DEPARTMENT OF MECHATRONICS ENGINEERING

MANIPAL INSTITUTE OF TECHNOLOGY
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MANIPAL INSTITUTE OF TECHNOLOGY

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Drives, Controls and Modelling Laboratory Manual (MTE 3211)

Fifth Semester B.Tech (Mechatronics Engineering)

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REG NO: 210929156
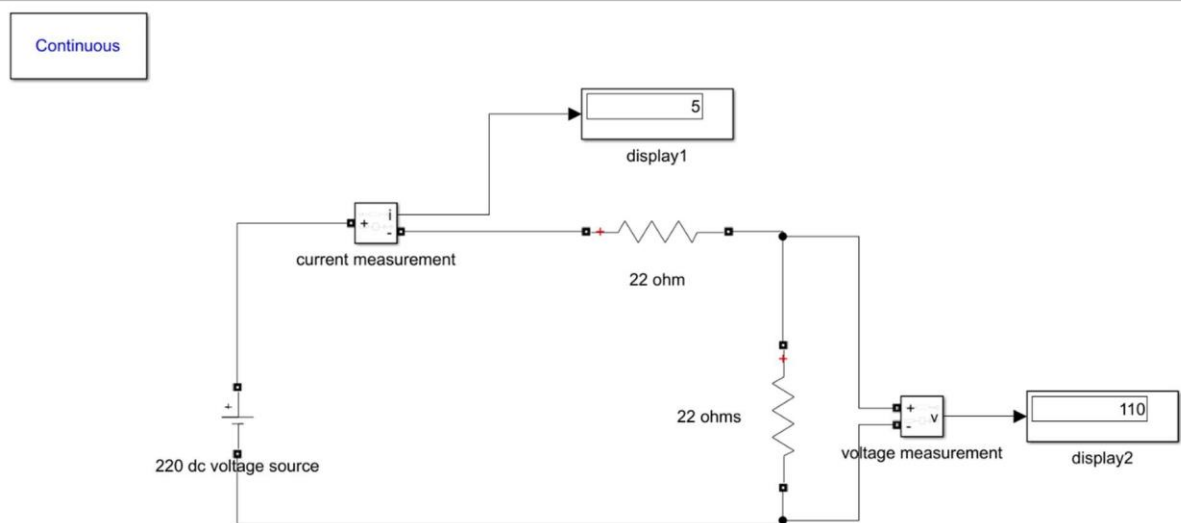
ROLL NO: 37

Experiment II:

Date:31/08/23

Open loop control of DC-DC Converters: Buck and Boost Converters
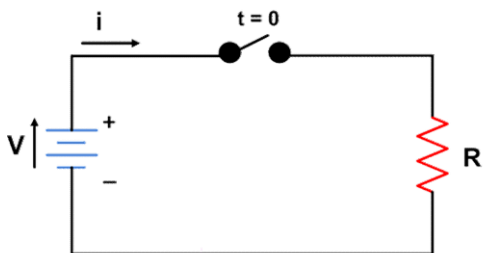
Aim:

