Coursework 1 – System Modelling and Transient Response (Approx. time 5 hrs)

The aim of this work is to form a simple electro-mechanical model and analyse the speed control for a DC motor used in a lift system.

Using the circuit model in Figure 1, create a second order model for the speed control of a motor and evaluate it using your assigned parameters – see Appendix.

Assuming a unity gain feedback closed-loop system to control the speed, assess the system transient performance to a step input for use within a lift (elevator) system, commenting on the actual system response, and the desired transient response of a lift system.

Discuss how to improve the transient performance of the speed control, using your own engineering judgement for the use of this within a lift system, justifying the reasons for the potential improvement.

Finally, reflect on why dynamic modelling of systems and understanding their transient response is important to support the design of controllers.
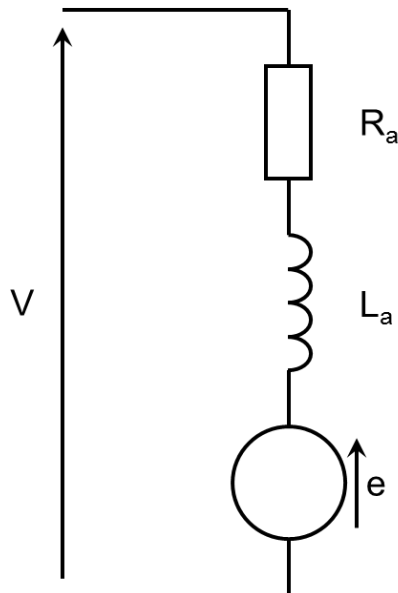

Figure 1 – Circuit model for DC motor

Submission

You are expected to submit a document of maximum 2 pages – any additional pages will be ignored. Ensure your name and candidate number are on the document. Your document is to be submitted through Blackboard, submission is closes on Friday 9th March at 5 pm GMT.

Appendix

Candidate Nos.		K_T (Nm/A)	K_e (V/(rad/s))	L_a (mH)	J (kgm²)	R_a (Ω)
From	To					
10206	34175	75.7	61.8	73.1	8.4	5.6
34176	35487	63.2	69.6	57.2	6.9	3.8
35488	38153	58.4	47.3	62.7	10.5	2.9
38154	39560	45.2	39.0	52.1	9.8	3.1
39561	67382	32.1	27.4	40.6	12.3	1.9