CHAPTER 8

CONCLUSION

The state feedback control approach has been designed for the Buck converter and Boost converter in continuous and discrete time domain using pole placement technique and similarly control law has been derived for Interleaved Buck and Interleaved Boost converter using pole placement and Linear quadratic optimal regulator methods. Moreover to ensure the robustness of state feedback control for the converters, the load estimator has been designed by deriving full order state observer. The Observer controller for Buck, Boost, Interleaved Buck and Interleaved Boost converters is designed by combining the state feedback control and load estimator using Separation Principle. The Separation Principle allows designing a dynamic compensator which very much looks like a classical compensator since the design is carried out using simple root locus technique.

The Observer controller is robust enough so that the above mentioned converters track the reference values inspite of input voltage variations and load disturbances. The controller is dynamic in such a way that for all the variations in the inductance and capacitance parameters the converters are capable of tracking the reference voltages. Overshoots and Undershoots are not evident in the output voltages for all the converters mentioned above. The steady state error thus evident is very minimum and is of appreciable order. In the case of interleaved converters, the controller is efficient enough in such a way that the interleaved converter modules have
good current sharing among them. The highest efficiency of the order of 96% has been achieved for all type of converters.

The experimental set up has been carried out to evaluate the performance of the Observer controller using Buck converter. The mathematical analysis, simulation study and the experimental study show that the Buck converter with Observer controller thus designed achieves tight output voltage regulation and good dynamic performances and higher efficiency of the order of 98%. The application of Interleaved Boost converter with Observer controller in photo voltaic system has also been evaluated and it is evident that the PV system has an effective output response under the load variations and changing irradiance level. The efficiency is much improved and the maximum efficiency is obtained as 97.8% with a reference voltage of 100 V. Effective output regulation is obtained with no overshoots or undershoots and zero steady state error without any ripples. The controller works much efficiently in such a way that it tracks the maximum power of the order of 996 W. The Observer method is topology independent and also can be extended for any of the applications such as power factor pre-regulation and speed control applications.