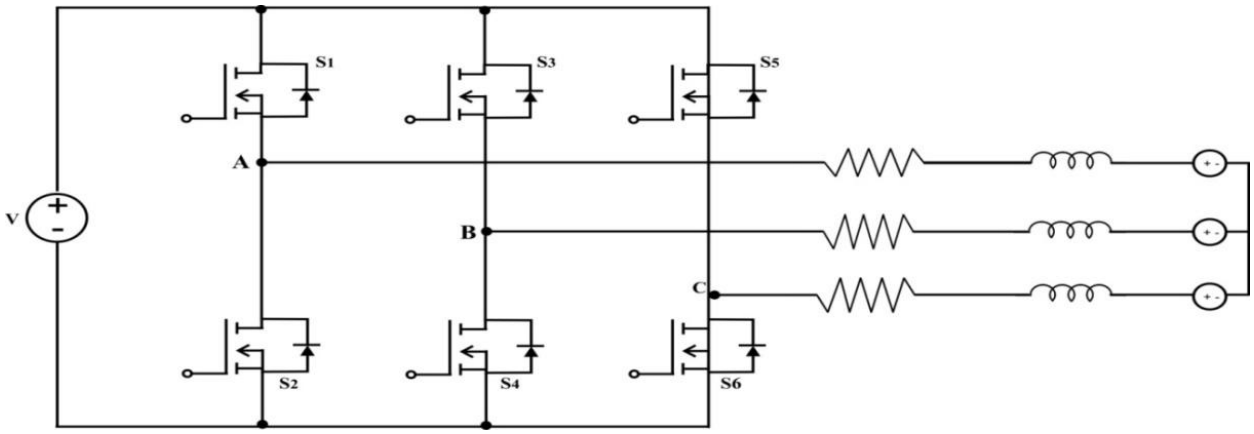
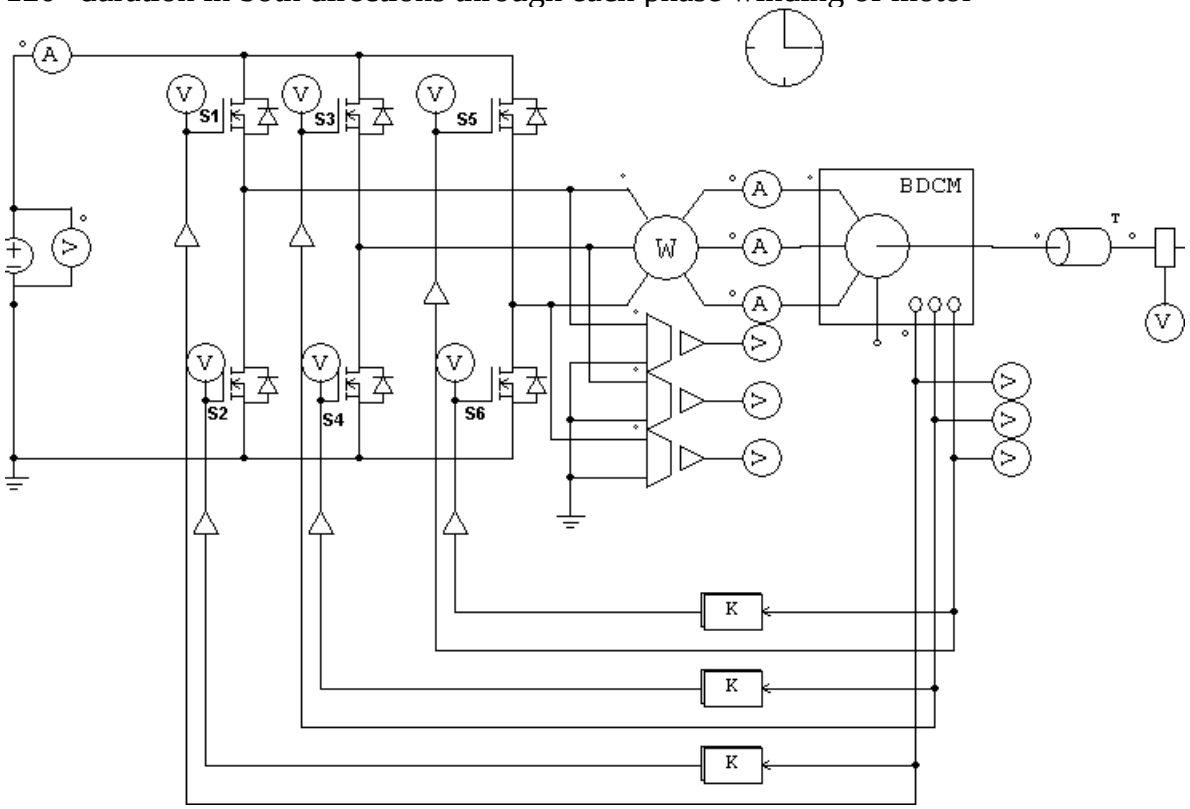
Control of BLDC Motor



Six switch commutation circuit

There are totally six switches from S_1 to S_6 which forms the commutation circuit. The Hall position values decide the switching sequence of the power semiconductor switches. The output status of Hall sensors changes for every 60° of rotation thus defining six conduction zones. The switching of the inverter is arranged to give symmetrical current pulses of

