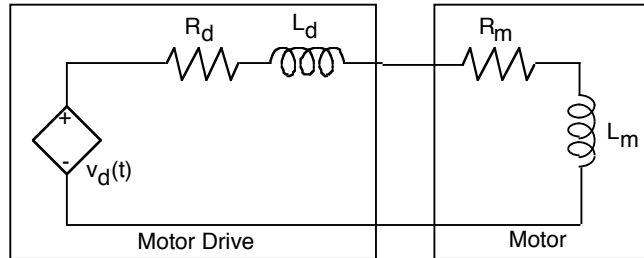


ECE 211 Fall 2003

Homework Seven

(Due 11/5/03 at the beginning of discussion.)

Problem One:



The above figure shows a steel mill main drive. When no steel is being rolled, the motor drive voltage $V_d=1V$. When steel enters the mill, the motor must reach 100A within 3 seconds or you will have a stall. The motor drive voltage will increase from its initial condition (1V) in a ramp of kt (i.e. $V_d=1+kt$). You are an engineer at this factory and if this stall happens you will have a multi-million dollar mess and your boss will probably fire you. You are considering purchasing a motor drive with the component values: $R_d=0.01R$, $L_d=5mH$, and $k=1.5$ V/s. The motor component values are: $R_m=0.04R$, and $L_m=45mH$.

- Graph the motor current vs. time for 5s.
- Would you buy this drive (is $k=1.5$ going to get you to 100A in 3s)?
- If you want a 20% safety factor (120A in 3s), what value of k will be required?

Problem Two:

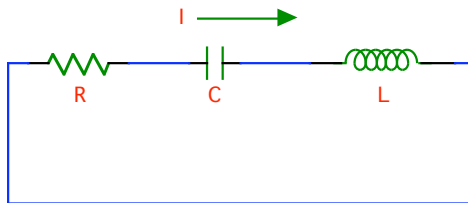


Figure 2A

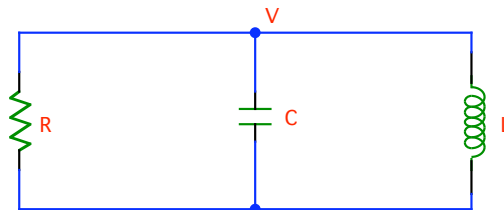


Figure 2B

In the circuit of Figure 2A at time zero, the current I is 1A and the capacitor voltage is 0V. The capacitance C is 100 microF and the inductance L is 2mH. Graph the current I from 0 to 10ms for $R=20R$, $R=8.94R$, and $R=2R$.

In the circuit of Figure 2B at time zero, the inductor current is 0A and the capacitor voltage V is 10V. The capacitance C is 100 microF and the inductance L is 2mH. Graph the voltage V from 0 to 10ms for $R=1R$, $R=2.24R$, and $R=10R$.