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Drives, Controls and Modelling Laboratory Manual (MTE 3161)

Fifth Semester B. Tech. (Mechatronics Engineering)

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DEPARTMENT OF MECHATRONICS ENGINEERING



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Fifth Semester B.Tech (Mechatronics Engineering)

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Experiment III: Open loop control of Controlled Rectifiers and Voltage Regulators

Date : 14 /09 /2023

Aim:

To simulate the open loop control of controlled AC-DC and AC-Converters.

Problem 1:

Understand the concept uncontrolled and controlled half wave rectification.

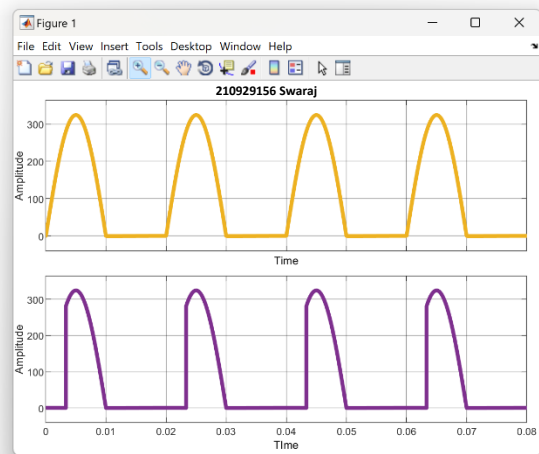
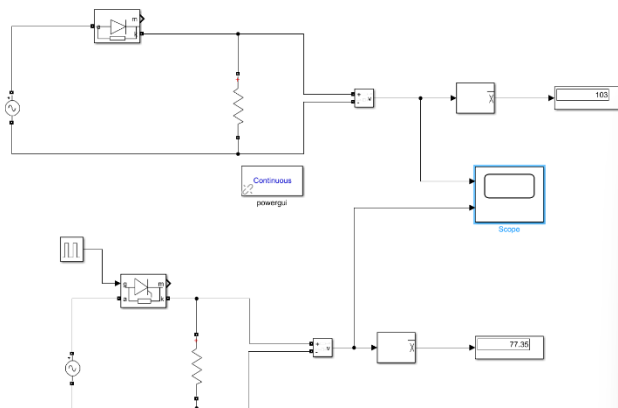
Given Data: 1ph 230V, 50Hz AC supply, Resistive load of 10Ω .

- a) Estimate the average output voltage for uncontrolled and controlled half wave rectifier and validate the same through simulation.

Half-wave uncontrolled = V_m/π Half-wave controlled rectifier, the average value of the voltage is $V_m(1+\cos(\alpha))/2\pi$

Do for $\alpha = 30, 60, 90, 280$ and show the avg output voltage - tabulate

- b) Calculate the firing angle required to meet the desired average output voltage of 100V and validate the same through simulation.



