EE561: Power Electronics Laboratory

Experiment 7: Voltage Source Inverter (VSI)

Objective: The objective of this experiment is to study the operation of single-phase and three-phase voltage source inverters (VSI) using MATLAB/SIMULINK.

Parameters:

Parameter	Value	
	Single-phase VSI	**Three-phase VSI**
Output voltage	230 V, 50 Hz	400 V, 50 Hz
Output Power	1 kW	10 kW
Switching Frequency	10 kHz	10 kHz
Load type	Resistive	Resistive, Y-connected
Modulation index	0.4 and 0.8	0.4 and 0.8

Procedure

1. Consider a single-phase full-bridge VSI with LC filter and resistive load. The switching signals are generated using sine-triangle PWM with bipolar voltage switching. Calculate the input voltage, load resistance and LC filter parameters for the modulation index values given in the table.
2. Simulate the single-phase VSI using the parameters calculated in step 1. Take the snapshots of input voltage, output voltage of full-bridge (i.e., PWM voltage before filter), load voltage, and inductor current. Check whether load voltage is 230 V, 50 Hz, sine-wave.
3. Repeat steps 1 and 2 when the switching signals generated using sine-triangle PWM with unipolar voltage switching.
4. Now consider a three-phase, three-leg VSI supplying a three-phase Y-connected resistive load through an LC filter. The switching signals are generated using sine-triangle PWM. Calculate the input voltage, load resistance and LC filter parameters for the modulation index values given in the table.
5. Simulate the three-phase VSI using the parameters calculated in step 4. Take the snapshots of input voltage, output voltage of full-bridge (i.e., PWM voltage before filter), load voltage, and inductor current. Check whether load voltage is three-phase, 400 V, 50 Hz, balanced and sinusoidal.

Report

Prepare the report with the results obtained for each case and your observations. Report should also contain snapshot of the simulated circuit, snapshot of the simulation configuration parameters. The design procedure, values of input voltage, load resistance and filter parameters for each case should be included in the report.

Note: In Simulink, the circuit has to be simulated using a fixed time-step solver