ELEC2400 - Matlab Computer Laboratory # 2

- All the MATLAB computer laboratories involve tasks being given which you must solve in MATLAB.
- The assessment for the laboratory requires you to hand in, **by 5pm on the Friday of the week you do the lab**, a file with the title `labx.m` (where `x` is the number of the lab in the title of this sheet).
- This file should be a MATLAB script file which when run, is your MATLAB solution to the tasks given.
- The file should be handed in via the blackboard link in the "tutorials" section of the course home page at `www.ee.newcastle.edu.au/brett/elec2400/tuts.html`
- If your name is 'Felix Student', and your student number is '6309070', then the first 3 lines of your file `labx.m` should be

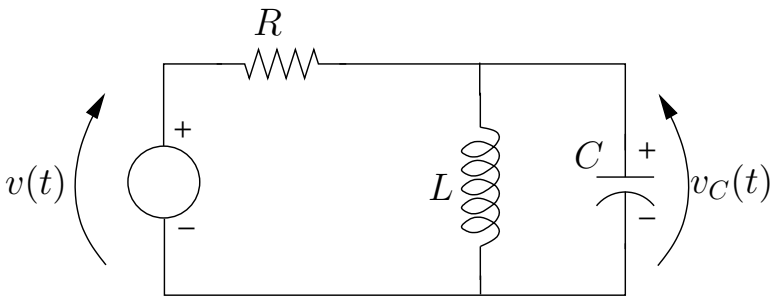
```
% Name: Felix Student
% Student Number: 6309070
clear all; close all;
```

- Precede each `plot` command with a `figure` command to open up a new figure window for each plot.
- Try to divide your solution file into sections that pertain to the individual questions on this sheet. This is best done by using a comment in your file `labx.m` such as:

```
% Solution to question 2(a) follows:
```

Now start MATLAB and address the following questions (over the page):

1. For the circuit shown below



the relationship between source voltage $v(t)$ and capacitor voltage $v_C(t)$ satisfies the differential equation relationship

$$\frac{\mathrm{d}^2}{\mathrm{d}t^2}v_C(t) + \frac{1}{RC}\frac{\mathrm{d}}{\mathrm{d}t}v_C(t) + \frac{1}{LC}v_C(t) = \frac{1}{RC}\frac{\mathrm{d}}{\mathrm{d}t}v(t).$$

Suppose that the actual component values are

$$C = 200\mu\mathrm{F}, \qquad L = 500\mathrm{mH}, \qquad R = 500\Omega$$

and that $v(t) = s(t - 0.1)$ where $s(t)$ is the unit step. Use MATLAB and the `lsim` command to simulate the capacitor voltage signal $v_C(t)$ over the time interval $t \in [0, 1s]$. Use 1000 time points in this range and generate a plot of $v_C(t)$ with the time axis labelled in ms.

2. Repeat the previous question with

$$C = 100\mu\mathrm{F}, \qquad L = 700\mathrm{mH}, \qquad R = 1\Omega$$

and this time plot both $v_C(t)$ and $v(t)$ on the same set of axes with a ms scale for the time axis.

3. Generate a MATLAB function RLC that when invoked with the command

```
vc = RLC(R,L,C,v,t)
```

will simulate, return and plot the capacitor voltage v_c for a given source voltage v, time axis vector `t`, and R, L, C. Use your function to generate a plot for the case of

$$R = 5000\Omega, \qquad L = 100\mathrm{mH}, \qquad C = 1000\mu\mathrm{F}.$$