O K L A H O M A S T A T E U N I V E R S I T Y

S C H O O L O F E L E C T R I C A L A N D C O M P U T E R E N G I N E E R I N G

ECEN 3723 Systems I
Spring 1999
Final Exam

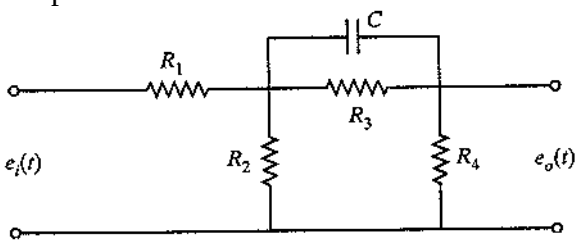
Name : _____

Student ID: _____

E-Mail Address:_____

Problem 1: (*Time-Response*)

Derive the transfer function $E_o(s)/E_i(s)$ of the electrical circuit shown below. Then obtain the response $e_o(t)$ when the input $e_i(t)$ is a unit step of magnitude E_i (i.e., $e_i(t) = E_i u(t)$). Assume that the initial charge in the capacitor is zero.

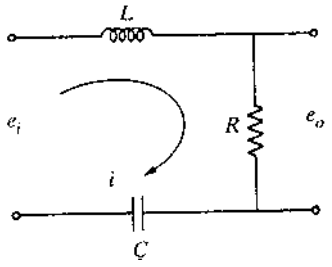


Problem 2: (*Frequency Response*)

Consider the electrical circuits shown beloew. Assume that the input is sinusoidal,

$e_i(t) = E_i \sin \omega t$,

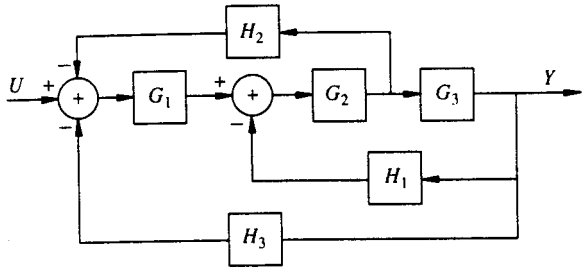
what is the steady state current $i(t)$?



Problem 3: (*Block Diagram Reduction*)

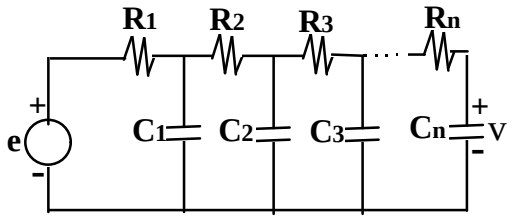
For the plant shown below prove that transfer function is

$$\frac{Y(s)}{U(s)} = \frac{G_1 G_2 G_3}{H_1 G_2 G_3 + H_3 G_1 G_2 G_3 + G_1 G_2 H_2 + 1}$$



Problem 4: (Transfer Function)

Derive the transfer function $V(s)/E(s)$ for the given RC ladder circuit given below.



Problem 5:

Obtain the inverse z-transform of

$$X(z) = \frac{(1-e^{-T})z^{-1}}{(1-z^{-1})(1-e^{-T}z^{-1})}$$