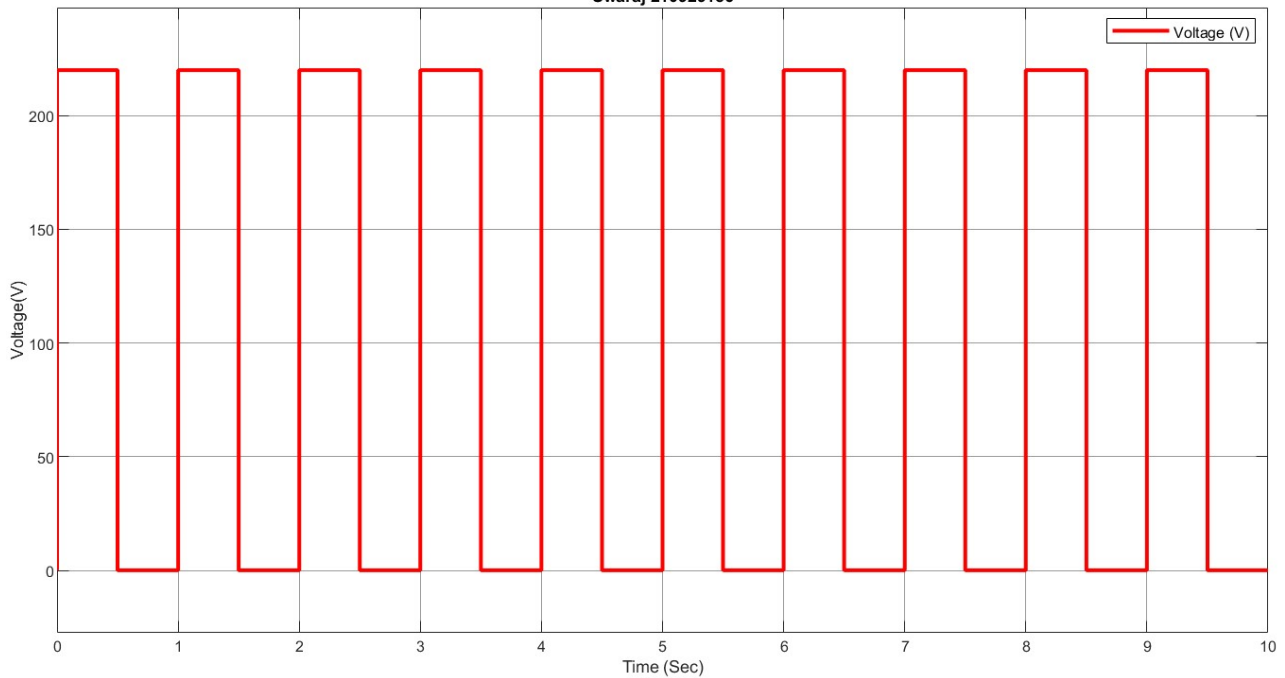To simulate the open loop control of DC-DC converters: Buck and Boost Topology

Problem 1:

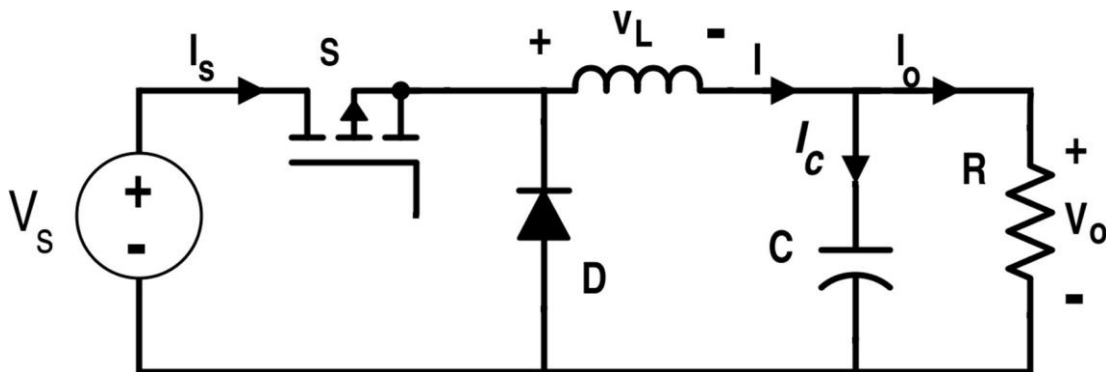Understand the concept switched mode power conversion.
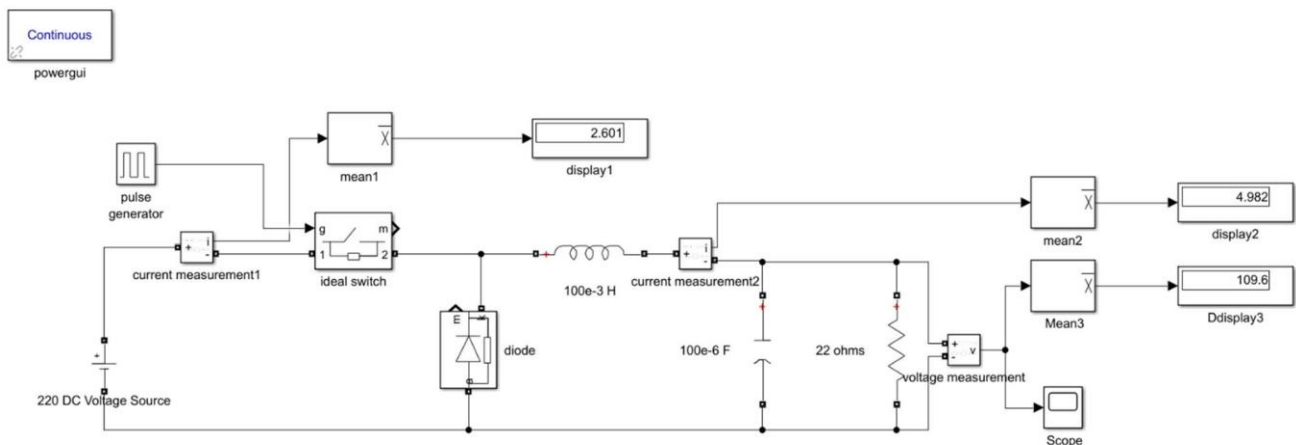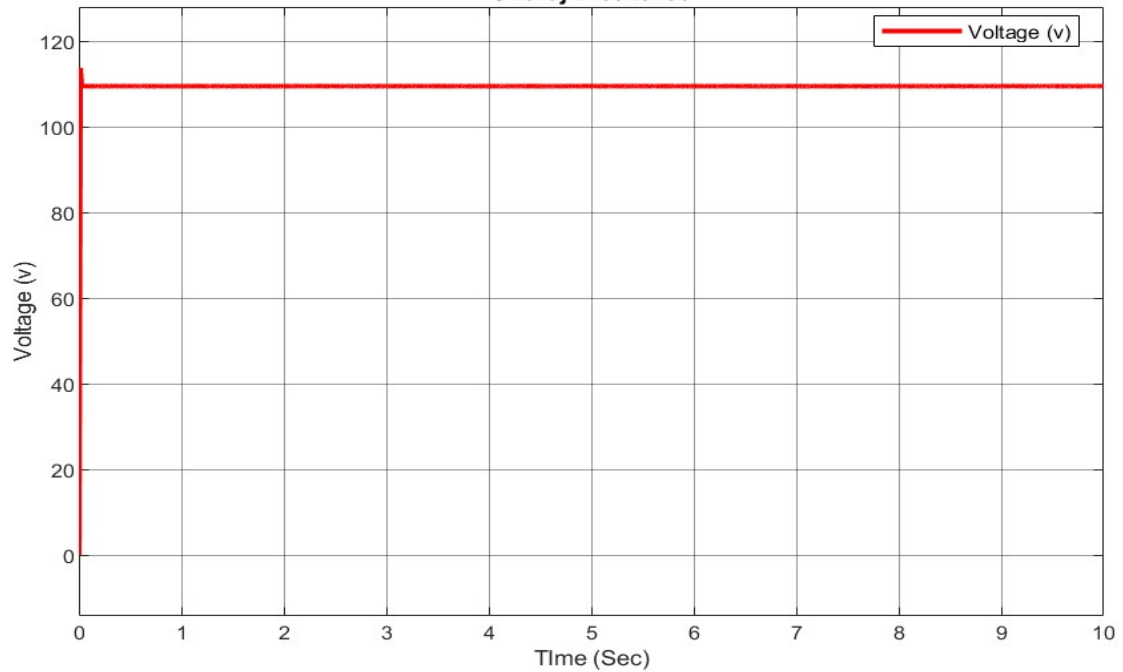

DC-DC switched converter

Problem 2:

