Lab 5

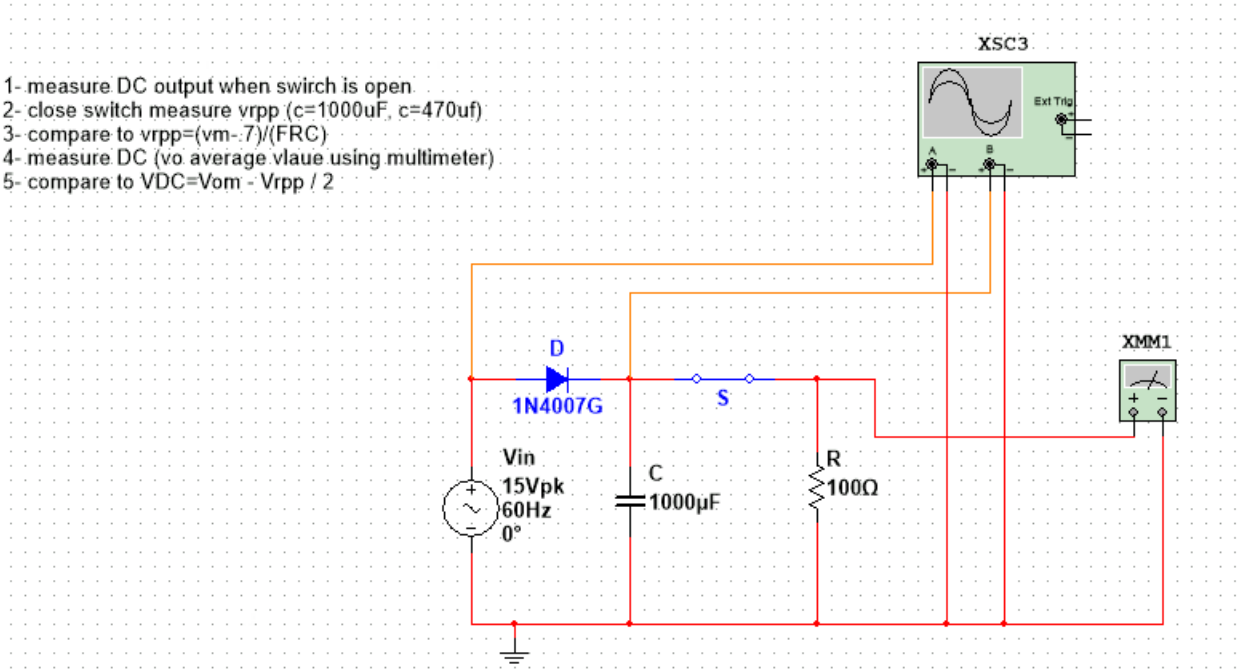
Diode Half/Full-Wave Rectifiers With Smoothing Filters

Learning outcomes

1) Learn half wave rectifier circuit with smoothing filter
2) Learn full wave rectifier circuits w/wout smoothing filter

Experiment 1) HWR circuit with smoothing filter

A) Create a new Multisim project and construct the circuit shown



B) Run the simulation as follows:

1. Check XSC3 to check the input voltage is sinusoidal 15 Vmax
2. Keeping switch S open, check output on capacitor C and measure its dc value
3. Close switch S and rerun the simulation
4. Measure the new output characteristics: Vomax, Vomin and calculate Vopp or Vrpp

   Vopp=Vrpp= Vomax - Vomin
5. Compare the measured Vrpp to the theoretical value of