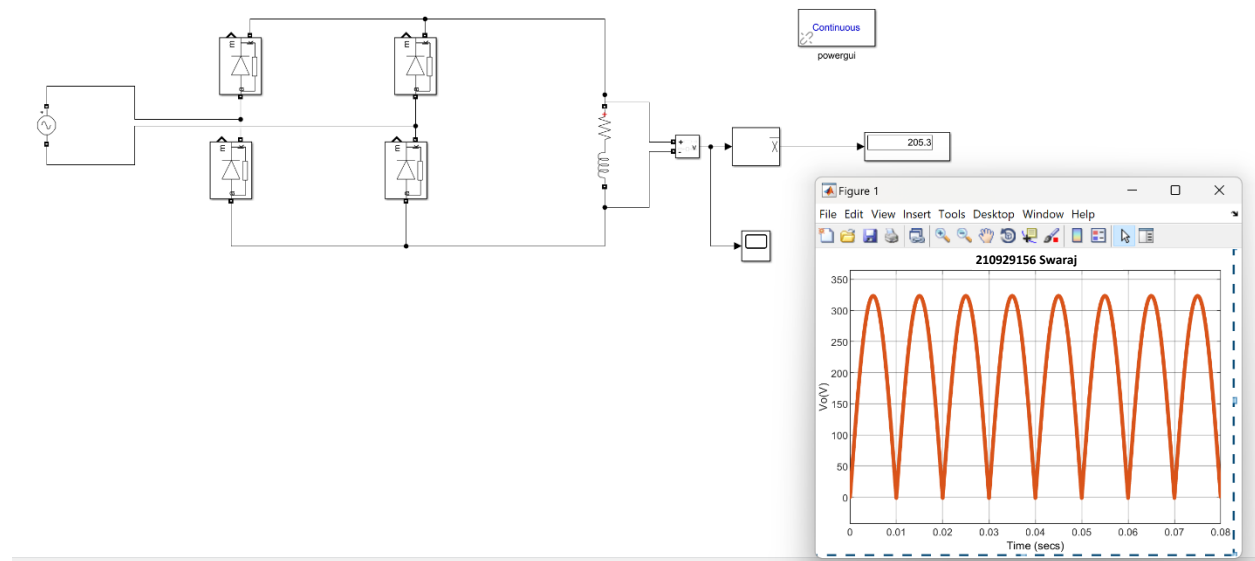
Problem 2:

Simulate the concept of full wave bridge controlled and uncontrolled rectifiers.

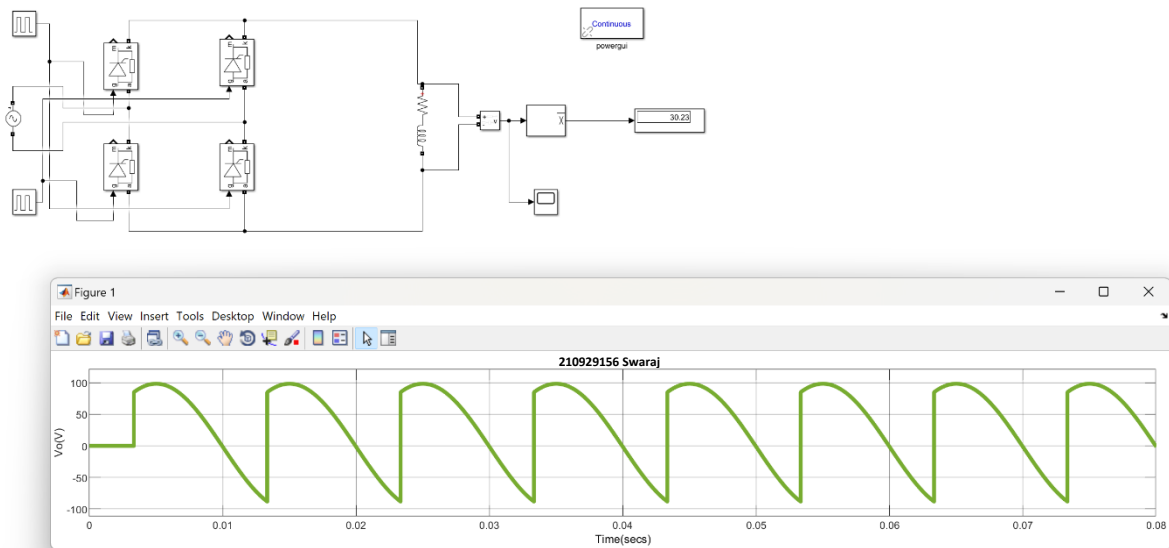
full wave bridge uncontrolled rectifiers = $V_o = 2 V_m/\pi$

