Chapter-7: CONCLUSIONS AND FUTURE SCOPE

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7.1 Conclusions

One of the important forms of instability is the small signal oscillatory instability (also referred to as small perturbation stability or dynamic stability). This thesis is primarily concerned with the design and analysis of decentralized state feedback power system stabilizing controllers to counter this type of instability. The following are the contributions of the thesis.

- In Chapter 3, a novel design approach is proposed for the PSS, based on the full state feedback linear quadratic regulator. This thesis adopts modified Heffron Phillip’s model developed by considering the step-up transformer’s secondary voltage as reference in place of the infinite bus. In comparison with the conventional PSS, LQR performed more or less equally under nominal conditions and much better under conditions of feeble, strong and leading power factors as against the failure of the conventional PSS in similar conditions.

- Chapter 4 presents an extension of power system stabilizer based on LQR to multi-machine systems. The performance evaluation of LQRPSS was held on two test systems extensively employed, 4 generators 10 bus system and 10 generator 39 bus system, in widely varying conditions of system operation. Almost in all the parameters of tested conditions of operation, the proposed PSS performed better in comparison with the conventional PSS.

- Chapter 5 presents a state feedback power system stabilizer based on pole placement for SMIB modelled after the revised Heffron Phillip’s
model. In comparison with the conventional PSS, the proposed PSS performed more or less equally under nominal conditions and much better under conditions of feeble, strong and leading power factors as against the failure of the conventional PSS in similar conditions.

- Chapter 6 presents an extension of the Pole Placement Regulator to multi-machine power systems also. The performance evaluation of the proposed pole placement PSS was carried out on the largely used 10 generator 39 bus test system in widely varying conditions of system operation. The proposed PSS was perceived to have performed better than the conventional PSS in accordance with all the parameters of tested conditions of operation.

- This thesis has demonstrated that the complex state feedback designs like LQR and pole placement controller designs for large power systems can be simplified to a coordinated decentralized small state feedback controller’s design adopting the modified Heffron Phillip’s Model.
7.2 Future Scope

The following few suggestions may be considered for the future work.

- The modified Heffron Phillip's model derived in Chapter-2 can be adopted for the design of the PSS applying robust control techniques.
- The effectiveness of the proposed controllers needs to be verified employing OPAL-RT or RTDS-based real time simulators.
- The impact of external parameters $G_{v1}$, $G_{v2}$ & $G_{v3}$ on the damping performance for various conditions of operation can be investigated.