$$Vrpp = \frac{Vm - 0.7}{R\ C\ F}$$

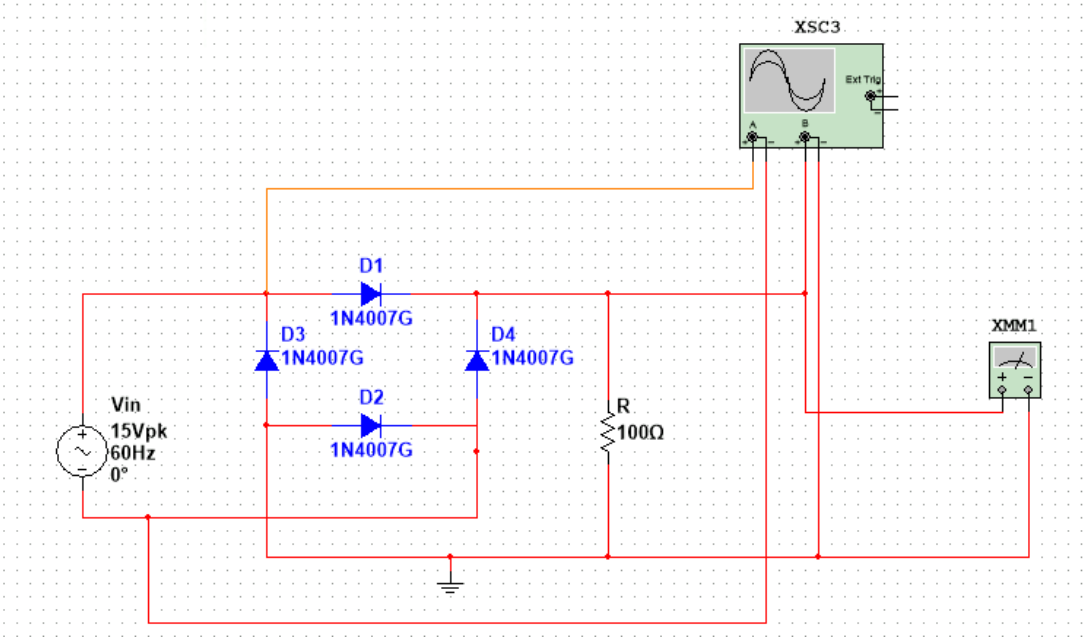
6. Measure Vo DC from the multimeter and compare it to the theoretical value of

$$Vo\ DC = (Vm - 0.7) - \frac{Vrpp}{2}$$

7. Change the C value to 470uF and redo step 4, 5, and 6
8. Why do you think there is big error in case of 470uF compared to 1000uF?

Experiment 2) FWR circuit

A) Create a new Multisim project and construct the circuit shown



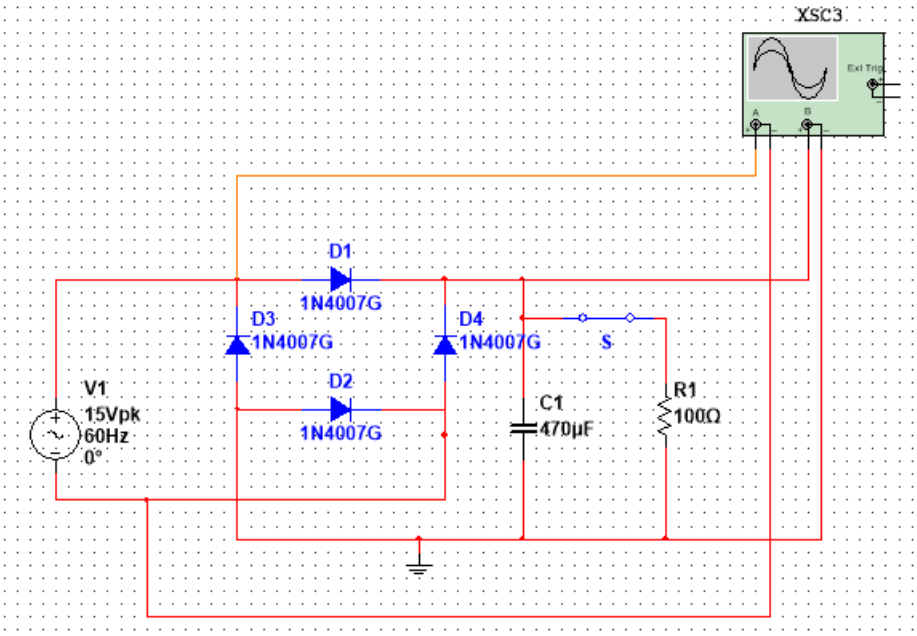
B) Run the simulation and observe the outputs on CRO

1. Check XSC2 to check the input voltage
2. Measure Vomax and compare it to Vinmax, why there is a difference between them
3. Measure the DC output voltage (DC or average) on the multimeter
4. Compare the measured DC value to the theoretical value of

$$V_{DC} = \frac{2(Vm)}{\pi}$$

Experiment 3) FWR circuit with smoothing filter

A) Create a new Multisim project and construct the circuit shown



B) Run the simulation as follows:

1. Check XSC3 to check the input voltage is sinusoidal 15 Vmax
2. Keeping switch S open, check output on capacitor C and measure its dc value
3. Close switch S and rerun the simulation
4. Measure the new output characteristics: Vomax, Vomin, and calculate
    i. Vopp=Vrpp= Vomax - Vomin
    ii. Vo DC = Vomax – Vopp/2
5. Compare the measured Vopp to the theoretical value of

$$Vrpp = \frac{Vm - 1.4}{2\,R\,C\,F}$$

6. Change the C value to 470uF and redo step 4 and 5
7. Why do you think there is big error in step 4 compared to step 5?
8. Which DC value is larger, the one from HWR or FWR (assuming C = 1000 uF) and why?