

OKLAHOMA STATE UNIVERSITY
SCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING



ECEN 5713 Linear System
Fall 1998
Midterm Exam #1



Name : _____

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Problem 1:

Suppose it is known that a discrete-time system has impulse response described by $h(n, k) = \sin k u(n - k)$. Is this system causal? Is it time-invariant? Please justify your answer.

Problem 2:

Linearize the (bilinear control) system described by

$$\dot{y} + (3 + \dot{y}^2)\ddot{y} + (1 + y + \dot{y}^2)u = 0$$

about the equilibrium point. Show the linearized state space representation (i.e., including state equation and output equation).

Problem 3:

Consider the linear system described by

$$y(t) = \int_{-\infty}^t (t + e^{-t} \sin(t - \tau)e^{\tau} + 2 - \tau)u(\tau)d\tau$$

find the transfer function $H(s)$ and state space representation $\{A, B, C, D\}$ with corresponding simulation diagram.

Problem 4:

Realize the following SIMO discrete-time, time-varying system and show the state space representation $\{A(k), B(k), C(k), D(k)\}$ with corresponding simulation diagram

$$y_1(k) + k^2 y_2(k-1) + k y_1(k-2) = u(k) + k^2 u(k-1) + k u(k-2)$$

$$\frac{1}{k+1} y_2(k+2) + k^2 y_1(k) = u(k+2) + k u(k+1) + 2u(k)$$