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```

part 5

```
clc;
clear;
close all;

load('mathModel.mat');
load('lqrPoles.mat');

%check observability
Ob = obsv(A, C);
isObservable = (rank(Ob) == length(A));

%design obsv
p = 5 * real(max(CLP));
L_clo = place(A.', C.', [p p+.0001]).';

%sim
cloSim = sim('part5model.slx');

%find Ts etc
Ts = findSettlingTime(cloSim.tout, cloSim.pos)
RMSE = findRMSE(cloSim.tout, cloSim.pos, 1)

%plot
figure();
hold on;
plot(cloSim.tout, cloSim.pos);
plot(Ts, cloSim.pos(find(cloSim.tout ==
    Ts)), 'ro', 'DisplayName', 'Settling Time = 0.320 [s]');
title('Closed-Loop Observer Full State Feedback');
xlabel('Time, t[s]');
ylabel('Position, \theta[rad]');
grid();

% commentary
comments = ['The RMSE of the LQR Method gains on a robust tracking
    controller' ...
    ' with a closed loop observer full state feedback was %.3f [rad].
    When compared' ...
    ' to just the LQR robust tracking controller, the settling time
    increased by ' ...
    ' %.3f percent and the RMSE remained the same.'];

fprintf(comments, 0.0047, 4.375);
```

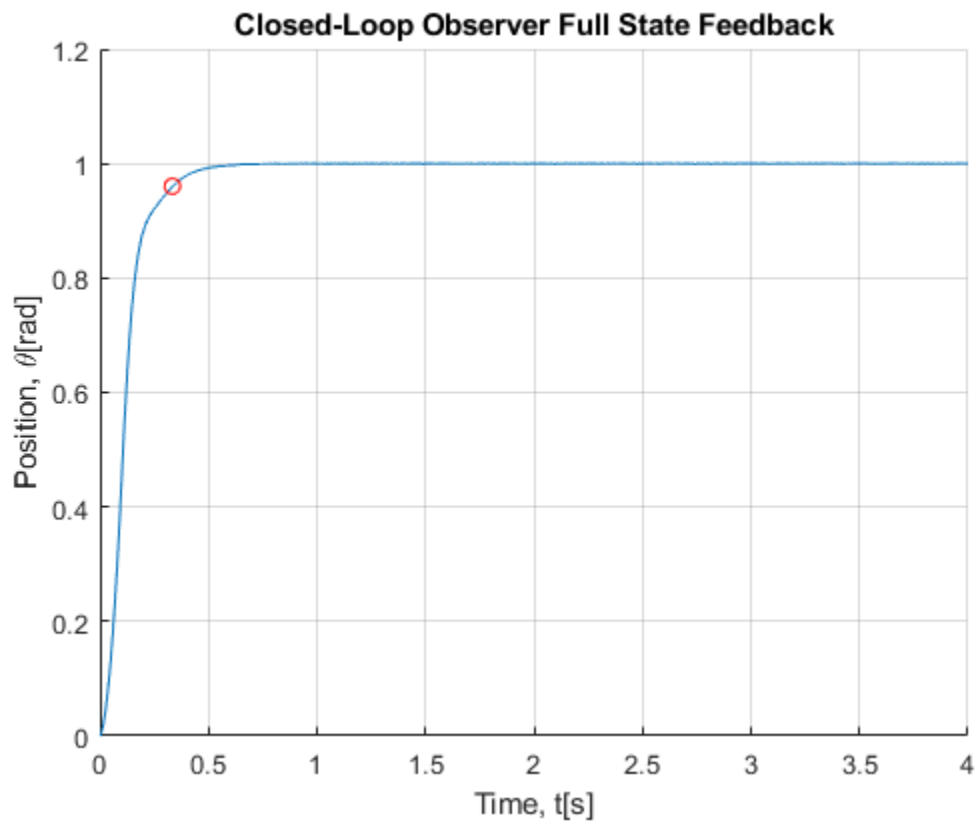
$T_s =$

0.3340

$RMSE =$

0.0047

The RMSE of the LQR Method gains on a robust tracking controller with a closed loop observer full state feedback was 0.005 [rad]. When compared to just the LQR robust tracking controller, the settling time increased by 4.375 percent and the RMSE remained the same.



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