

# Control Systems Assignment # 2

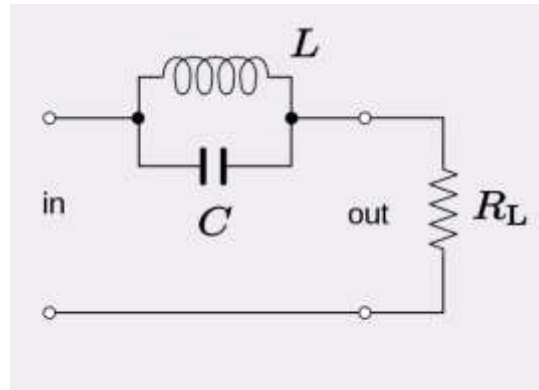
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## Problem 1

Develop a mathematical model in state space for the following circuit using first principles.



Write down the variables and constants, define which variables are state variables and which variables are input and output variables.

## Problem 2

Construct a mathematical (state space) model for the spread of an epidemic disease. Consider the state variables as follows

1. Number of people susceptible to the disease (S)
2. Number of people infected by the disease (I)
3. Number of people recovered from the disease after being infected (R)

Consider the input variable to be vaccination (V) and treatment (T). The output is the number of infected people (I).

## Problem 3

Find the equilibrium points and linearize the following systems

- a)  $\dot{x} = 5x^2 + 3x + 9$
- b)  $\dot{x} = -x^3 - x$
- c)  $\dot{x} = \cos(x) + \sin(x), (-\pi \leq x \leq \pi)$