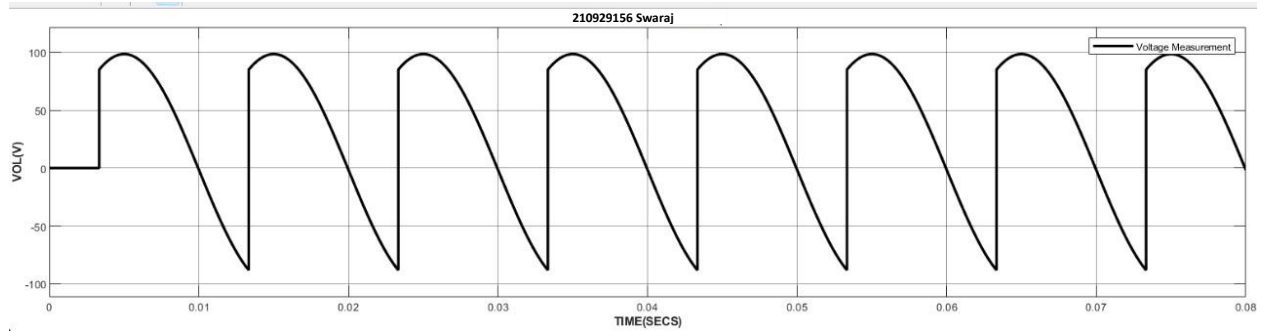
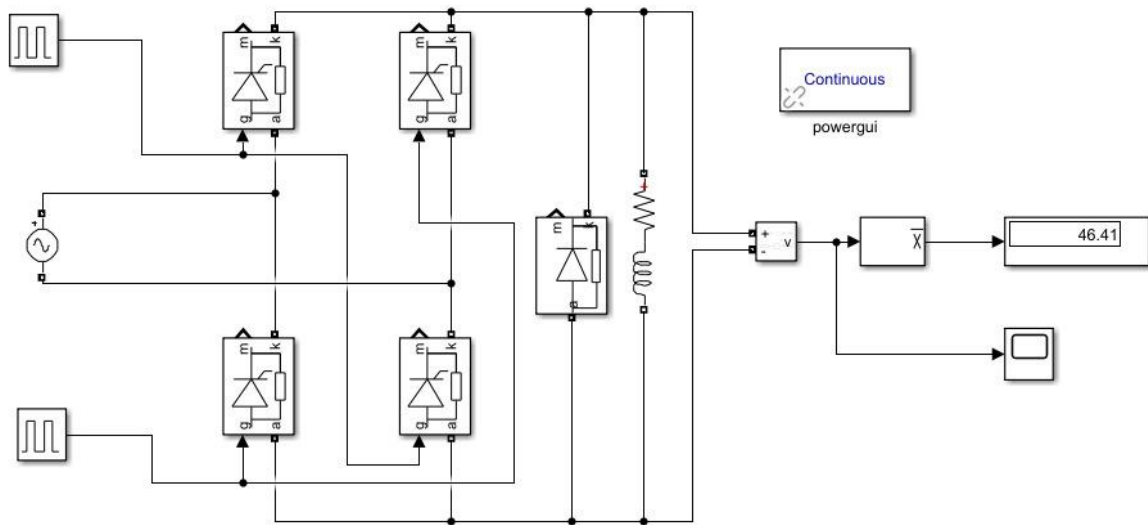
full wave bridge controlled rectifiers = $V_o = 2 V_m \cos(\alpha)/\pi$