Plot the voltage response of a Buck converter across a resistive load of 22 ohm. The source voltage is 220 V and PWM signal has 50% duty cycle and 10kHz switching frequency. Also plot the current in the circuit. Model the circuit with ideal switching devices and L = 100 $\times 10^{-3}$ H, C = 100 $\times 10^{-6}$ F. Understand the significance of efficiency improvement using switched mode power conversion.
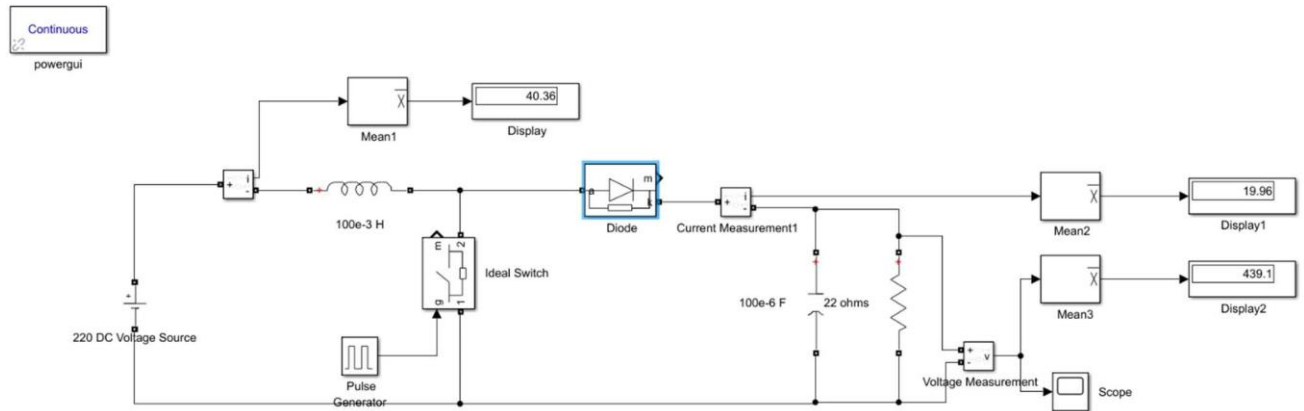
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Simulate and Plot efficiency at various output voltages of buck converter.

Problem 3:

Plot the voltage response of a Boost converter across a resistive load of 22 ohm. The source voltage is 220 V and PWM signal has 50% duty cycle and 0.1ms period. Model the circuit with ideal switching devices and L = 100×10^{-3} H, C = 100×10^{-6} F.

