1) The impulse response of a system is $h(t) = u(t) - u(t-4)$.

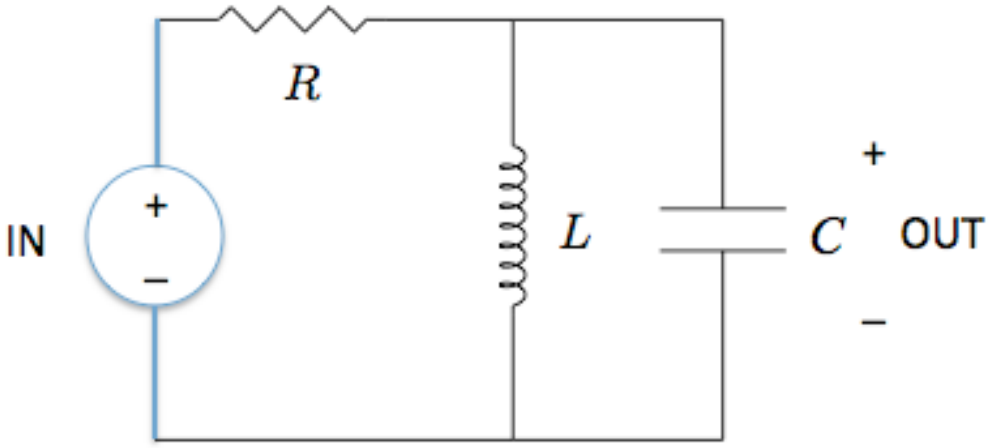
a) If the input to the system is given by $x(t) = exp(-t)\ u(t)$, find the output $y(t)$.

b) Find the natural response of the system given by $n(t)$.

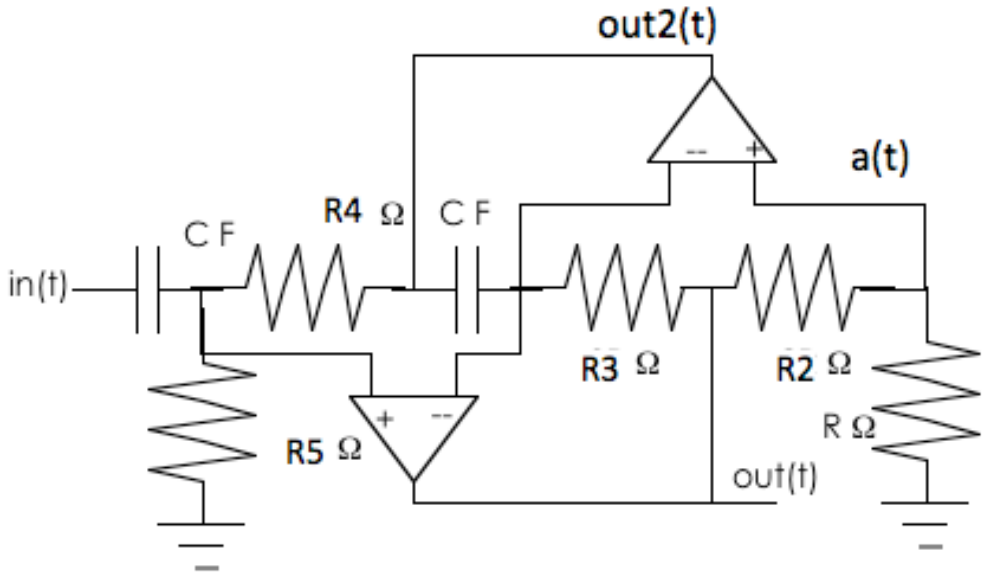
2) Consider the circuit below where R=5Ω, L = 4H, and C = 0.05F.

a)Find the transfer function $H(s) = OUT(s)/IN(s)$ and the impulse response $h(t)$.

b)Find the zero input response at out(t) when the inductor has an initial current from top to bottom; $i_L(0) = 0.1A$. There is zero initial charge on the capacitor.



3) Consider the circuit below. The output is given by out(t) . Find the state and then determine the state space representation.



4) A circuit is described by the following differential equation where *y(t)* is the output and *in(t)* is the input .

$$d^2y(t)/dt^2 + 5dy(t)/dt + y(t) = 2\,din(t)/dt + in(t)$$

(a) Find the transfer function for this circuit.

(b) Write a Matlab script to express the transfer function in symbolic form and from this find the poles of the system.

(c) Write a Matlab script to find the state space realization from the transfer function.

(d) Write a Matlab script to find the total response when *x(0) = [1 , -1]'* and *in(t) = exp(-t) cos(2t) u(t).*

1) The impulse response of a system is *h(t) = u(t) – u(t-2)* .

