BIRZEIT UNIVERSITY

Electrical and Computer Engineering Department

Power Electronics ENEE 3305

An Assignment on Power Devices Switching

Fall 2017

1. A chopper circuit supplying a highly inductive load and having an **IGBT (BSM200GA120D)** as a switch, has the following parameters: Io=25A (use a current source of 25A to represent the RL load), Vd=400V, fs=15kHz, Ls=700nH and ton=30us. Assume linear voltage and current falls and rises during switching to:
   i) calculate the conduction and the switching power losses if tc(on) =400ns, tc(off)=600ns, assuming that Von=2.5V using the appropriate derived formulas
   ii) In ORCAD/PSPICE, simulate a chopper circuit implementing an IGBT (BSM150GB50D) as a switch to supply a highly inductive load which has the following parameters: Io=25A, Vd=400V, fs=15kHz, Ls=700nH and ton=30us. In the results, show the turn-on and turn-off transitions (magnified) for the voltage, current and power losses in the IGBT.
   iii) calculate the average power losses in the IGBT
2. If the chopper circuit is now supplying a purely resistive load of 15 Ohms (no parallel diode) and implementing the IGBT model. Assume linear voltage and current falls and rises during switching to:
   a) calculate the conduction and the switching power losses if Vd=400V, fs=15kHz, ton=30us, tc(on) =400ns, tc(off)=600ns, Ls=700nH and Von=2.5V using the appropriate derived formulas
   b) simulate the circuit in 2) using ORCAD/PSPICE and plot the magnified turn-on and turn off transitions of the voltage, current and power loss in the IGBT.
   c) calculate the average power losses in the IGBT

The assignment is due to on Tuesday 24/10/2016.