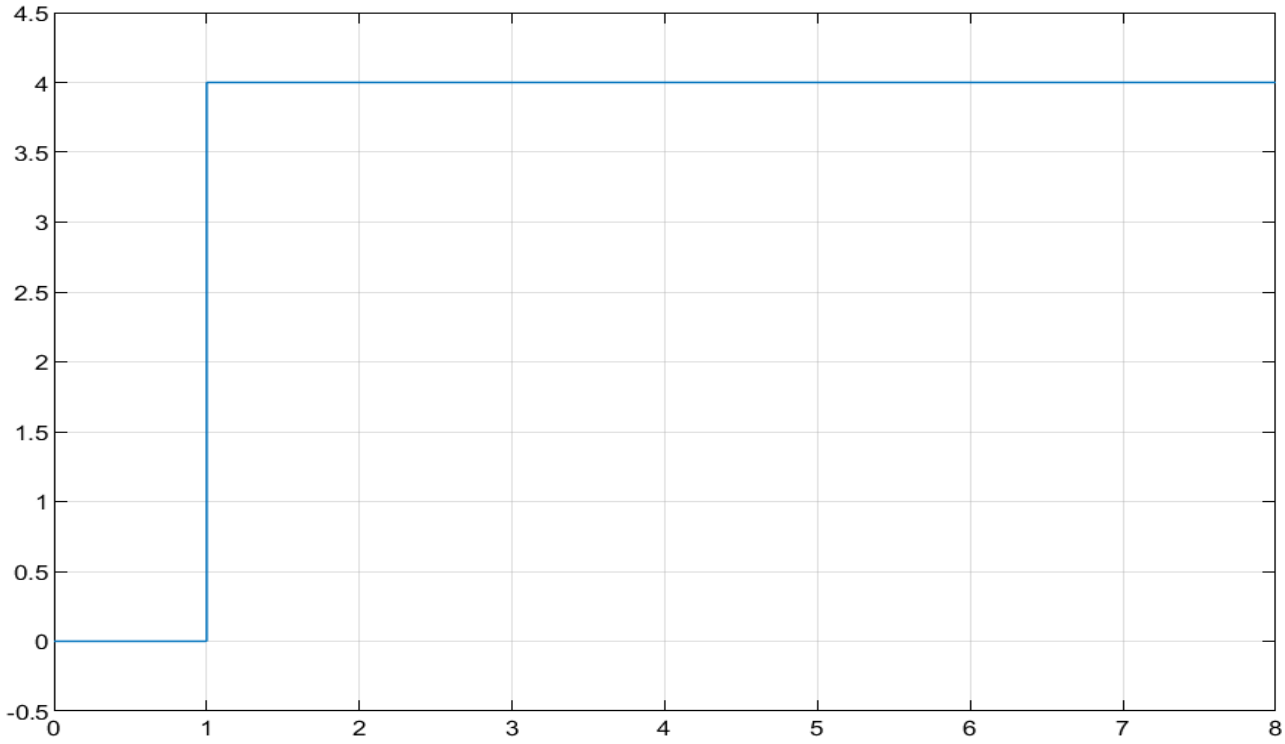
Control

Lab Assignment 01: hybrid electric vehicles (HEV)

