

College of Electronic Technology- Tripoli

Final-exam -Term: Spring 2020

Department: Communication Engineering

Subject: Dynamic Systems & Control

Semester: 5th

Examiner: Dr. Mosa Abdesalam

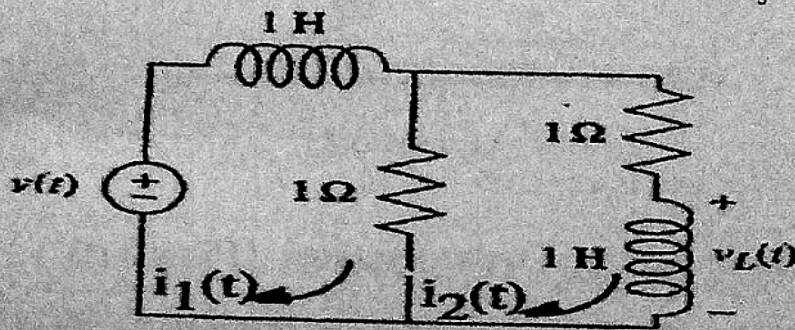
Marks: 40.

Allowed Time: 2.00 hrs.

Problem 1: Transfer Function for RLC (10 points)

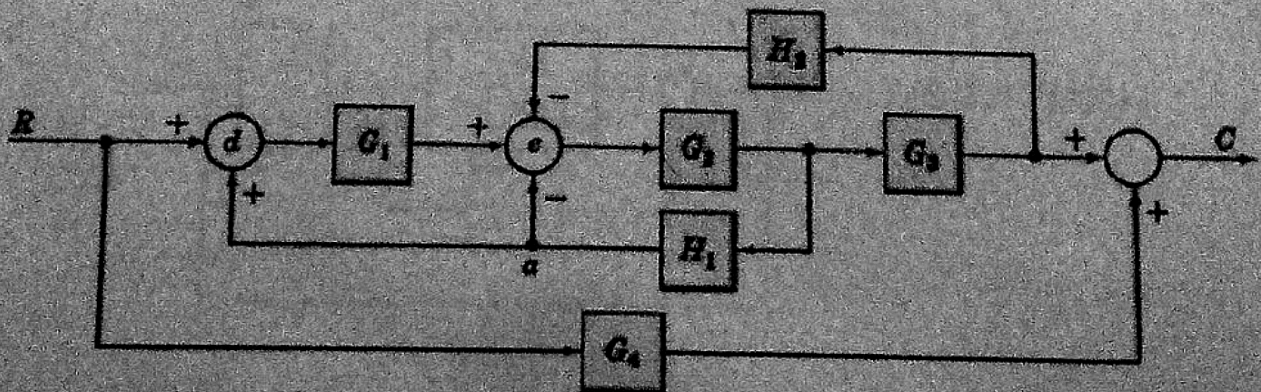
The network shown in Figure below. Assume that $v_i(t)$ is the input and $v_o(t)$ is the output. The output is the voltage through L_2 as shown in the figure as $(+ V_L(t) -)$.

1. Find the transfer function representation. (5 points)
2. Find the inverse Laplace transform of the $v_o(t)$. First, perform the partial fraction expansion on $v_o(s)$, where the input is unit step response ($v_i(s) = \frac{1}{s}$). (5 points)



Problem 2: signal flow graph. (10 points)

Determine the transfer function $(C(s)/R(s))$ for the block diagram below by signal flow graph techniques. (3 point-chang +7 point Mason's gain formula)



Problem 3: First Order Systems. (10 points)

Find the transfer function, $V_o(s)/V_i(s)$, for the circuit in Figure below. Where $R = 1\Omega$, and $L = 1H$.

Do the following:

1. Determine the transfer function $\frac{C(s)}{R(s)} = V_o(s)/V_i(s)$.
2. Draw the step response of the network. Where the input is unit step response ($R(s) = \frac{1}{s}$).
3. Determine the values of time constant, rise time, settling time, and steady state error.
4. For the system shown figure below evaluate the static error constants K_p , K_v and K_a and find the expected steady state errors for the unit step, ramp and parabolic inputs.

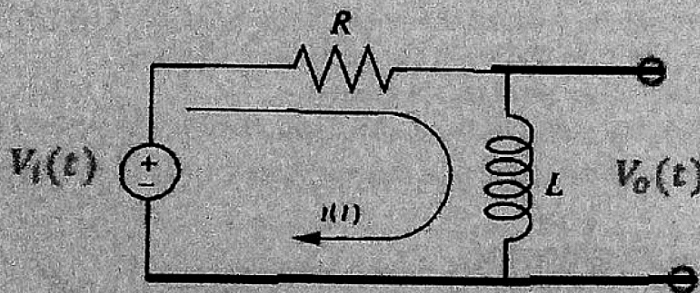
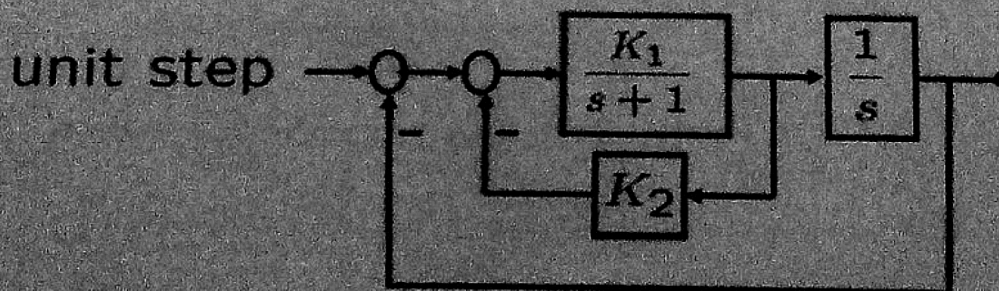


FIGURE RL network

Problem 4: Second Order Systems. (10 points)

1. For the system shown in Figure below, determine the values of gain K_1 and K_2 so that the maximum overshoot in the unit-step response is 0.163 and the peak time is 2 sec. With these values of K_1 and K_2 , obtain the rise time, settling time 2%, 5%, β and ω_n .
2. Determine the static error constants K_p , K_v and K_a and find the expected steady state errors for the unit step, ramp and parabolic inputs.



Good Luck.