Uncontrolled bridge rectifier



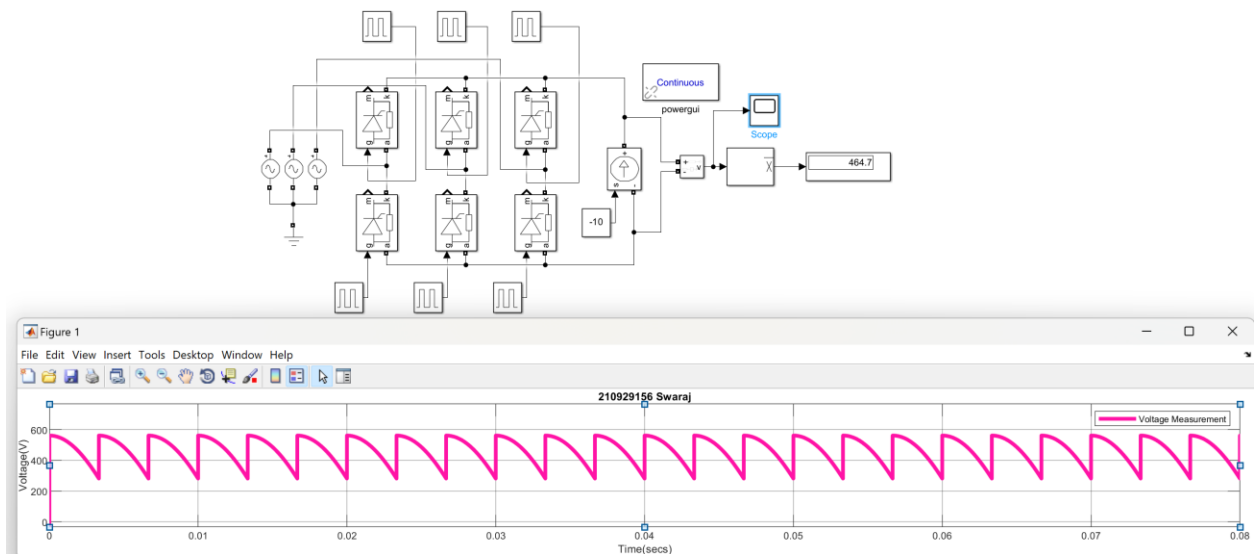
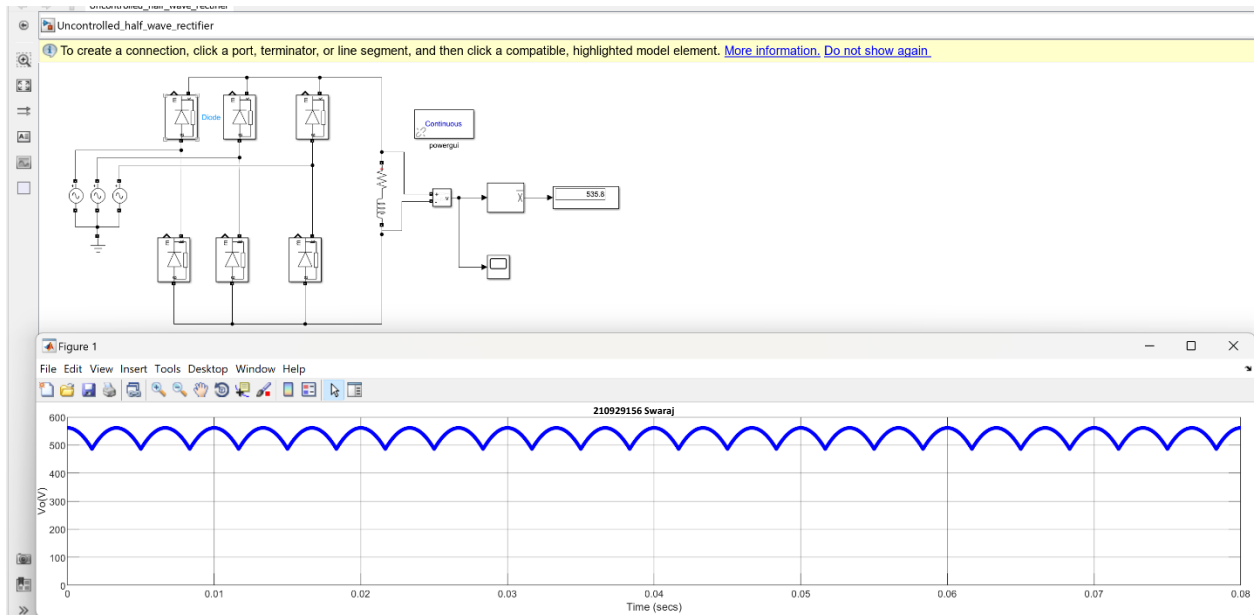
Controlled bridge rectifier