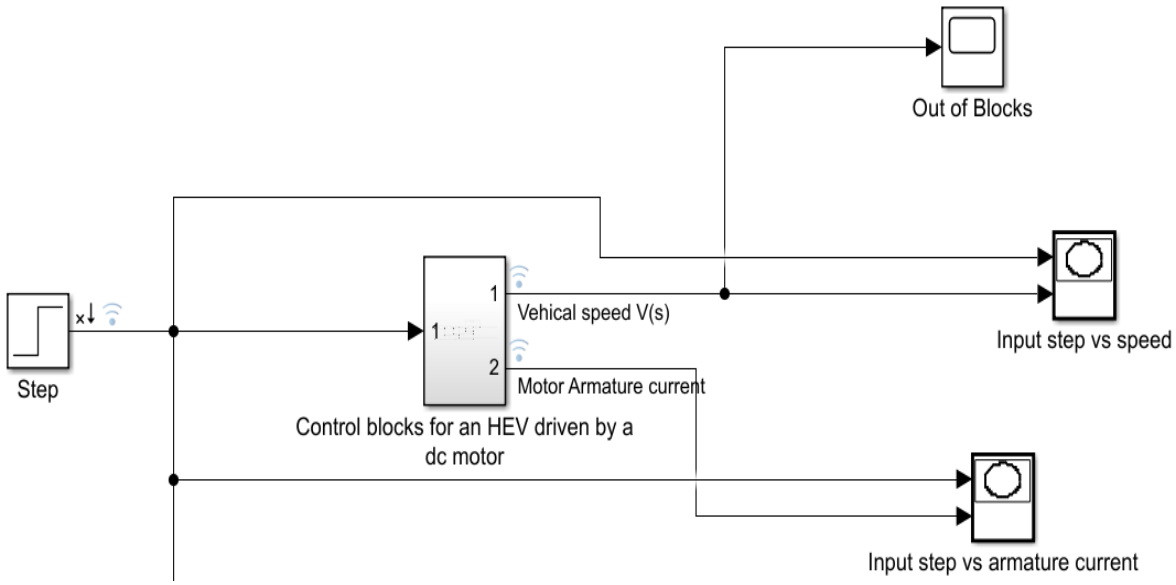
Note: My reference signal is

(5) Unit step with (Step Time=1 & Initial value=0 & Final Value=4)

