EE394J11 Homework Assignment #3

Due date: 10/28/2013

For all questions elaborate some few conclusions or comments about the results. For all questions with simulations include a graph with the used model. State all the assumptions made in your solutions of the problems.

1) Consider a single phase H-bridge inverter with a modulation signal given by $m(t) = 0.8\cos(2\pi 60t)$. Plot on the same figure one cycle of the output fundamental signal, and the output voltage if NSPWM is used. Repeat the plot with UPWM. Compare the results. Plot the spectrum for both cases and compare the results. Plot also the state sequence. Consider that the switching frequency is 21 times the fundamental frequency and the input voltage is 100 Vdc. NOTE: This choice of switching frequency allows for a clear representation of the signals and the effect under analysis, but it also has a practical implication: 1.2 kHz is a typical switching frequency that can be found in very high-voltage applications.

2) For this problem consider a three-phase inverter with a modulation signal on phase *a* equals $m_a(t) = m(\cos(2\pi 50t) - (1/6)\cos(6\pi 50t))$, and a switching signal 21 times the fundamental. Plot the spectrum up to 50 times the fundamental for v_a and v_{ab} for m = 1.05, 1.15, and 1.25. Find in the literature the time domain representation of classic space vector modulation strategy. That is, write down the modulation signal that results from implementing space vector modulation (only write down the function and comment on its form…no need for doing the plots of the first part of this problem)

3) What is the average output voltage for a 3-phase rectifier with a line-to-line input voltage of 380 V? If this rectifier uses SCR, what is the delay angle α that yields half of the average voltage than that found for the first part of this problem?