Rutgers University
The State University Of New Jersey
College of Engineering
Department of Electrical and Computer Engineering

330:501 Systems Analysis

Problem Set 4

1. **S & B: Chapter 3, Problem 1**
2. **S & B: Chapter 3, Problem 2**
3. **S & B: Chapter 3, Problem 6**
4. **S & B: Chapter 3, Problem 7**
5. **S & B: Chapter 3, Problem 14**
6. You are given a system with scalar output $y(t) = \frac{du(t)}{dt}$ for a scalar input $u(t)$. Can this system be rendered in state-space form? That is, can appropriate **A B C** and **D** be found such that
$$\dot{\mathbf{x}} = \mathbf{A}\mathbf{x} + \mathbf{B}u$$
and
$$y = \mathbf{C}\mathbf{x} + \mathbf{D}u$$
Either find the appropriate matrices or prove that no such matrices exist.
7. Let $y(t)$ be a scalar output and $u(t)$ be a scalar input with transfer function
$$H(s) = \frac{Y(s)}{U(s)} = \frac{1 + s(s+1)^2}{s(s+1)}$$
Following problem 6, can appropriate **A B C** and **D** be found to render this system in state-space form? If so, find the matrices. If not, show why not.
8. Finally, suppose
$$H(s) = \frac{Y(s)}{U(s)} = \frac{1 + s(s+1)}{s(s+1)}$$
can appropriate **A B C** and **D** be found? If so, find the matrices. If not, show why not.