CHAPTER 6

CONCLUSIONS

6.1 GENERAL

This section presents the important conclusions of the investigations reported in this research work. They are summarised as follows.

The topologies of Series Resonant Converter, Parallel Resonant Converter, Series Parallel Resonant Converter (LLC and LCC) are simulated and their performance is compared for wide load variations. Among the four topologies, LLC is found most suitable for wide load variations. Hence the performance of LLC is compared with that of LLC-LC for wide input voltage variations and results show that LLC-LC converter is better than LLC converter for input voltage variations yielding better efficiency as well as better output voltage. Efficiency tends to increase with increase in input voltage and hence these are suitable for high input voltage operation.

Both LLC and LLC-LC converters are implemented for the speed control of BLDC motor. LLC topology is used for both open and closed loop operation. On comparing the simulated results of motor speed and torque, it is observed that though more stable speeds are obtained in LLC-LC converter, their values are very less as compared to LLC. Hence it is concluded that LLC-LC is a good option for light loads whereas for heavier loads, LLC is a better option.

Simulation is carried out for speed control of PMDC motor. Both Open loop and closed loop control of PMDC is carried out with resonant converter. Closed
loop control is carried out with series resonant converter with Proportional and Integral (PI) and Sliding Mode Controller (SMC). It is observed that for the change in speed, the response of SMC is better than PI controllers with respect to both peak overshoot and settling time. The SMC also gives better performance under load disturbances and parameter variations. Hardware is implemented for speed control of PMDC motor using resonant converters and the performance of the circuit is analysed. A PMDC motor of rating 200W, 80V, 2.5A and 3300 rpm is used for implementation of Sliding Mode Controller. An Inductive proximity sensor is used along with the PMDC for sensing its speed. LABVIEW is used to analyse the performance of the PI and SMC. Hardware results show that the PI controller overshoots and takes a longer time to settle as compared to SMC. In contrast, smooth settling time and a rapid rise time can be observed in SMC.

Capacitive discharge based ignition system and resonant converter based ignition system are simulated using MATLAB/SIMULINK. Results of simulation show that the efficiency of resonant converter based ignition system is better than that of Capacitive discharge based ignition system. Hence a prototype is developed and implemented for automobile ignition system using a resonant converter. From hardware implementation of the resonant converter for automobile ignition system, it is observed that the efficiency of resonant converter based ignition system is approximately 5 times greater than the efficiency of the system. The performance of the resonant converter ignition system is satisfactory at both high and low engine speeds.

6.2 SCOPE FOR FUTURE WORK

For PMDC motor, hardware is realised with LLC converter. The performance of PMDC motor can be analysed with LLC-LC converter.

Parallel resonant converter is implemented for automobile ignition system. Other topologies of resonant converters can also be implemented for automobile ignition system and their performances can be analysed. The electrical circuit can be simplified further to suit requirements of engines. To sense the TDC of the engine at even higher speed, a sensor with better response time can be used.