# Question #5

## Extended Kalman Filter (EKF)

The EKF starts off at time-step 0 with an estimate of the total state and covariance. At each time-step k, during the prediction step the EKF uses the non-linear equations to calculate the estimated state which in turn is used to approximate the predicted covariance matrix.

where

During the correction step the EKF calculates the innovation vector () using the measurement estimate derived from the non-linear measurement equation.

The filter then generates a new linearized DT System (H) matrix, linearized about the new state estimate, to calculate the Kalman gain, update the total state estimate and update the covariance matrix.

## Tuning Approach

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## Typical Simulation Plots









## Chi-Square Test Results



