MCEN4043: SYSTEM DYNAMICS - FALL 2017

LABORATORY 9: MODELING OF ELECTROMECHANICAL SYSTEMS

Due Wednesday, 11/8

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OBJECTIVE

Students will use the MATLAB command 'ss' and Simulink to simulate and study the behavior of electromechanical systems.

$R = 300\ \Omega$

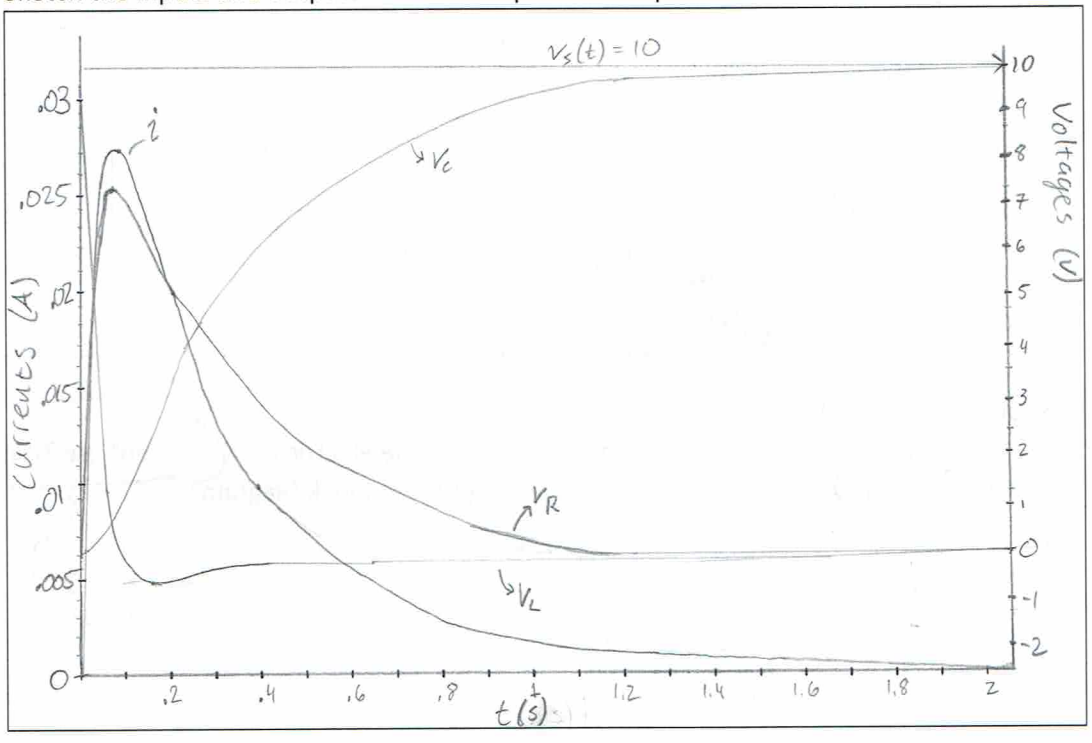
$C = 1 \times 10^{-6}$ F

$L = 10 \times 10^{-3}$ H

$V_s = 10$ V

Part A: Response of an RLC circuit under different inputs.

1. Prepare a MATLAB file to simulate the response of an RLC circuit under a constant voltage. Indicate the voltages across all elements.
2. Sketch the inputs and outputs in the same plot in the space below.

