CHAPTER 5
CONCLUSIONS AND FUTURE WORKS

5.1 Conclusion

Fixed capacitor–thyristor control reactor (FC-TCR) provides continuously controllable reactive power in the lagging power-factor range and the leading power-factor domain. This compensator injected the desired reactive power to the system by adjusting the susceptance of the TCR. The susceptance adjusted by controlling the firing angle of the thyristor. This thesis presented the Artificial Neural Network (ANN) based adaptive PI controller for controlling the firing angle of FC-TCR in order to compensate the reactive power of the distribution system. The reactive power of the overall system \( Q_S \) evaluated using a PI controller system which the parameters \( (K_p, K_i) \) tuned by the Artificial Neural Network (ANN). The reactive power of the load demand \( Q_L \) used as the input of ANN and the PI controller parameters used as the output (target). The modeled systems were simulated in MATLAB / SIMULINK.

From the simulation results and analysis explained in the previous section could be concluded that better performances are achieved by the proposed method, ANN based PI controller for FC-TCR, when it is compared with a conventional PI controller. In case 1, the proposed method reached the objective, \( Q_S = 0 \), approximately 0.8s faster than a conventional PI controlled system. In case 2, the proposed method reached the objective, \( Q_S = 0 \), approximately 1.1s faster than a conventional PI controlled system. Finally, in case 3, the proposed method reached the objective, \( Q_S = 0 \), approximately 1.0s faster than a conventional PI controlled system.

5.2 Scope for Future Work

In this thesis, it shown that the proposed system can successfully inject the desired reactive power to the distribution system, but it still has some problem need to be solved. The generating data of PI controller parameters may took a
long enough time to find the optimal value. The FC-TCR has the limitation with load condition. The thyristorized circuit is known as one of the harmonics current generator. This thesis needs to be extended in order to solve these problems in the future works as follows:

1. Designing genetic algorithm based optimal self-tuning fuzzy logic controller used for regulating the gains of the basis Proportional-Integral (PI) as a self-tuning controller, in order to tune the PI parameters automatically.
2. Designing the Thyristor Switched Capacitor – Thyristor Controlled reactor in order to extend the scope of the compensator.
3. Designing the hybrid system, combination of adaptive harmonic filter and reactive power compensator, in order to reduce the harmonic current and compensate the reactive power.