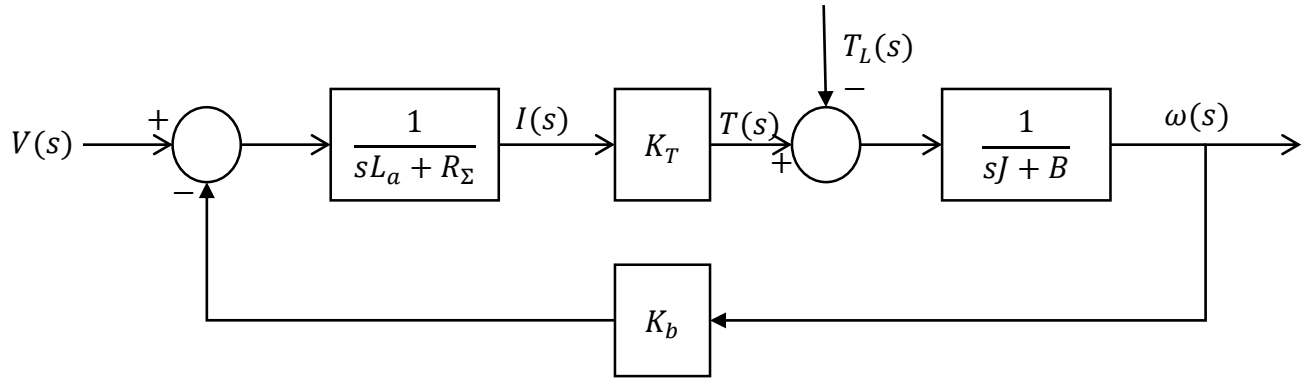
EE380A (Control Systems Lab) – Experiment 1 (Pre-Lab Work)

Q1. For $\frac{\omega(s)}{V(s)} = \frac{K_m}{\tau_m s+1}$, verify that $K_m = \frac{K_T}{R_\Sigma B+K_T K_b}$, $\tau_m = \frac{R_\Sigma J}{R_\Sigma B+K_T K_b}$ using the following figure, and determine the numerical values using the table.



Q2. Design using Bode plot-based techniques a controller of the minimum order possible to control the speed of the motor for the following time domain specifications: $e_{ss} \leq 2\%$, $t_s \approx 0.5s$ ($\pm 2\%$ tolerance band), $\%M_p \leq 20\%$.

Q3. Simulate the continuous-time controller designed in **Q2** using GNU Octave (Simulate the closed loop system). You can use GNU Octave functions like **series, feedback, cloop, conv,** etc.

If the closed loop system performance is not as desired, then redesign your controller and simulate.

Q4. Discretize the continuous-time controller with the sampling period T_s.

Q5. With the discretized version, perform a simulation of the digital control of the continuous-time plant using the m-file **easysim.m** provided. Plot your results as two subplots with ω vs t in the upper subplot, and u vs t in the lower subplot.

Q6. Write the digital controller part in C.