Control System Laboratory Report

Name and ID no. of the Student:

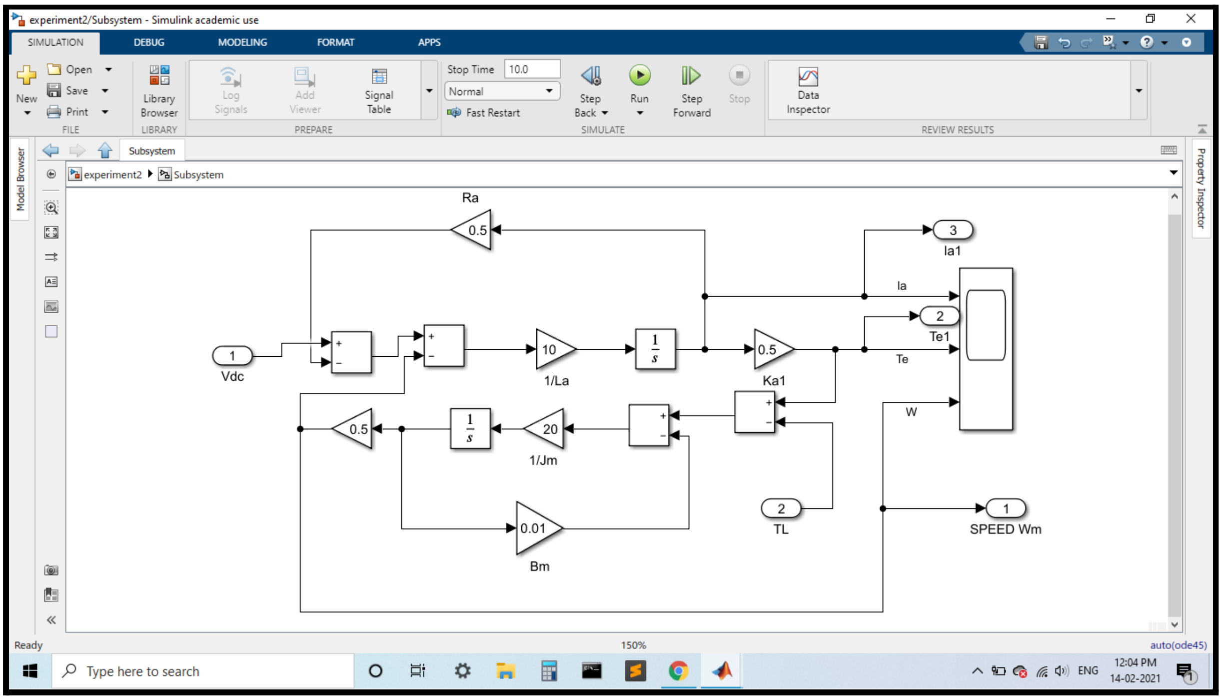
VISHWAS VASUKI GAUTAM, 2019A3PS0443H

Title of the Experiment:

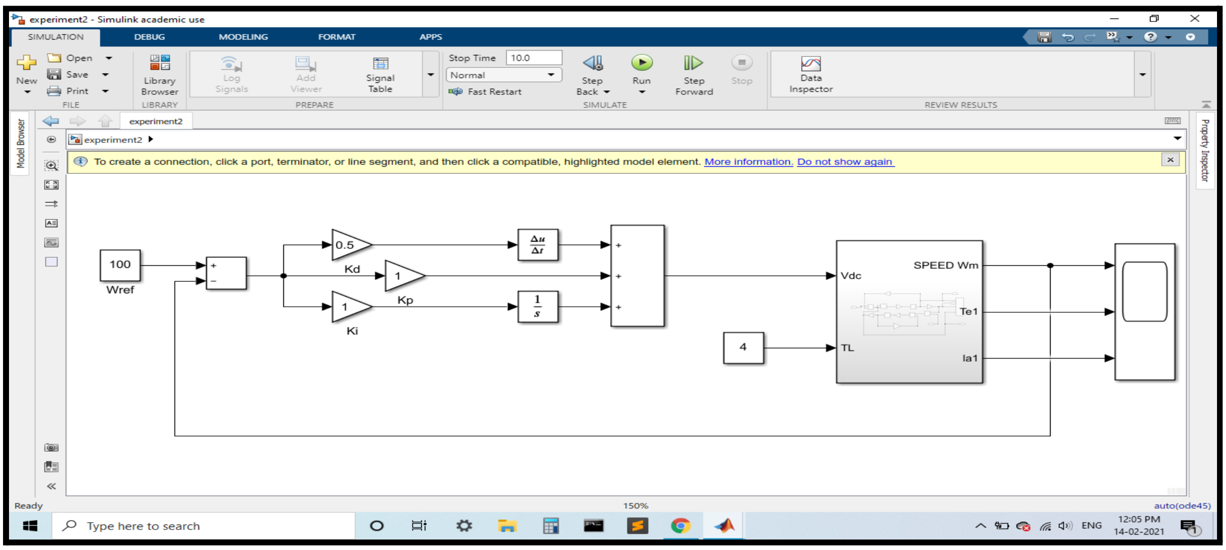
PID control

Model/Simulation:

a) The image below shows the Simulink model for the DC motor.

