College of Electronic Technology– Tripoli

Final-exam -Term: Spring 2020

Department: Communication Engineering

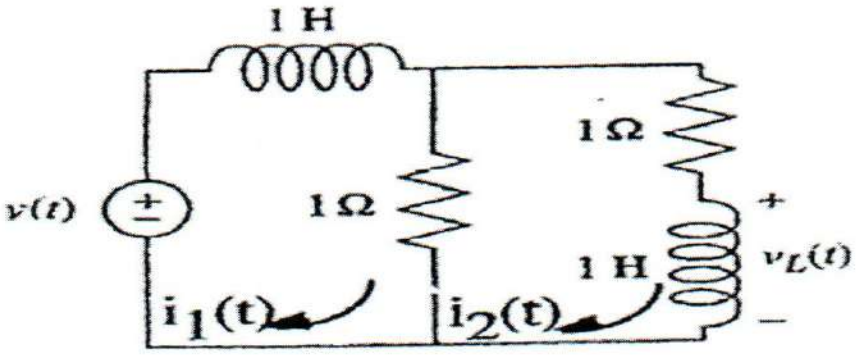
Subject: Dynamic Systems & Control **Semester: 5th**

Examiner: Dr. Mosa Abdesalam **Marks: 40.** **Allowed Time: 2.00 hrs.**

Problem 1: Transfer Function for RLC (10 points)

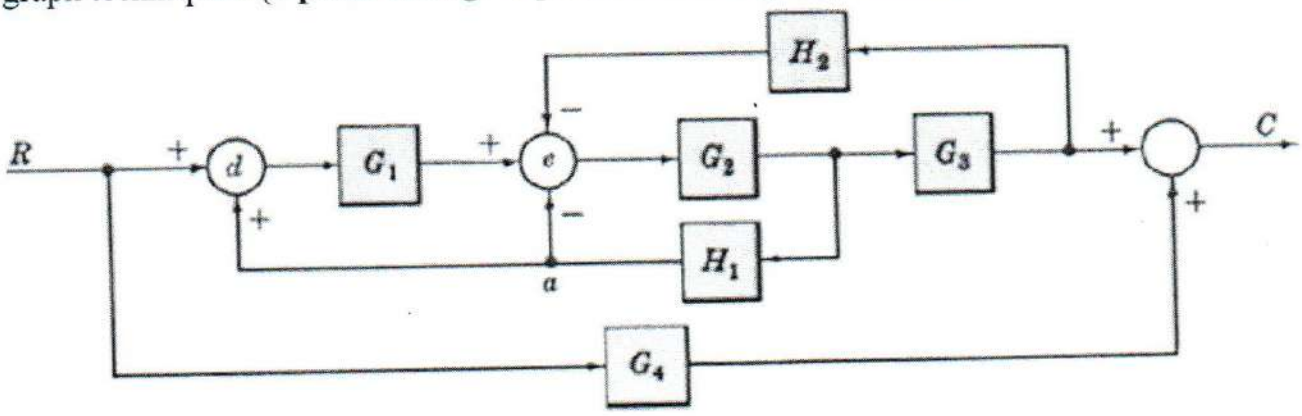
The network shown in Figure below. Assume that $v_i(t)$ is the input and $v_o(t)$ is the output. The output is the voltage through L_2as shown in the figure as$(+\ V_L(t)-)$.

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.

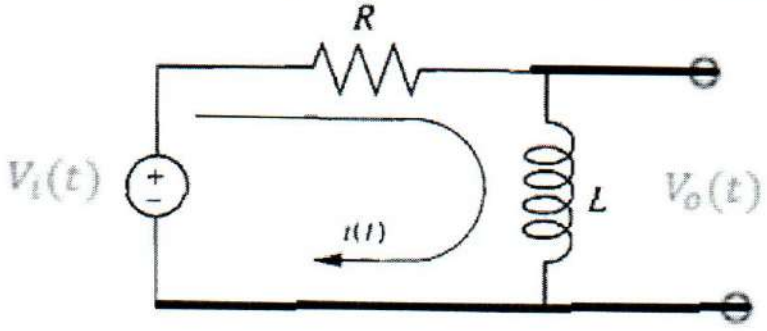
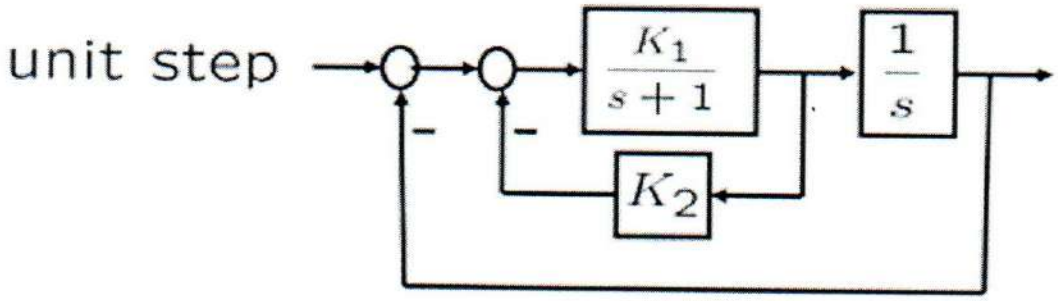


FIGURE RL network

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 andK_2, obtain the rise time, settling time 2%, 5%, β and w_d.
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.