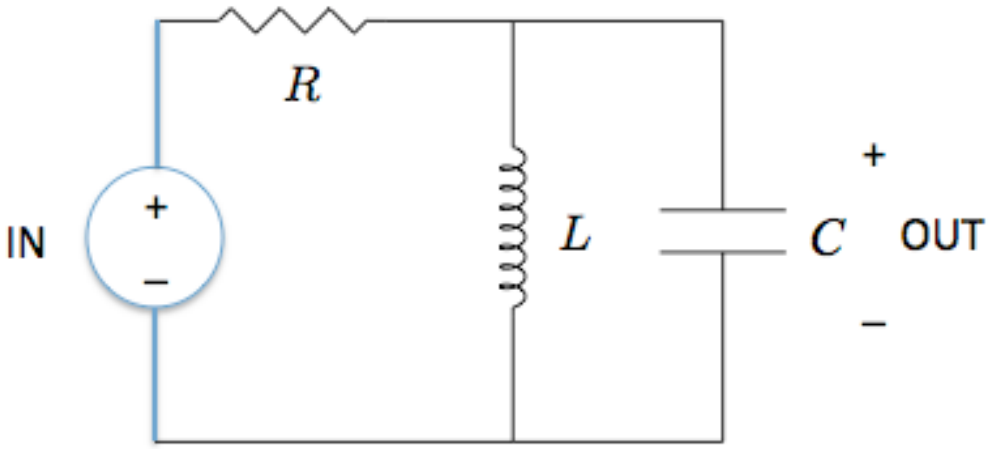
c) If the input to the system is given by *x(t) = exp(-2t) u(t)*, find the output *y(t)*.

d) Find the natural response of the system given by *n(t)*.

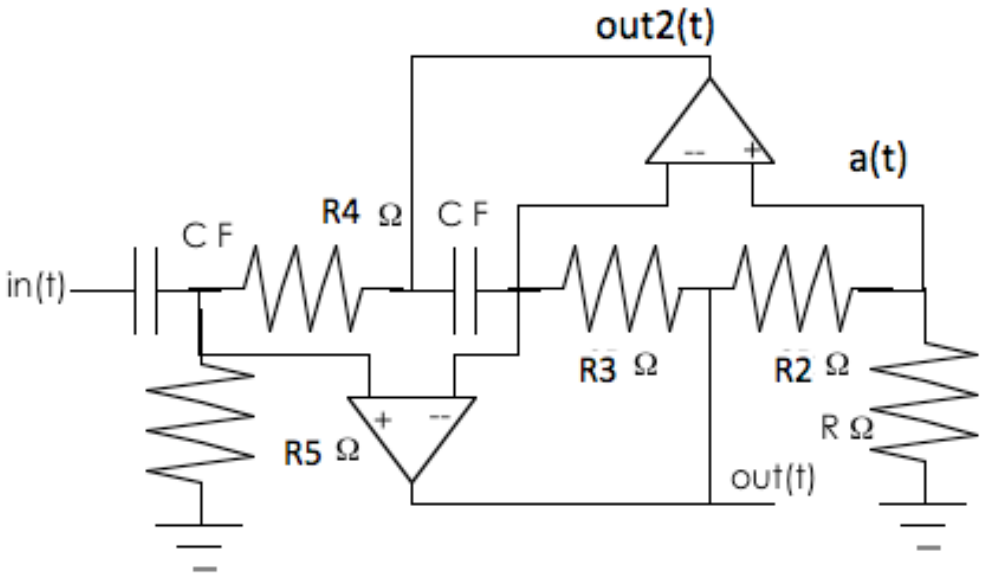
2) Consider the circuit below where R=10/3Ω, L = 5H, and C = 0.1F.

a)Find the transfer function *H(s) = OUT(s)/IN(s)* and the impulse response *h(t)*.

b)Find the zero input response at out(t) when the inductor has an initial current from top to bottom; $i_L(0) = 0.1A$. There is zero initial charge on the capacitor.



3) Consider the circuit below. The output is given by out2(t) . Find the state and then determine the state space representation.



4) A circuit is described by the following differential equation where *y(t)* is the output and *in(t)* is the input .

$$d^2y(t)/dt^2 + 13dy(t)/dt + 4y(t) = din(t)/dt + 3in(t)$$

(e) Find the transfer function for this circuit.

(f) Write a Matlab script to express the transfer function in symbolic form and from this find the poles of the system.

(g) Write a Matlab script to find the state space realization from the transfer function.

(h) Write a Matlab script to find the total response when *x(0) = [-1 , 2]'* and *in(t) = exp(-3) cos(5t) u(t).*