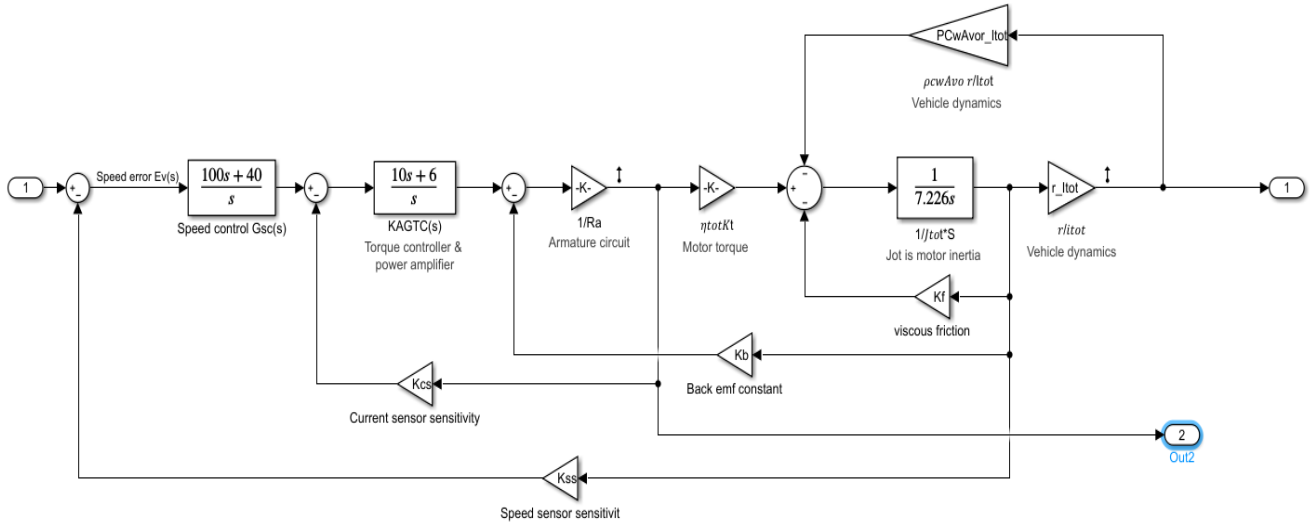


Part1: Simulink

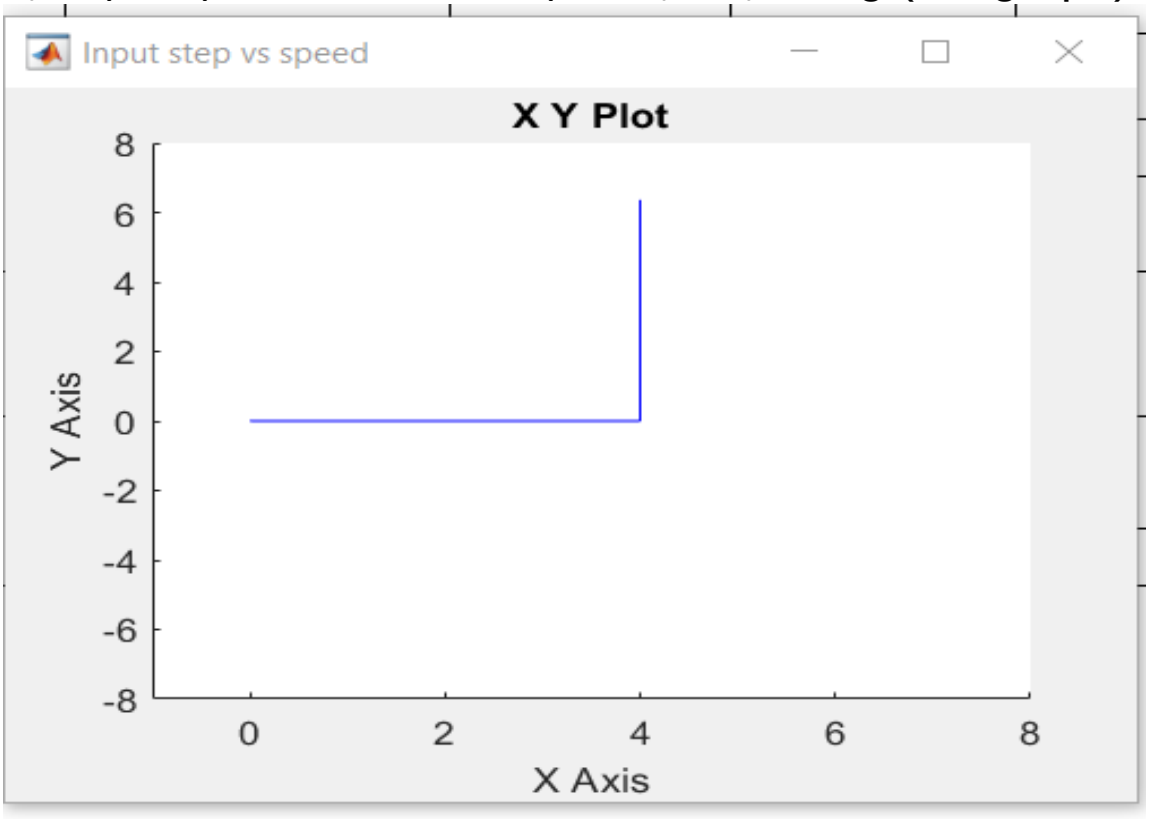
Top view of blocks



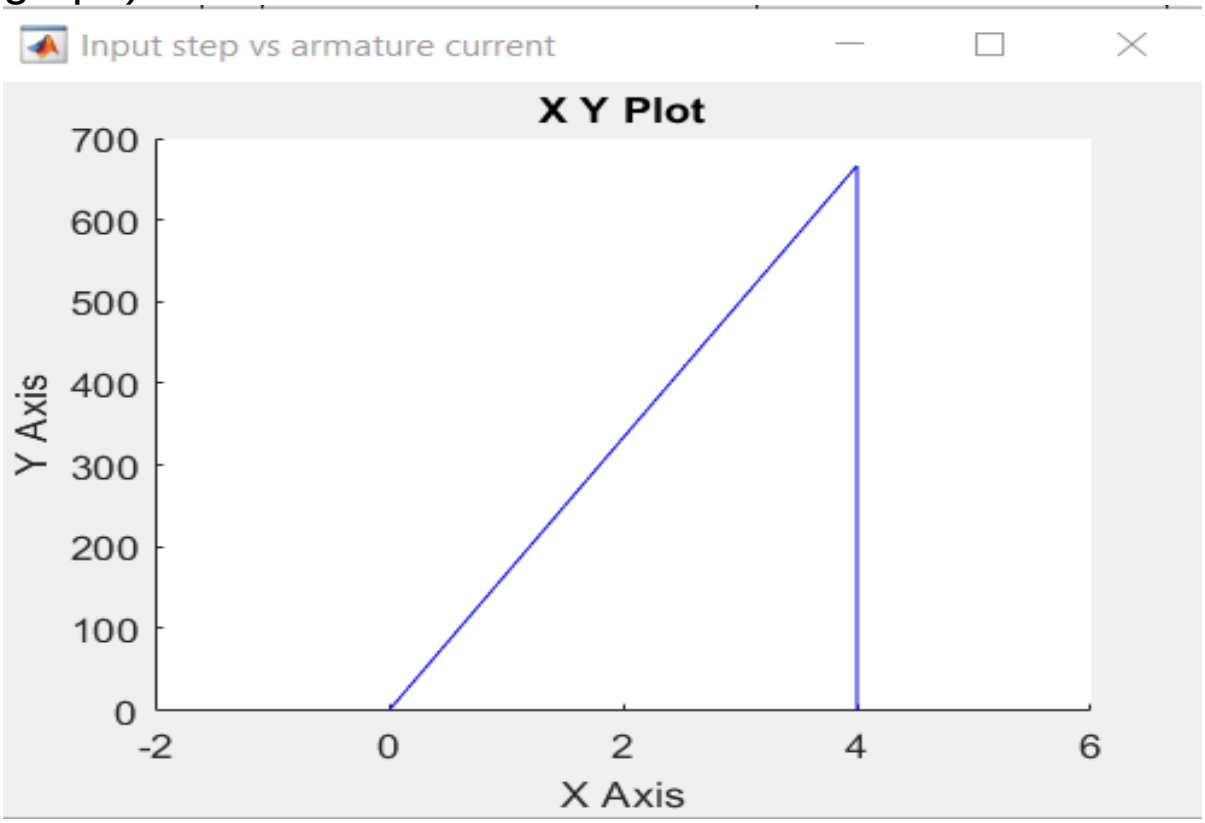
