**Design of a Modular, Direct-Drive Axial-flux PM Generator for Wind Turbine Applications**

**Chapter 1: Introduction**

-Background of Wind Energy Harvesting

-Problem Statement and Research Objective

-Thesis Outline

**Chapter 2: Review of Wind Energy Conversion(WEC) Systems**

-Power Equations and parameters

-Challenges in WEC Systems

-Current Wind Turbine Systems

a)Induction Generators

-SCIG

-WRIG

-DFIG

b)Synchronous Generators

-WRSG

-PMSG

-Flux orientations in PM based systems

a) Radial Flux

b) Axial Flux

c) Transverse Flux

-Importance of modularity in WEC Systems and AFPM

-Conclusion

**Chapter 3: Design of Proposed Generator**

-Introduction

-Mechanical and Electrical parameters

a)Fundamental Equations

b)Geometrical paramaters

-Structural deflection

c)Phase turns, Phase resistance & inductance and flux densities

-Thermal considerations

-Reluctances

-Flux and flux densities

d)Volume and mass Equations

-Active mass calculation

-Structural mass calculation

e) Losses

f)Power and Efficiency

- Electromagnetic FEA vs Analytical evaluation for sample dimensions

**Chapter 4:** **Optimization and Design**

-Introduction

-Evolutionary Algorithms(EA) and Genetic Algorithm(GA)

-Genetic algorithms based optimization

a)Constants

b)Objective Function

c)Constraints

d)Independent variables

-MATLAB GA Toolbox implementation

- 5 MW AFPM generator with optimized design parameters

**Chapter 5: FEA Verification**

-Introduction

-Design Considerations

a)Electromagnetic

b)Structural

c)Thermal

-Comparison of the optimization results with FEA results

**Chapter 6: Conclusions and Future Work**

-MW-level commercial counterparts of designed generator

-Conclusion

-Future work

**References...........**