120° duration in both directions through each phase winding of motor

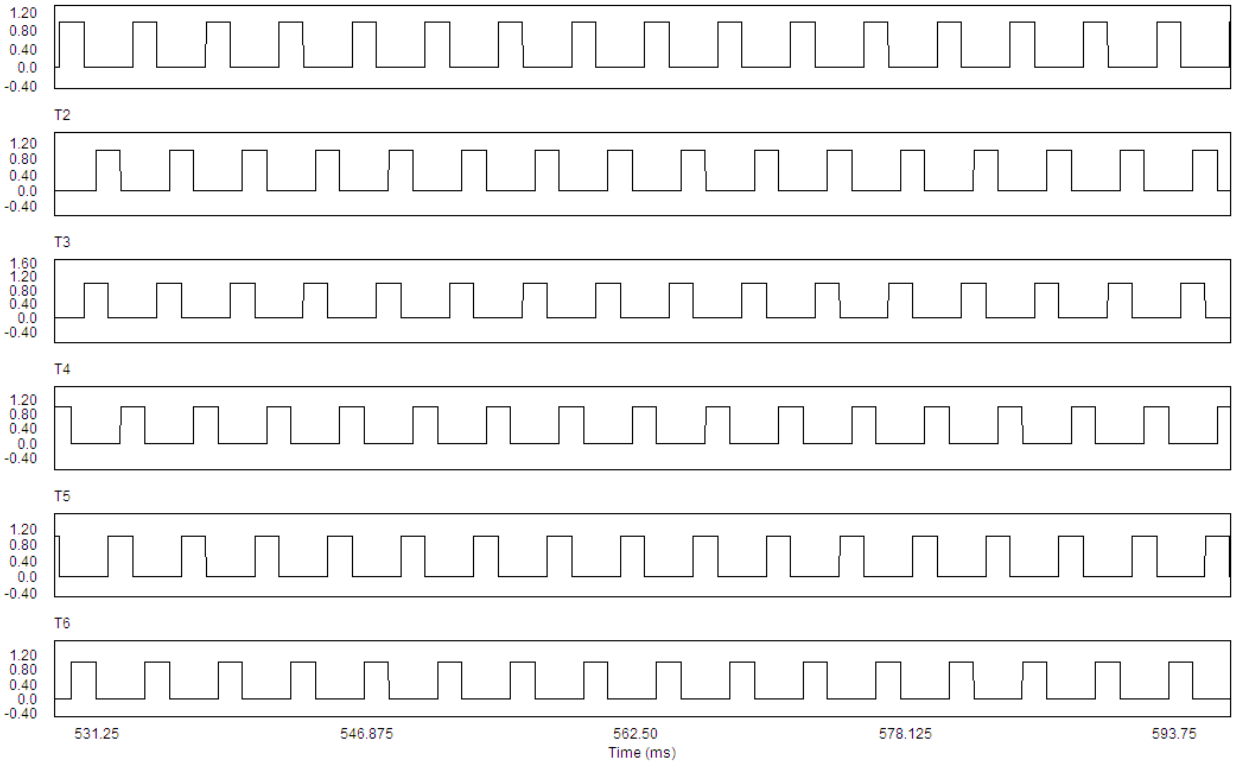


Simulation block diagram of six switch BLDC motor drive in open loop

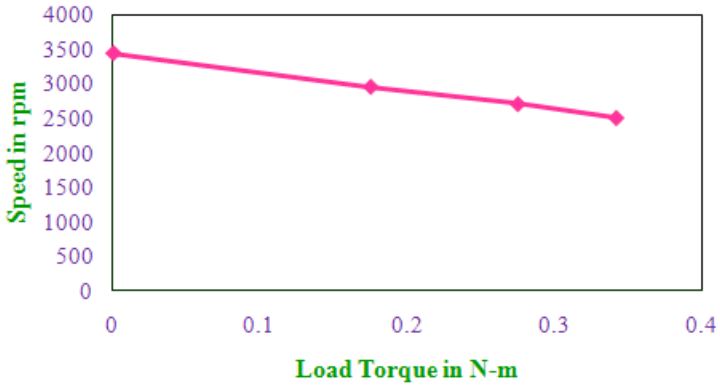
The brushless DC motor is a permanent magnet synchronous machine supplied from a six switch inverter with the switching on/off of the inverter determined by the rotor position. A BLDC motor needs quasi current waveforms, which are synchronized with the back emf to generate constant output torque and have 120° conduction and 60° non conduction regions. Also, at every instant only two phases are conducting and the other phase is inactive. Torque is produced because of the interaction between the magnetic field generated by the stator coils and permanent magnet. Ideally the peak torque occurs when these two fields are at 90° to each other and falls off as the fields move together.

The inverter usually employing any one of the solid-state switching devices like power transistor, MOSFET and IGBT provides three-phase voltages to the motor. To get performance characteristics similar to those of the DC machine, Hall type position sensors have been employed for switching the inverter. The Hall sensor module produces three phase square pulses with 120° displacement such that the Hall element produces positive polarity voltage when it is influenced by the north pole and zero voltage under the influence of the south pole. A controller/sensor decoder circuit generates and

directs triggering pulses to the switching devices of the inverter based on the Hall sensor voltage levels, which are related to the rotor position with respect to the stator axes.



Gate pulse



Speed torque characteristics in open loop

Input :

Gate current

Output :

Torque (rotor rotates producing torque)

Algorithm :

At any time only 2 coils are containing current flowing throw them so rotor (which is permenant magnet) chases magnetic field , position of rotor is determined using Hall position sensors in order to determine which 2 coils the current will flow through next