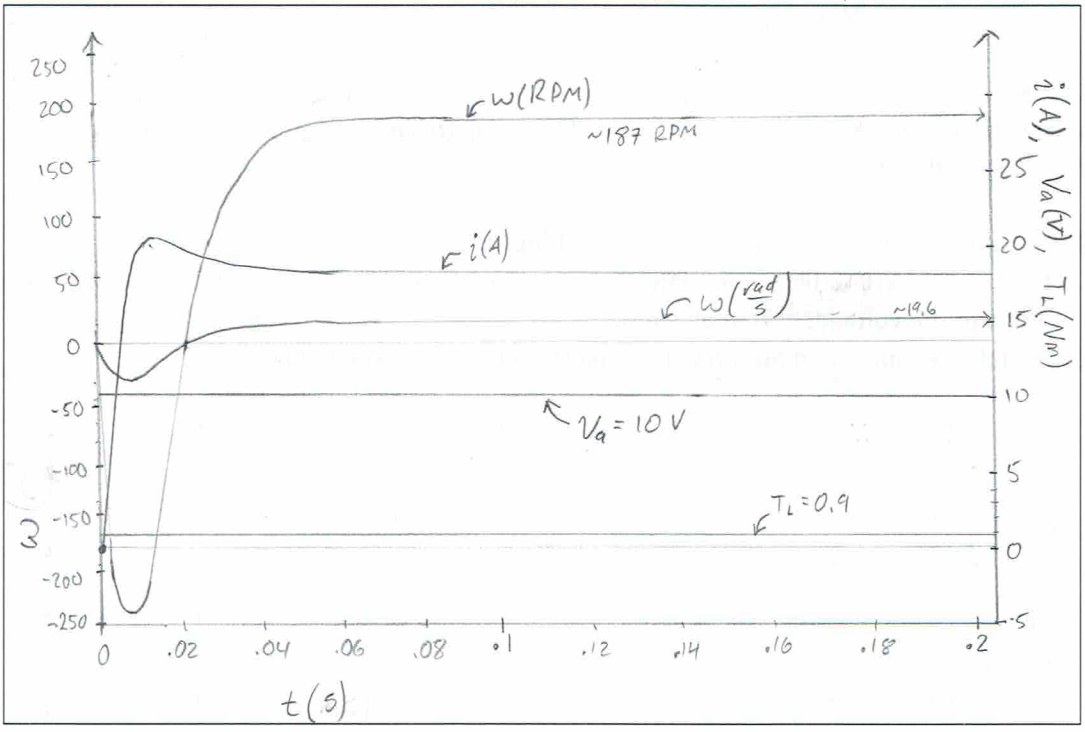


3. Submit the files to D2L.

Part B: Response of an Electric Motor under constant inputs.

4. Prepare a MATLAB file to simulate the response of an electrical motor subjected to a certain constant voltage and torque load.
5. Sketch the inputs and outputs in the same plot in the space below.

$L_a = 2 \times 10^{-3}$
$R_a = 0.5$
$K_b = K_T = .05$
$I = 9 \times 10^{-5}$
$c = 1 \times 10^{-4}$
$V_a = 10\ V$
$T_L = 0.9$



6. Submit the files to D2L.
7. Prepare and submit a Simulink file that models the same electric motor. Do not use Transfer Function Blocks, this is, do not reduce the corresponding Block Diagrams.

Included

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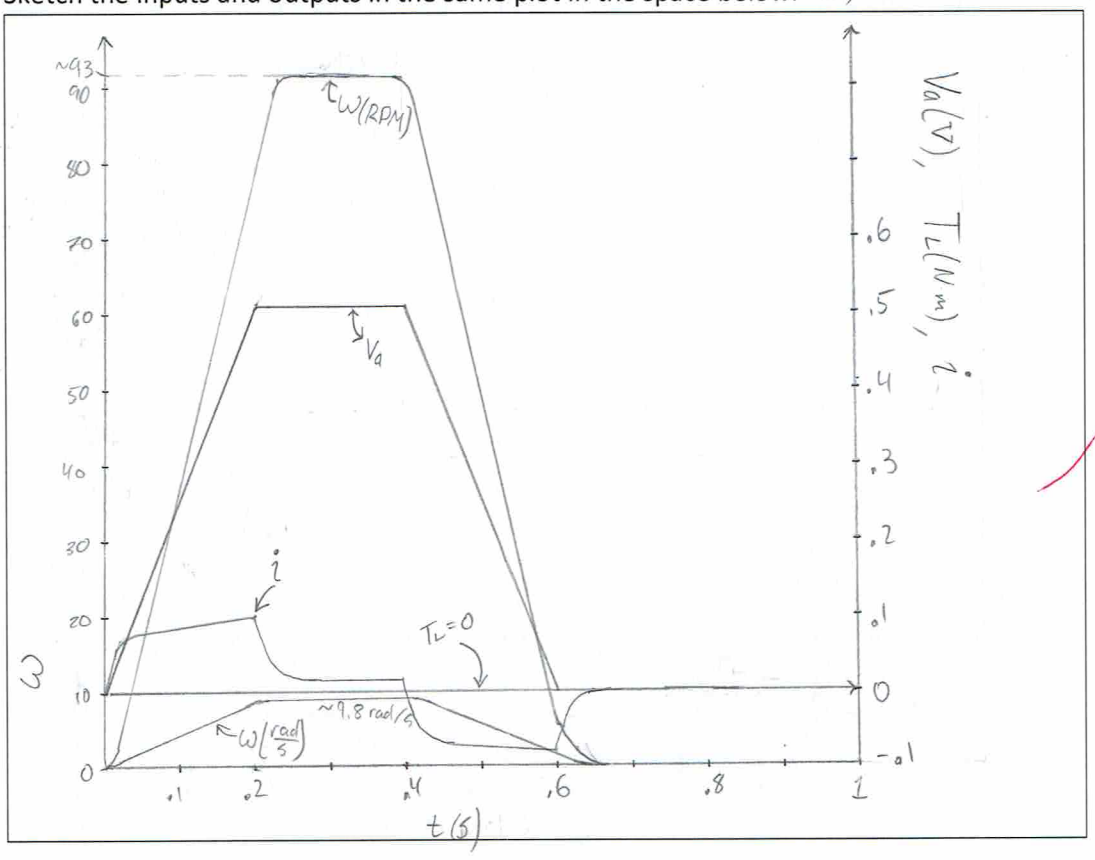
Part C: Response of an Electric Motor under a Trapezoidal Voltage.

