



Course: Digital Control (CSE416)

Date: 18/11/2019

Midterm Exam 1

Total: 30 marks

Time: 1.5 hour

Attempt the following questions:

Question (1): (10 marks)

For the following signal shown in Figure 1, calculate the z-transform of $x(t)$ assuming that the sampling time is 1 sec.

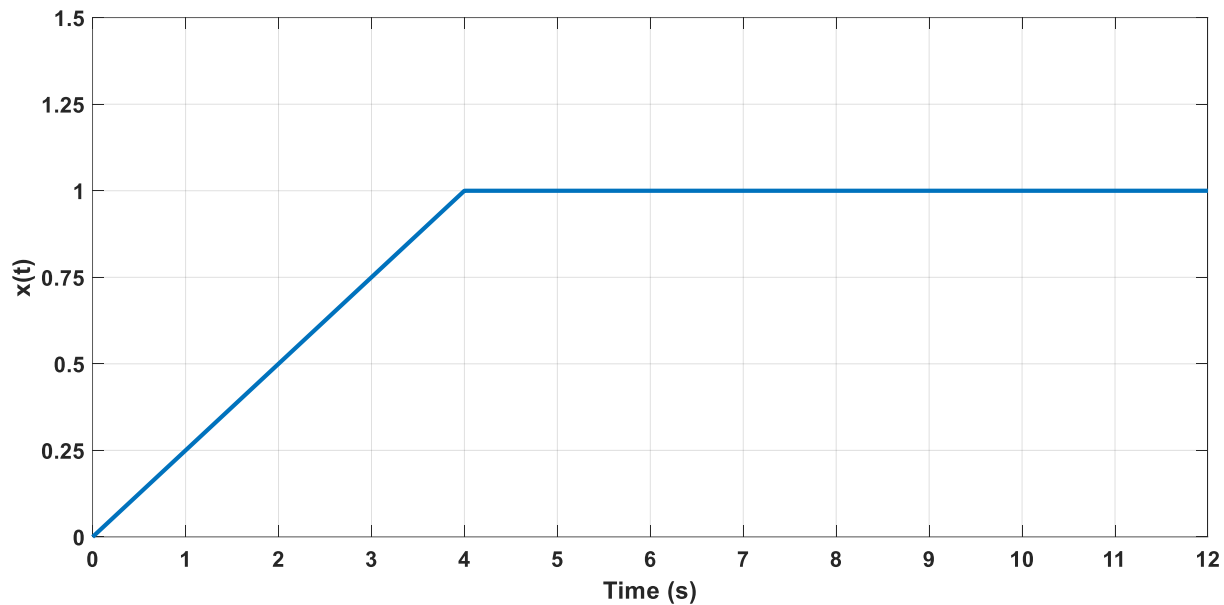


Figure 1

Question (2): (10 marks)

Consider the cruise control systems in Figure 2. The input the traction force u , the output is the cruising speed v , b is the damping ratio, and M is the car mass.

1. Obtain the continuous transfer function model of the system $\frac{V(s)}{U(s)}$.

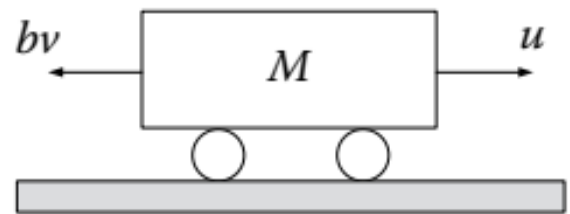


Figure 2

2. Discretize the continuous transfer function to obtain $\frac{V(z)}{U(z)}$ using the zero-order hold.

Question (3): (10 marks)

Consider the following block diagram:

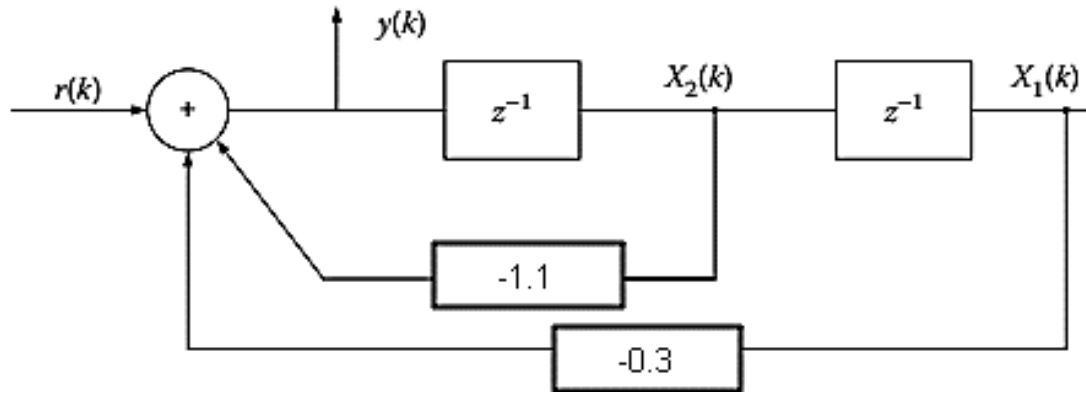


Figure 3

1. Derive the state variable model for the above block diagram.
 2. Derive the transfer function $\frac{Y(z)}{R(z)}$.
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