Simulate and Plot efficiency at various output voltages of boost converter.
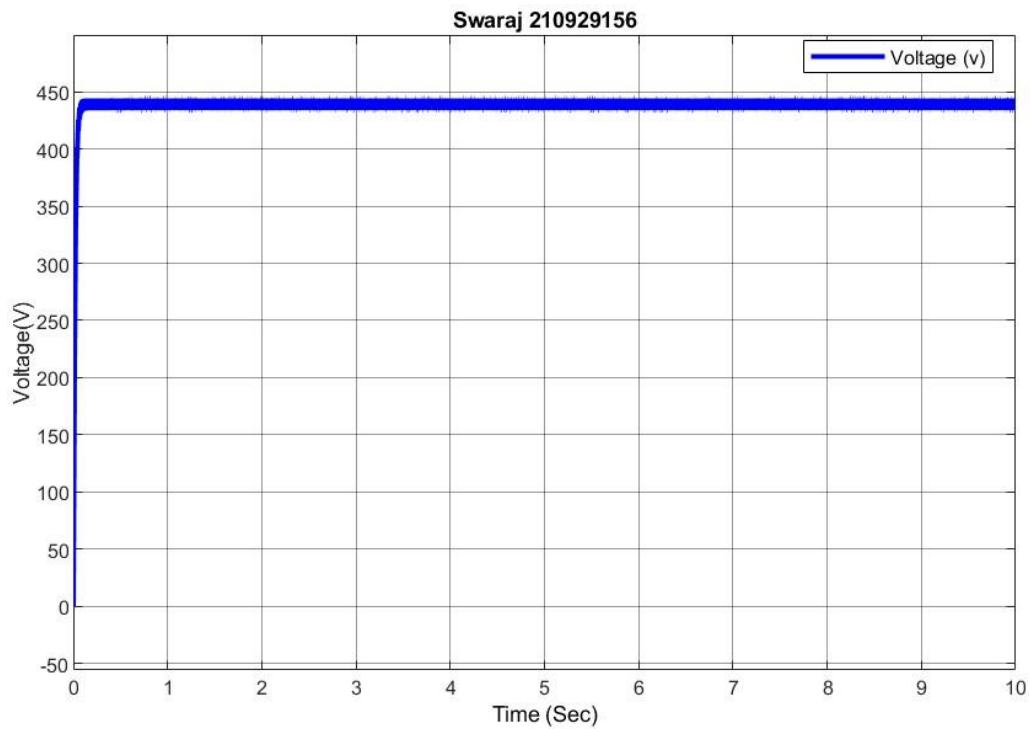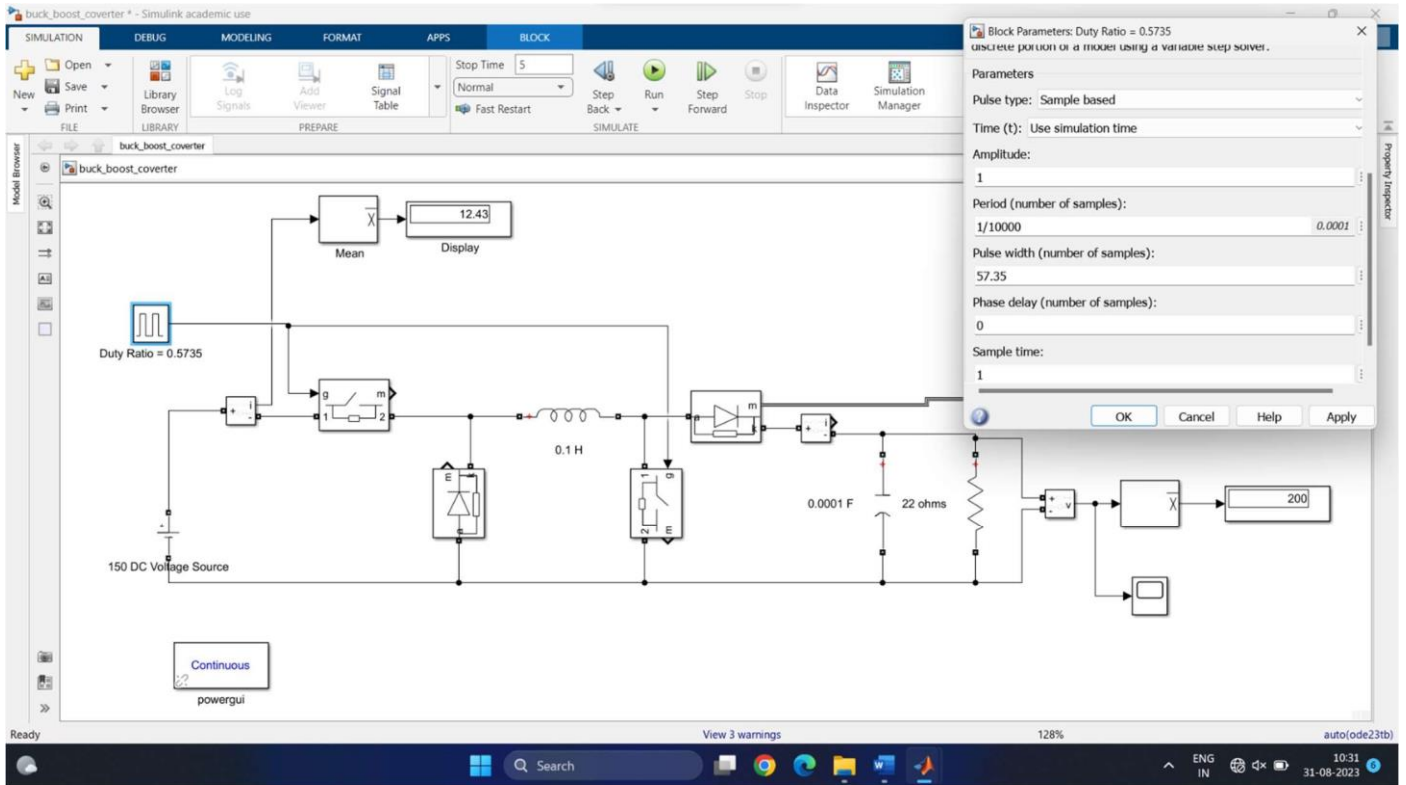

Open-Ended Lab Exercises - 2:

1. Simulate a Buck-Boost Converter with input voltage 150V and output to be variable between 100- 200 V. Identify the maximum and minimum duty ratio.

