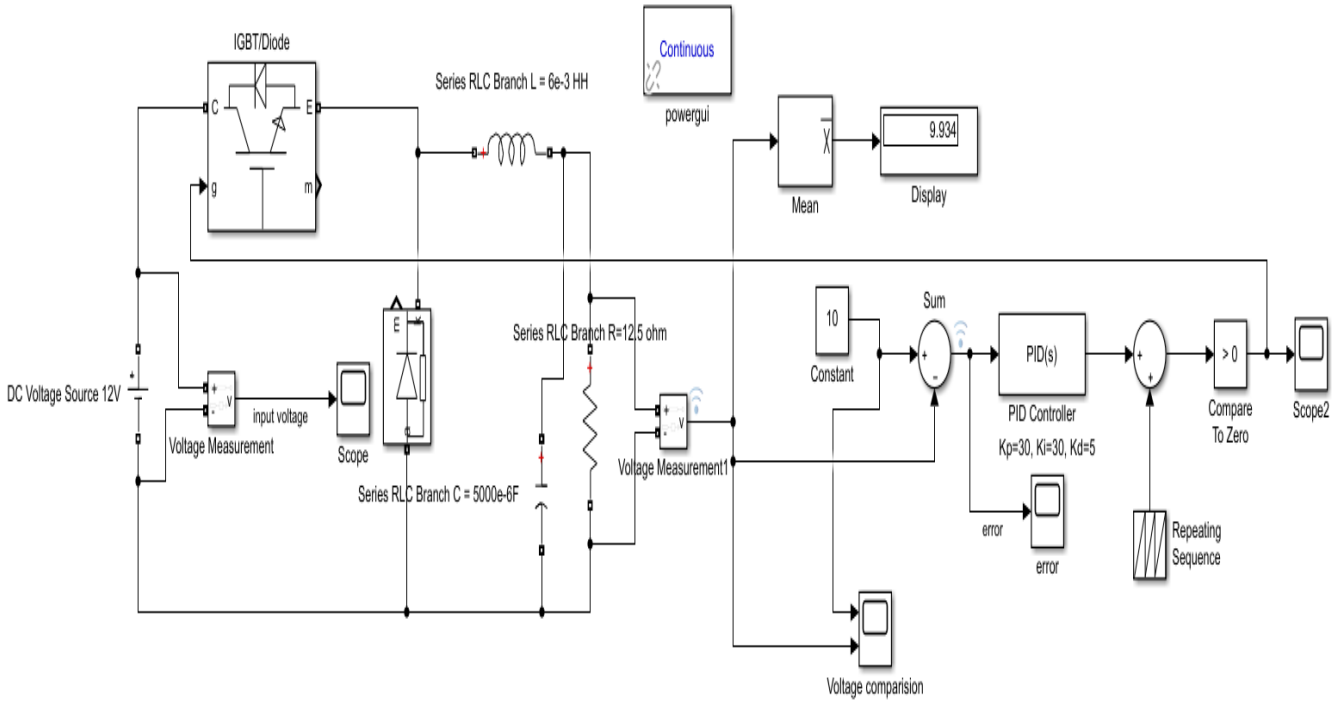
Title of the Experiment:

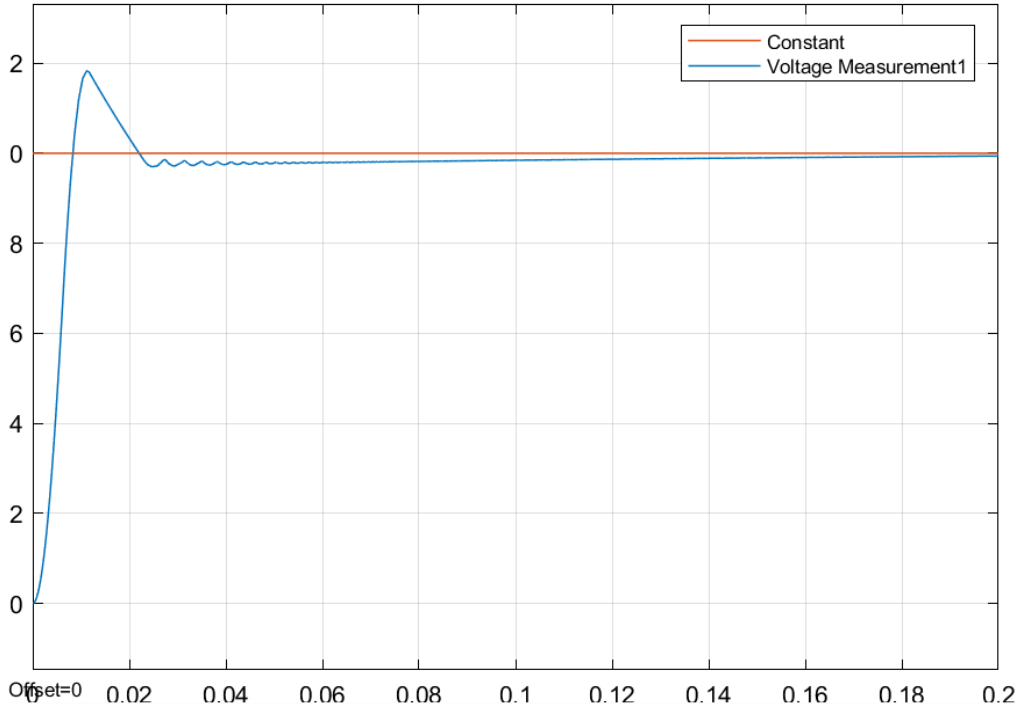
Controller design for DC-DC converters

Model/Simulation:

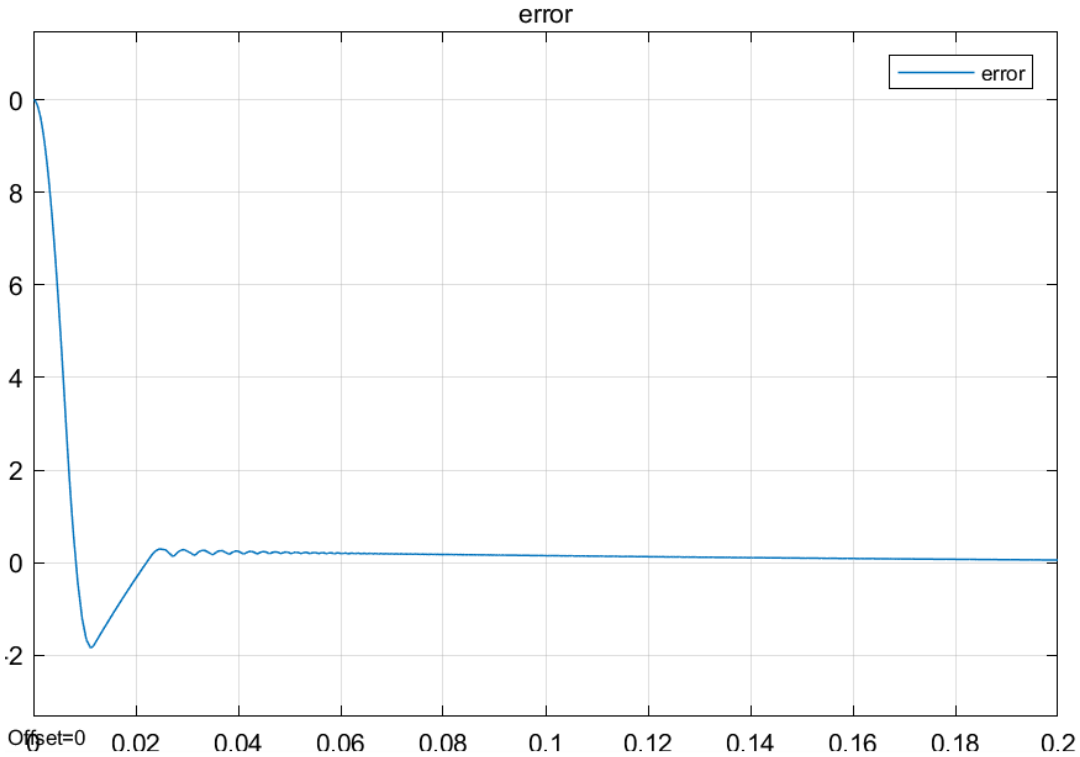


Results:

Output Voltage of Controller after using PID controller:



Error between the reference (desired) output voltage and the actual output voltage: Minimized to ‘zero’ with time after using PID controller:



Conclusive remarks:

As we can see that the input 12V DC supply is converted into 10V DC.

The Simulink model constructed above is a DC-DC converter(also known as Buck Converter) using components from Simulink and Simscape libraries. It used to convert DC voltage from one value to a lower value (if step down). The switching of the IGBT is controlled with a PID controller.

We compare the output of the PID controller with a repeating saw-tooth sequence. The IGBT must be controlled with an ON-OFF signal, hence we use a '>0' block to switching the signal to the IGBT. The inductor and capacitor are used to remove current and voltage ripples.

From the first graph, we can see that 10V has been obtained by using PID controller and other comparing constant value 10. The display block present shows 9.934V which is the average of the total voltage from the starting until 0.2s.

The second graph shows the error minimization over time using the PID controller. The error was first high but later got settled at zero when voltage got settled at ~10V.

The repeating sequence is used to repeat the signal.

DC-DC Step-down converters are used in battery chargers etc.