Details of sub block (Control blocks for an HEV driven by a dc motor)



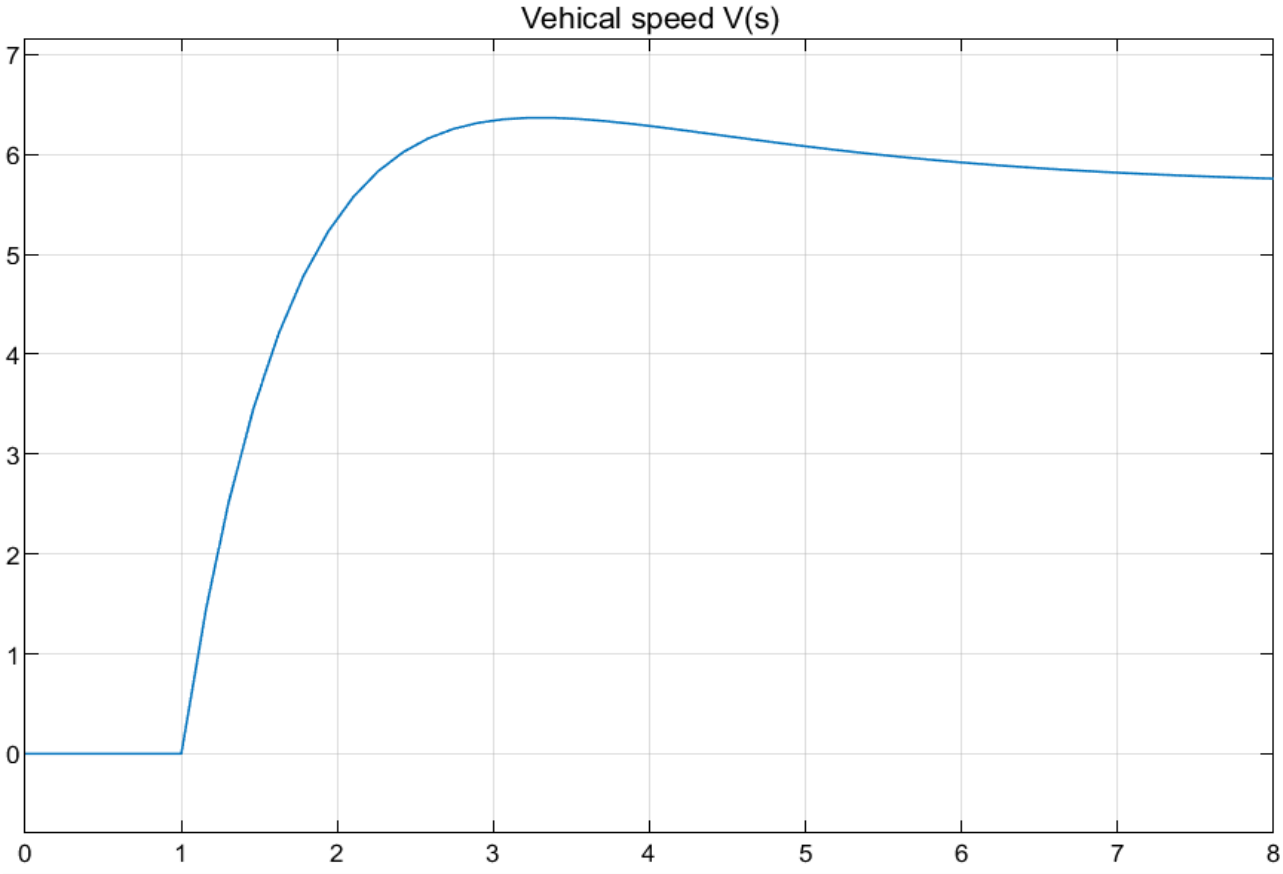
1)Step response of the car speed (m/s) using (XY graph)



