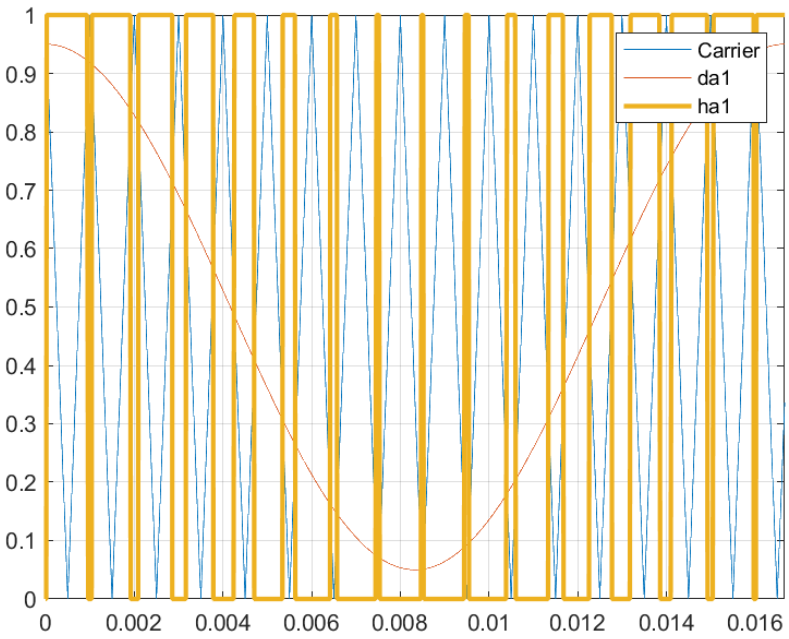
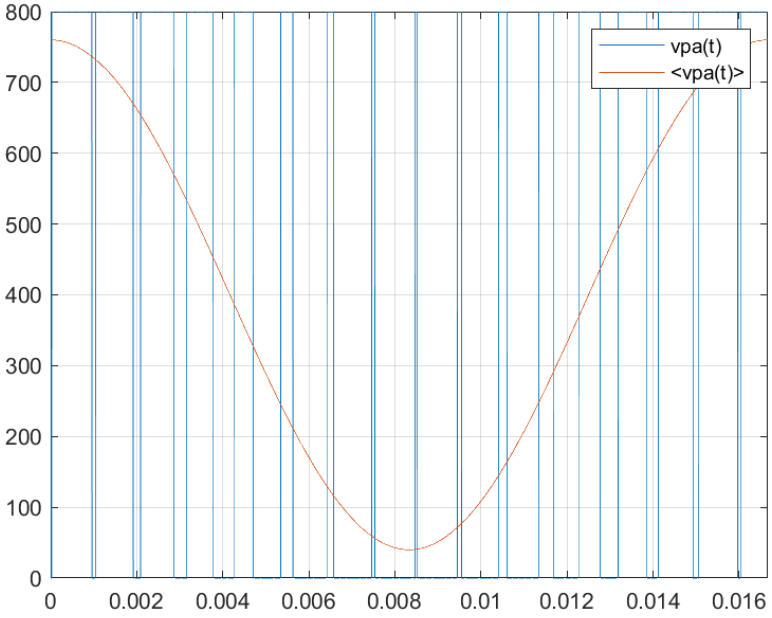
Hyeongmeen Baik

ALE 3

Part a. Plot d_{a1}(t), carrier(t), and h_{a1}(t) on the same plot for one fundamental (60 Hz) period, for $T_s = 1/f_s = (1/1000)$ s. Make sure the index of your time array is < $T_s/30$, and ideally < $T_s/100$



Part b. If the dc bus is 800V, plot the instantaneous pole voltage, v_{pa}(t) and short time average <v_{pa}(t)>. What is the maximum voltage rating that devices in the 1P2T will need to block?



The maximum blocking voltage is 800V, when the other switch is operating.

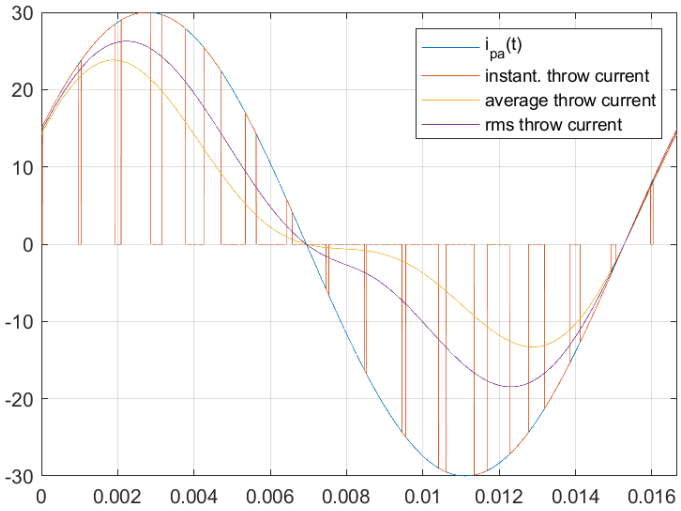
Part c. If the pole current is $i_{pa}(t) = 30\cos(\omega t - \frac{\pi}{3})$, plot the following on the same graph.

