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 5713 System Theory
Fall 1997
Midterm Exam #1

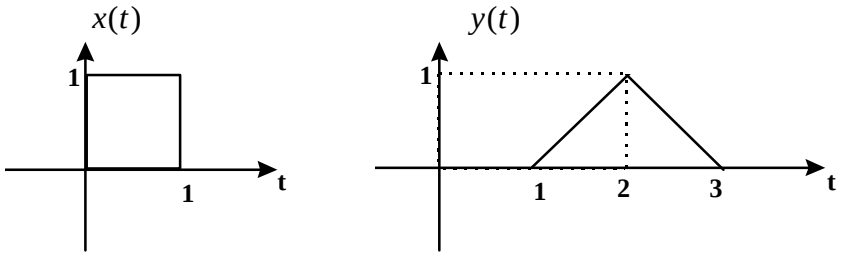
Name : _____

Student ID: _____

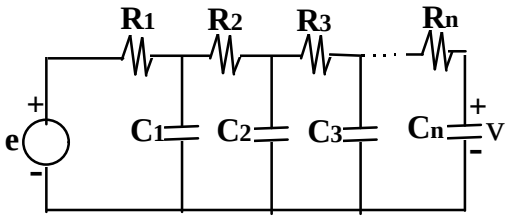
E-Mail Address:_____

Problem 1: (*Classification of the Systems*)

A system is found to have zero-state response, $y(t)$, when the input, $x(t)$, is applied. Is this system a) causal, b) time-varying, c) zero-memory, and/or d) zero-state linear ? Justify your answer.



Problem 2: *(Mathematical Representation)*
Derive the state space representation for the RL ladder circuit given below: (where **e** is the input voltage and **V** is the output voltage)



Problem 3: (*Realization Theory*)
Find a minimal *observable* canonical form realization (i.e., its simulation diagram and state space representation) for the following MISO system described by

$$H(s) = \left[\frac{2s+3}{s^3+4s^2+5s+2} \quad \frac{s^2+2s+2}{s^4+3s^3+3s^2+s} \right]$$

Problem 4:

Find the observable canonical form realization (in minimal order) from discrete-time system

$$y(k+3)+3ky(k+2)+e^{-k}y(k+1)+y(k)=k^2u(k+3)-(k+1)u(k+1).$$

Notice that gain blocks may be *k* dependent.

Problem 5: (Best Estimate)
What is your best (i.e., in least mean square sense) estimate of Longhorns vs. Cowboys game ?