Dynamics Systems and Controls

Lab 10

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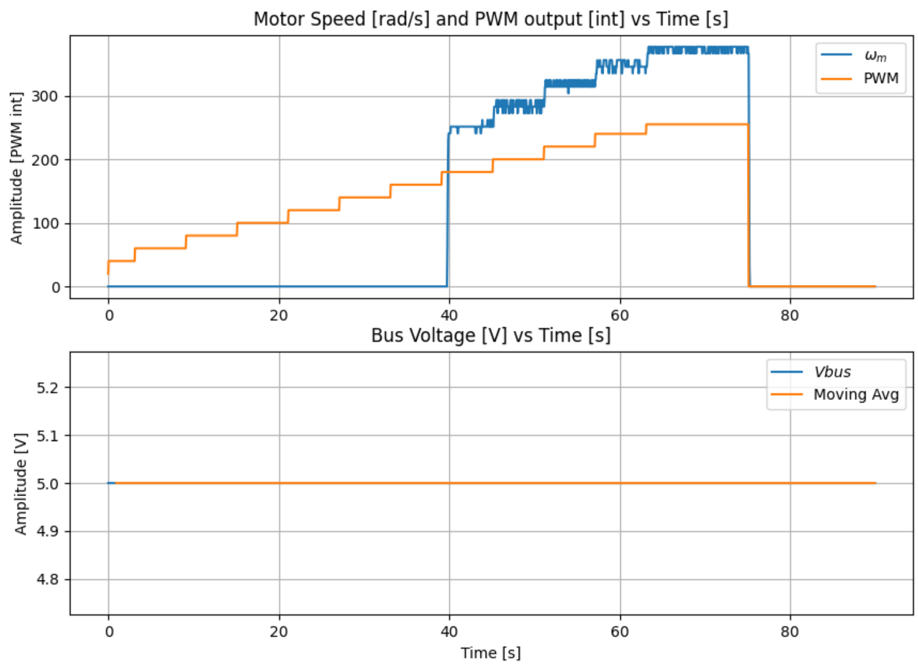
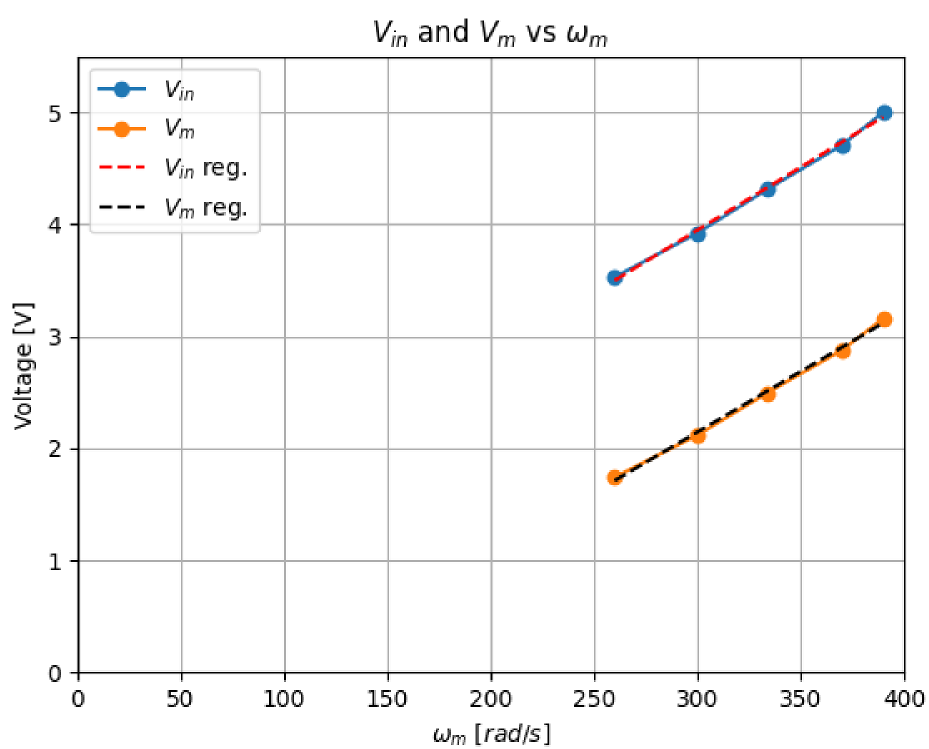
1.