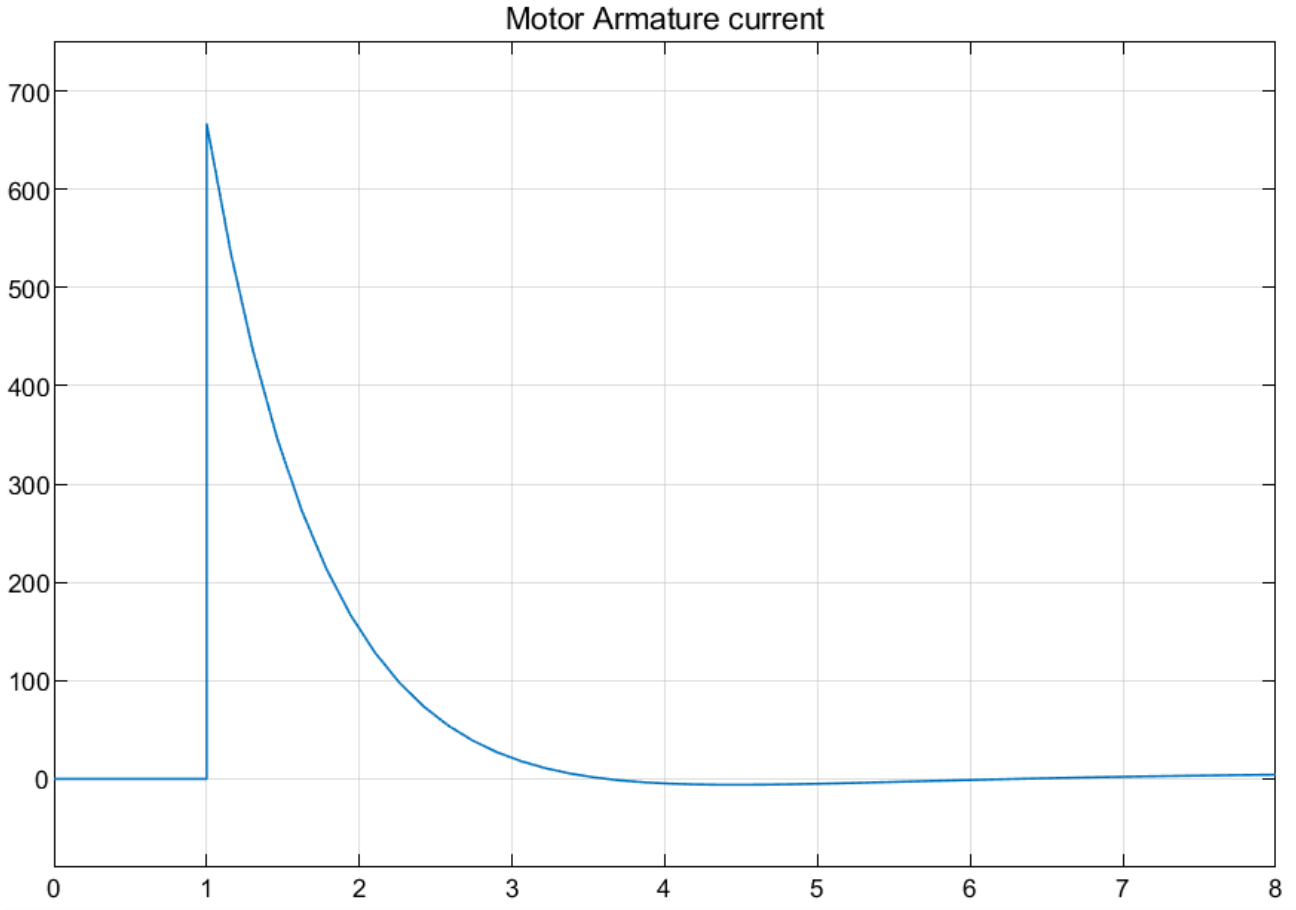
2)Step response of the motor armature current (A) using (XY graph)



