

ME334 Homework 1**Question 1**

A dc motor develops 600 N-m of torque at a speed of 50 rad/s when 200 volts are applied. It stalls out at this voltage with 1200 N-m of torque. The inertia and damping of the armature are 5 kg-m² and 2 N-m-s/rad, respectively. This motor drives the load through a gear train as shown in **Figure 1**.

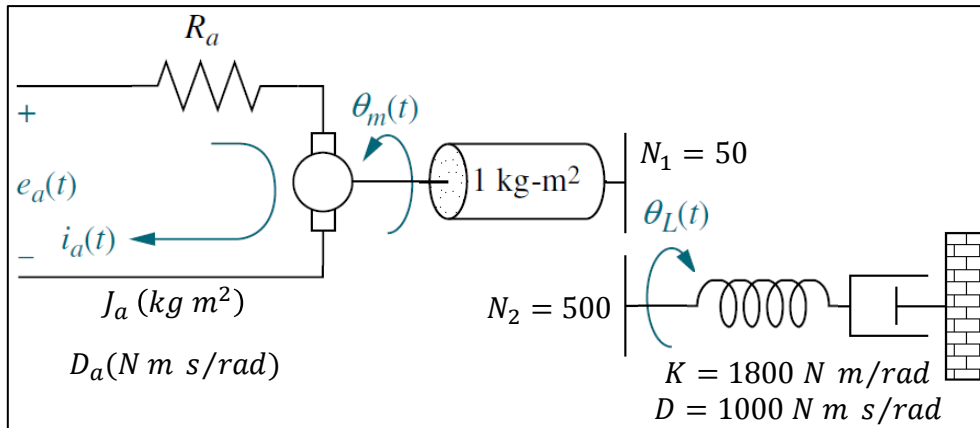


Figure 1. DC motor with gear train load

- Draw the torque-speed curve, **Torque** (N m) vs **Speed** (rad/s), and determine the function $T_m(\omega_m)$.
- Find the transfer function.

$$G(s) = \frac{\theta_L(s)}{E_a(s)}$$

Hint:

$$\frac{R_a T_m(s)}{K_t} + K_b s \theta_m(s) = E_a(s)$$