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Vin slope [V/(rad/s)]: 0.011224015975705983
Vin intercept [V]: 0.5812131622952847
Vin R^2: 0.9968414453738613
Vm slope [V/(rad/s)]: 0.010826282066073558
Vm intercept [V]: -1.1041104603983092
Vm R^2: 0.9966341315379672
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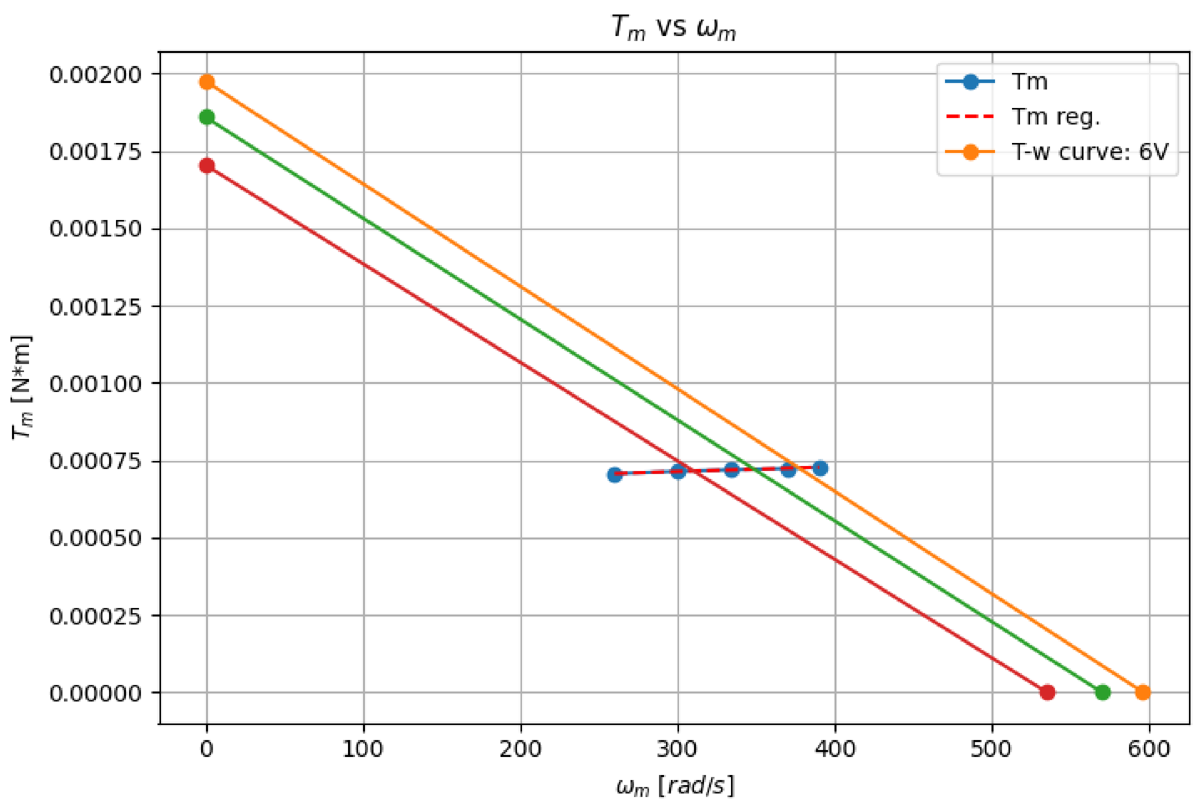
2. The plot of motor torque estimates both damping and static friction. It estimates the static friction by showing the torque at which the motor begins to move. By looking at the plot of motor torque vs motor speed, the slope of the curve would be the damping. Damping is the reactance to an applied speed, so because we know both the input and output, we can fit the damping coefficient. rm is found to be the slope in the table above using the slope of the motor voltage vs motor speed. The static friction torque Tmo = im*rm = 65.25 mA * 0.0108 Nm/mA= 7.047e-4 Nm. The damping coefficient can also be found using this information Bm = dT/dW = rm(dA)/(390-260) = 0.0108*(67.2-65.25)/(390-260) = 1.62e-4 Nm/W.
3.



Calculating the stall torque and no-load angular velocity, the torque speed curve can be generated. The stall torque can be computed using the motor constant divided by the resistance of the motor. The no-load angular velocity is found by taking the stall torque and dividing it by the motor constant squared over the resistance plus the damping term coefficient. By finding these two end points, the entire curve can be estimated.