The car speed (m/s) with time using (Scope Block)



The motor armature current (A) with time



Part 2: MATLAB

Editor - D:\Drive \Fourth year\1st term\4.Control \3.Lab\tfFile.m

tfFile.m

```
%  Generated by MATLAB on 28-Oct-2022 20:41:05
%  MATLAB version: 9.8.0.1323502 (R2020a)
% ------------------------------------------------------------------
saveVarsMat = load('tfFile.mat');

ETAtot_Kt = 1.8;
Kb = 2;
Kcs = 0.5;
Kf = 0.1;
Kss = 0.0433;
PCwAvor_Itot = 0.6154;
Ra_inv = 1;
r_Itot = 0.0615;

linsys1 = saveVarsMat.linsys1; % <1x1 ss> unsupported class

tfFun = saveVarsMat.tfFun % <1x1 tf> unsupported class

clear saveVarsMat;
```

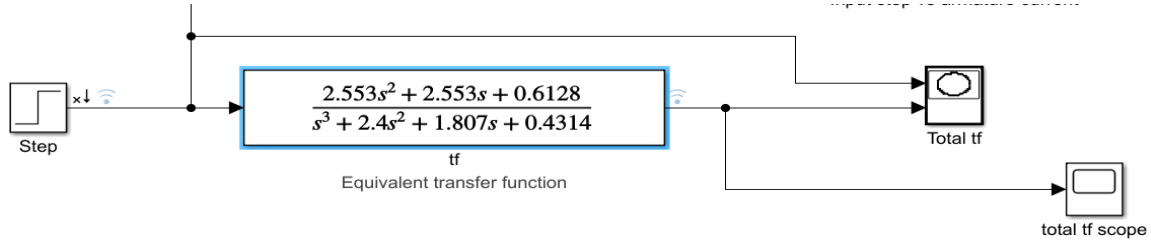
Command Window

New to MATLAB? See resources for Getting Started.