8. Prepare a MATLAB file to simulate the response of an electrical motor subjected to a trapezoidal voltage and torque load.
9. Sketch the inputs and outputs in the same plot in the space below.

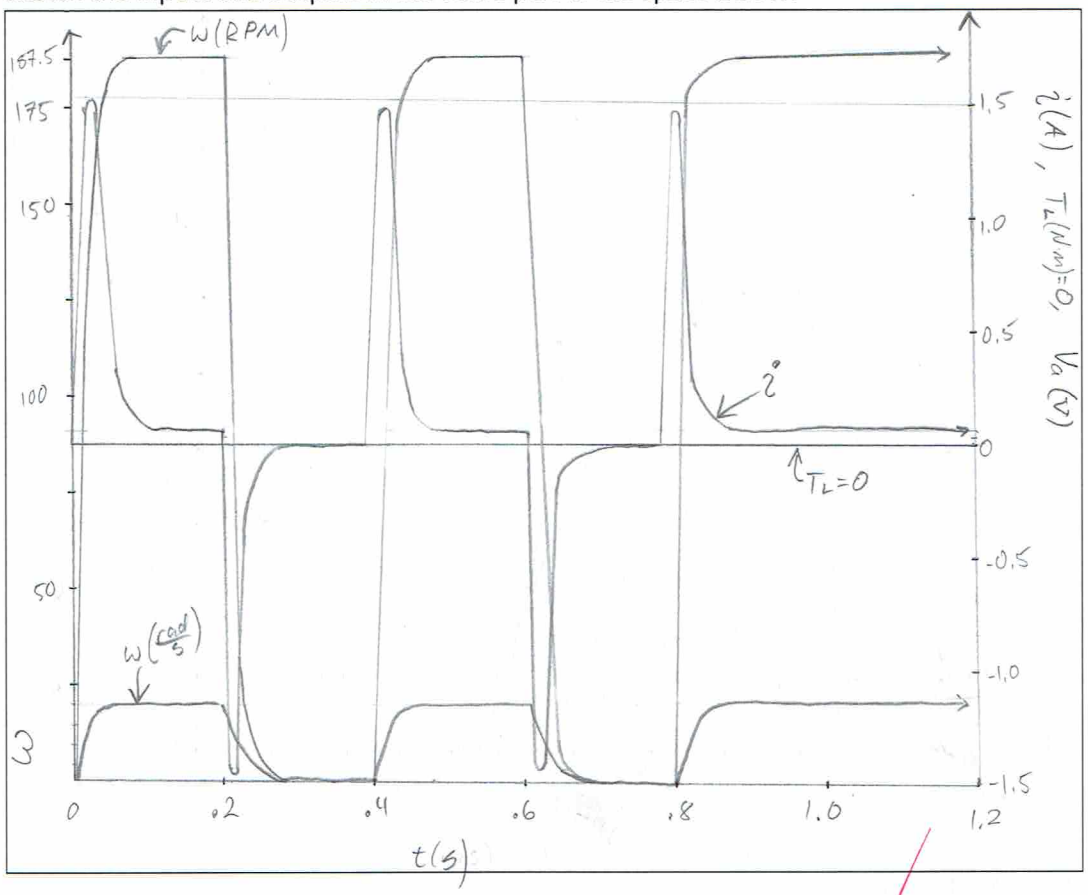


10. Submit the files to D2L.

Part D: Response of an Electric Motor under a Square Wave Voltage.

11. Prepare a MATLAB file to simulate the response of an electrical motor subjected to a square wave voltage and torque load.
12. Sketch the inputs and outputs in the same plot in the space below.

$T_L = 0$



13. Submit the files to D2L.