1: pole current = $i_{pa}(t)$

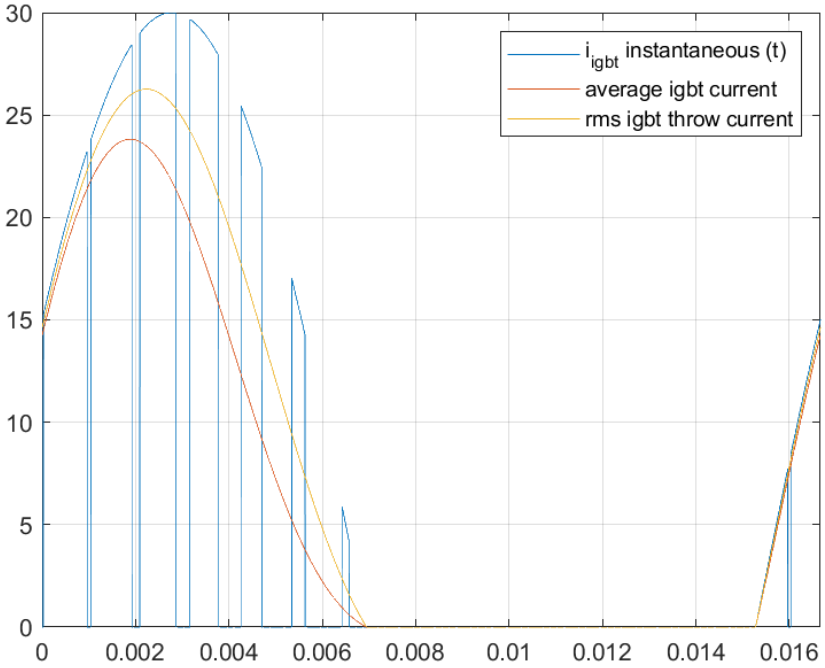
2: instantaneous throw current $h_{a1}(t) * i_{pa}(t)$

3: average throw current = $d_{a1}(t) * i_{pa}(t)$

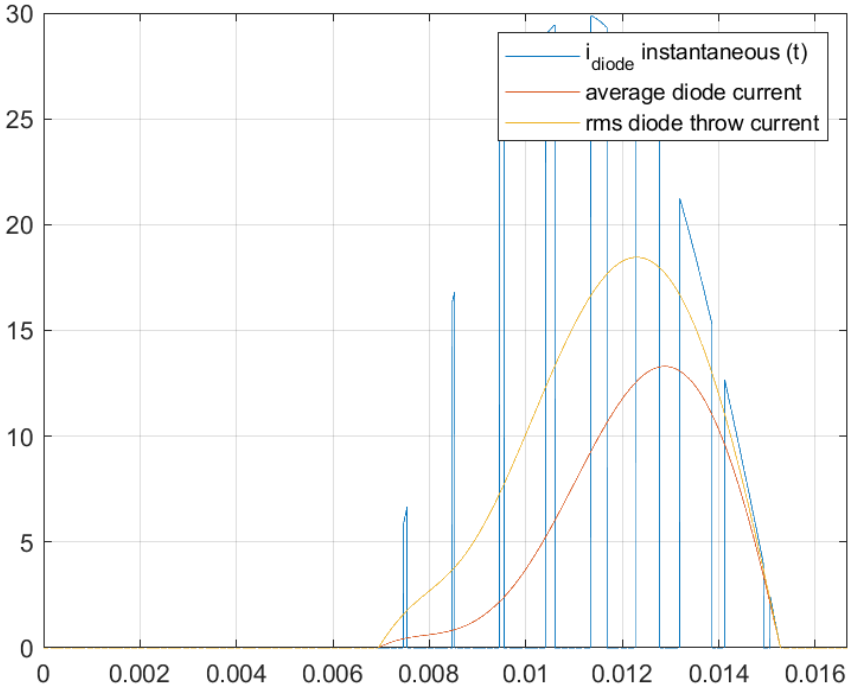
4: rms throw current = $\sqrt{d_{a1}(t)} * i_{pa}(t)$



Part d. If the upper pair of devices is an IGBT and diode, what is the IGBT's instantaneous, average and RMS currents? Plot these alone with $i_{pa}(t)$.



Part e. (Optional) Plot the upper throw diode currents (instantaneous, average and RMS).


30
25
20
15
10
5
0
0
0.002
0.004
0.006
0.008
0.01
0.012
0.014
0.016
i diode instantaneous (t)
average diode current
rms diode throw current