

## **ABSTRACT**

*Good control system is a control system that has a fast response and stable. It can be seen from the performance index of the system. In this final project used Linear Quadratic Regulator (LQR) optimal control as controller. For the mathematical modeling of plant used Auto Regressive identify exogenous (ARX).*

*From the results of the testing and analysis of mathematical modeling of plant with Arx [1 1 1] identification yield a best fit 91.82 % and the validation of estimating model to the actual motor response obtained the root mean square error 2.4406 % and there is no addition of order of the function transfer.*

*Implementation of LQR optimal control in a DC motor works quite well with overshoot, rise time, settling time, and steady state error performance in accordance with the specified index. Performance of the system showed the best value when the value of  $Q = [0.85]$  and the value of the matrix gain feedback  $K = 0.6269$  show that a settling time 0.4436 seconds, rise time 0.2121 seconds, percentage of overshoot 2.119 %, and the steady state error 0.204 %. It shows that the design of the system with the value  $Q = [0.85]$  produces better performance than the expected.*

*Key words : DC Motor, LQR, ARX*