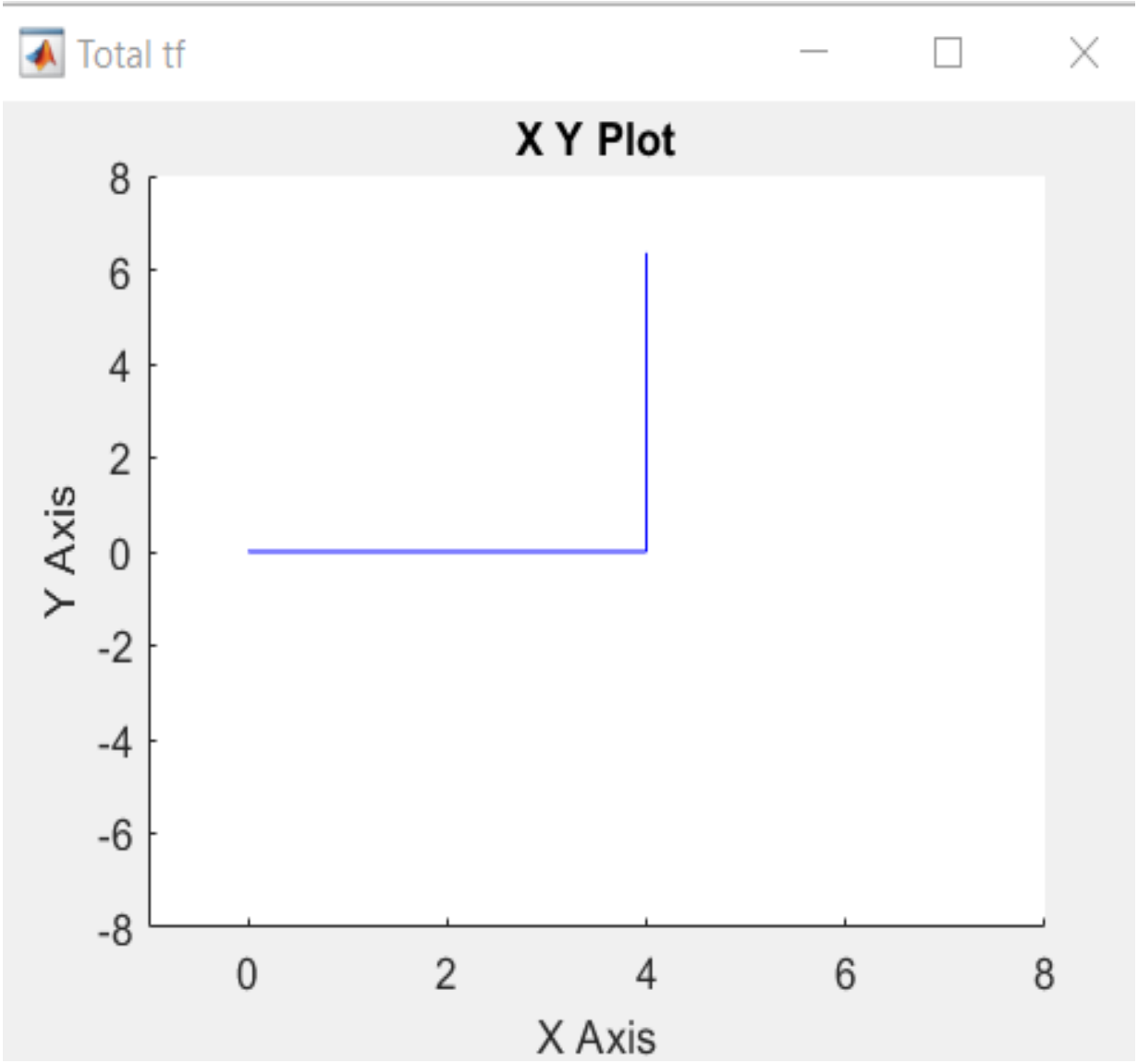
```
                2.553 s^2 + 2.553 s + 0.6128
    Kcs1:  -------------------------------
           s^3 + 2.4 s^2 + 1.807 s + 0.4314

Name: Linearization at model initial condition
Continuous-time transfer function.

fx >>
```

• transfer function $\frac{V(s)}{Rs(s)} = \frac{\mathbf{2.553\ S^2+2.553\ S\ +0.6128}}{\mathbf{S^3\ +\ 2.4\ S^2+1.807\ S+0.4314}}$

I want to verify if this is the true Total transfer function so I will use Simulink to verification:



Step response of Whole system using (XY graph)



This is the input and output of the system from blocks and from the equivalent transfer function so we notice that the equivalent transfer function is equal exactly to the output of blocks