

ME333 Introduction to Mechatronics  
Quiz 8: Brushed DC Motors

Name \_\_\_\_\_

1. Write the motor power equation, derived in terms of  $V$ ,  $\tau$ ,  $I$ ,  $\omega$ ,  $L$ , and  $R$ :

$$IV_{\text{motor}} = \tau\omega + I^2R + LI^*(dI/dt)$$

2. Describe what each part of the equation in #1 relates to:

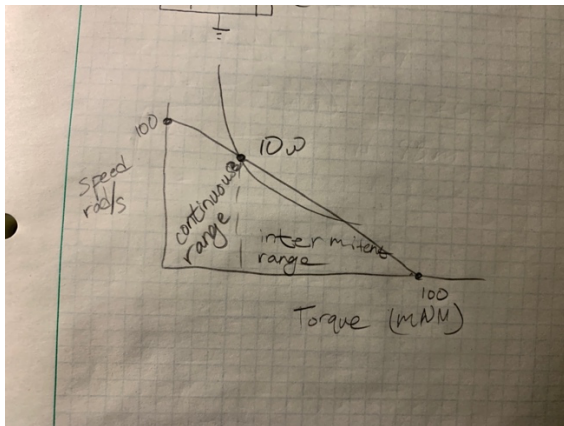
$IV$  = total power

$\tau\omega$  = mechanical power (rotational speed \* torque)

$I^2R$  = power dissipated through resistance of wires in the form of heat

$LI^*(dI/dt)$  = power dissipated through the inductor due to changing current

3. Draw the speed-torque curve for a motor at 10V, with  $R = 10\Omega$ ,  $P = 10W$ ,  $k_t = 0.1\text{Nm/A} = 0.1\text{Vs/rad}$ , and label the max continuous region.



4. Draw a motor connected to four switches, built in an h-bridge configuration. Label the switches that would need to close to make the motor rotate in one direction (either CW or CCW) and the switches to close to make the motor rotate in the other direction.

