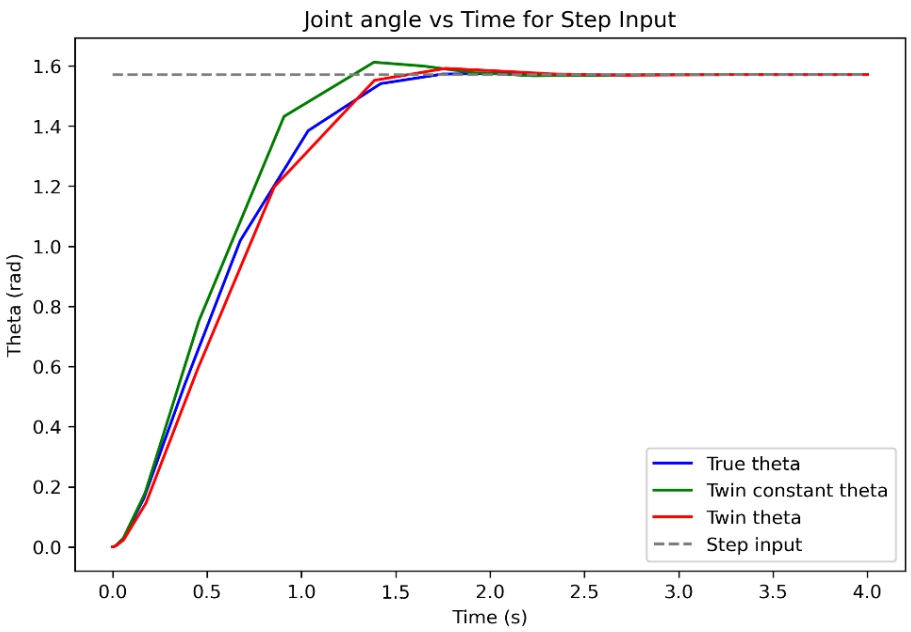
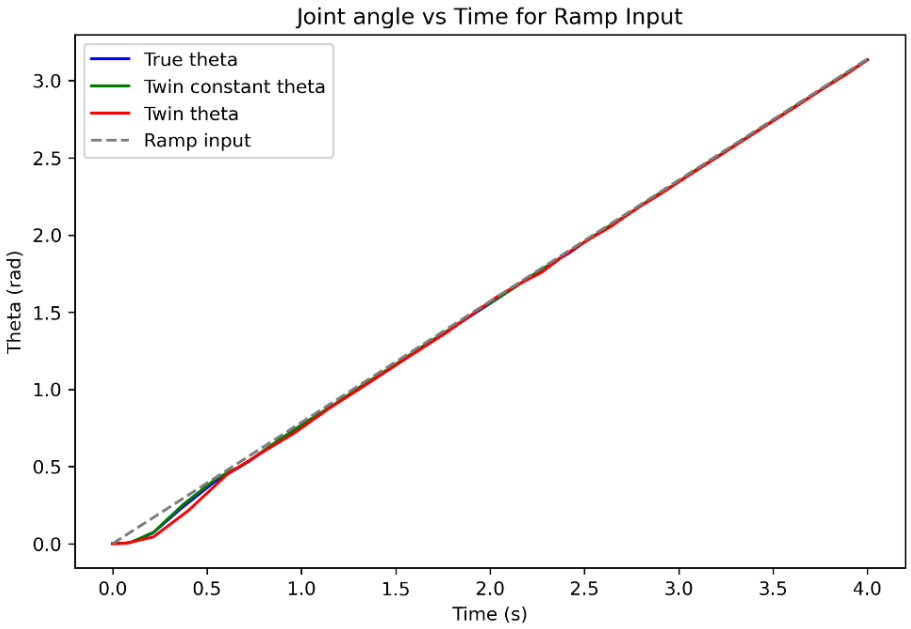
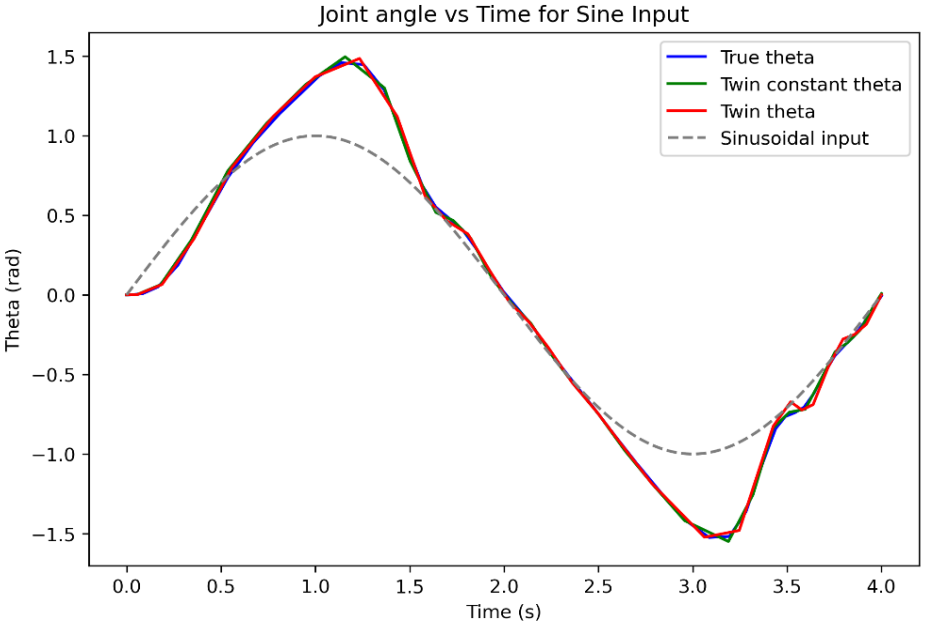
Results

A] Results:

1. The parameters for the twin model are slightly off compared to the true (real) model. Hence, in order to achieve similar joint angle trajectories, different PID gain values had to be used for the true model and the twin model.
2. The twin constant model is another model which has the parameters of the twin model but the same controller gains as used in the true model. It is used to determine how closely the twin model behaves when being used with the PID gain values of the true model.
3. For step input, the steady state joint angle did not have any significant error after applying the respective controller gains on the models.
4. All the models had similar settling time with the overshoot being highest for the twin model with controller gains of the true model.
5. The overshoot for the twin model with controller gains of the true model was 2.6% and the settling time was 1.6 seconds.
6. For ramp input, there was up to 0.4 degrees of error in the final joint angle in the 3 models wrt the final joint angle of the ramp input.
7. For sinusoidal input, the range of error in the final joint angle for the 3 models wrt the sinusoidal input was -0.4 to +0.5 degrees with the twin model having no error.
8. The graphs of joint angle vs time for step input, ramp input and sinusoidal input are shown below:


Joint angle vs Time for Step Input
Theta (rad)
Time (s)
True theta
Twin constant theta
Twin theta
Step input


Joint angle vs Time for Ramp Input
Theta (rad)
Time (s)
True theta
Twin constant theta
Twin theta
Ramp input


Joint angle vs Time for Sine Input
Theta (rad)
Time (s)
True theta
Twin constant theta
Twin theta
Sinusoidal input