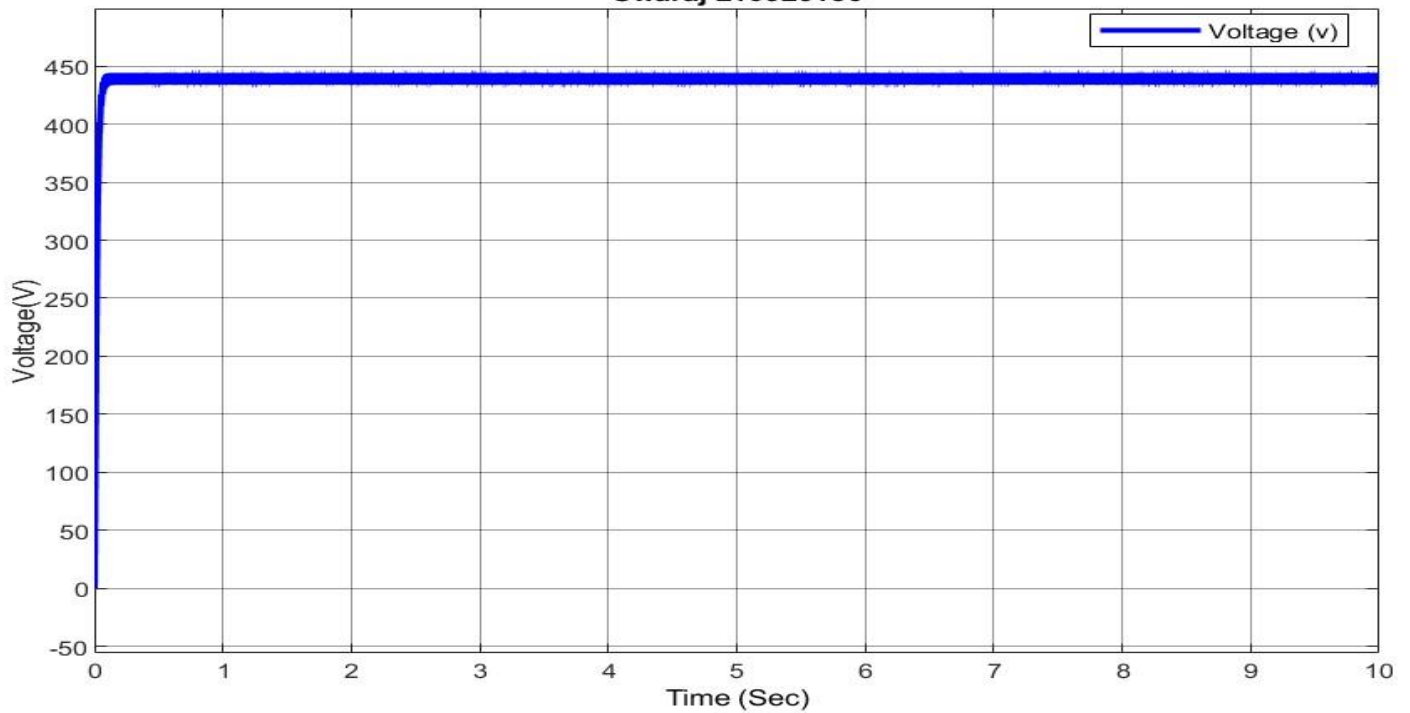   Converter parameters: 10kHz Switching frequency, L=100mH, C=100µF, Load resistance=22Ω. Simulate till 5sec.

   i.Max Duty Cycle = 57.35

[5]

II. Min Duty Cycle = 40.431

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