Problem 2:

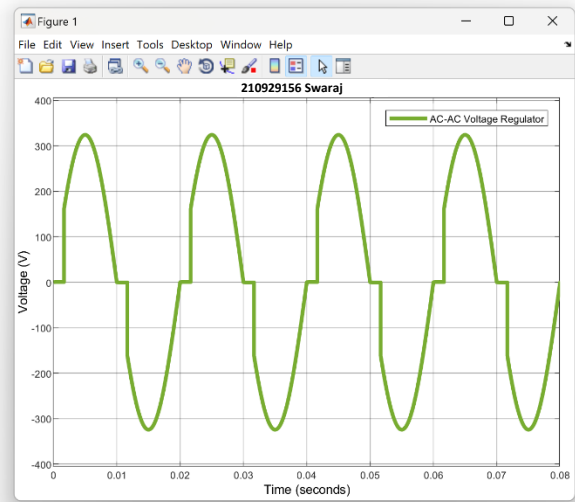
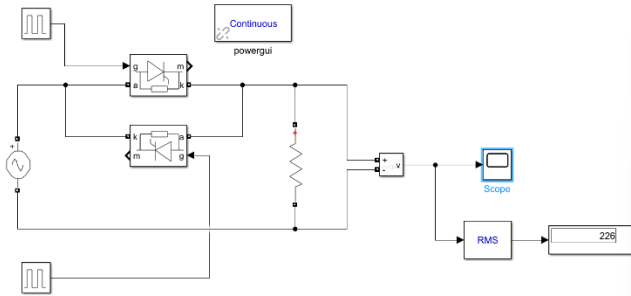
Simulate the concept of 3ph full wave bridge controlled and uncontrolled rectifiers



- Vary the firing angle between 0 and 180 deg and observe the output voltage.

Problem 3:

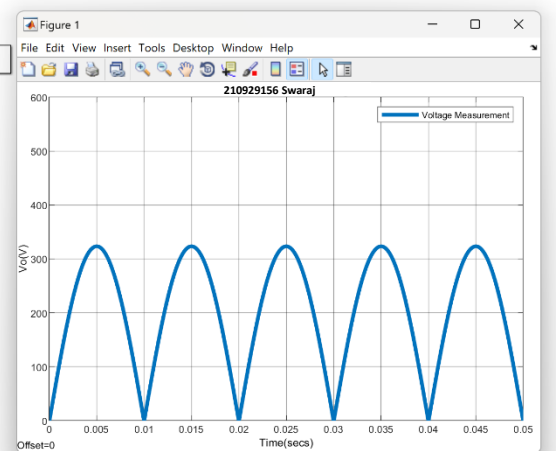
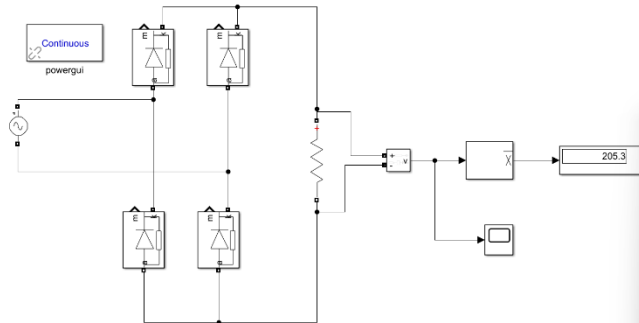
Simulate the concept of AC-AC Voltage regulator.



Open-Ended Lab Exercises - 3:

1. Simulate a full wave diode rectifier with 230V rms input AC supply connected to a resistive load of $R=32.5\Omega$.

- b) Plot the output voltage across Resistive Load.



- c) Observe the output voltage if a $4700\mu\text{F}$ capacitor is connected across the resistive load.

[5]