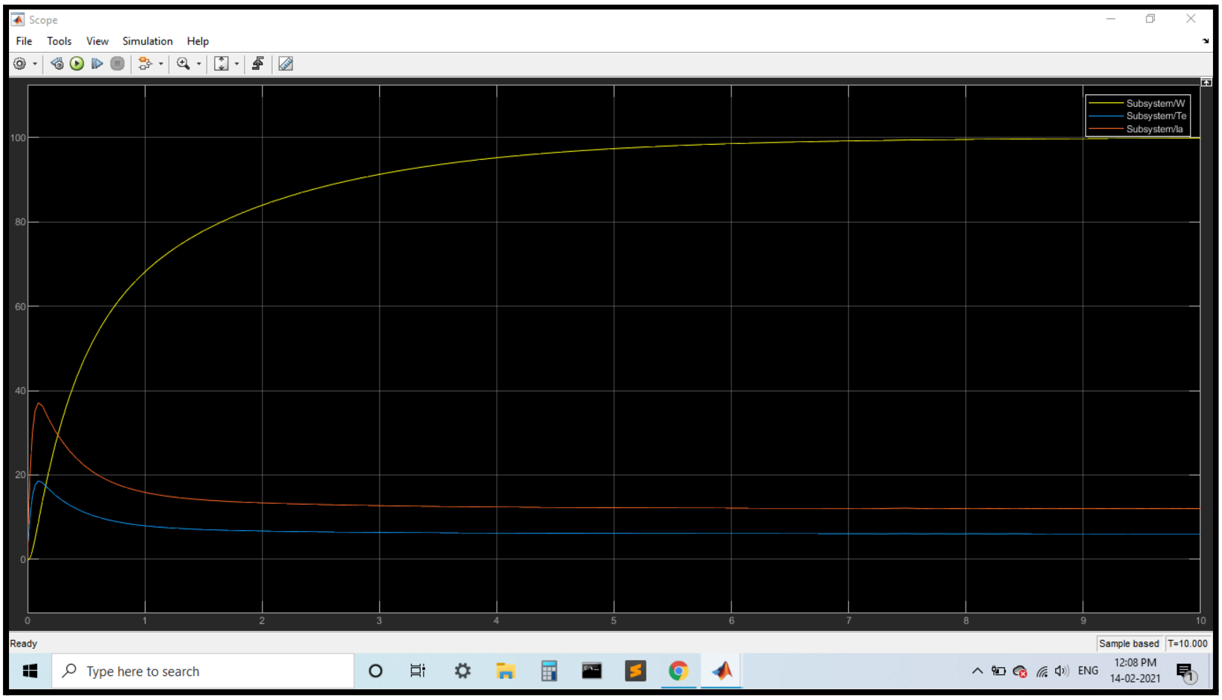


b) The image below shows the Simulink model for the PID control of the DC motor



Results:

The below is the plot from the scope that shows the control of the DC motor



Conclusive remarks:

The motor control of a DC control is continuously done using a PID controller. A PID controller continuously calculates the error is speeds of the DC motor i.e. Error = Reference_Speed - Actual_Speed. (The actual speed of the DC motor is obtained from the feedback loop.) This error is fed into the PID controller that uses the Proportionate, Integral and Derivative gains and the corresponding Proportional, Integral and Derivative terms and the sum of these terms is fed as input to the system.

In practical terms it automatically applies an accurate and responsive correction to a control function. This can be clearly seen in the Result graph, the DC motor initially is not at the reference speed of 100 angular velocity, however as time progresses the error goes on decreasing and the speed of the DC motor eventually reaches the reference speed. Another attribute of a PID controller is its ability to correct a system with minimum overshoot and minimum delay. This can be seen in the resulting graphs as well. However in case we need an overshoot or a delay, it can be achieved by varying the PID gains.

P term: This increases the speed of the response of the system.

I term: Gives the accumulated offset that should have been corrected previously.

D term: Provides more control over the overshoots and an appropriate value makes the system more stable.

The brief table below how *increasing* each gain will affect the system:

	Rise Time	Overshoot	Settling Time	SteadyStateError
Kp	↓	↑	small change	↓
Ki	↓	↑	↑	eliminated
Kd	↑	↓	↓	no change

Thus it can be seen that each term acts as a compensatory term for the other and the system remains balanced in the end. Therefore, PID controllers are highly versatile and are used in various applications.