EEE2035 Class Test 2

Friday 7th April

Name:

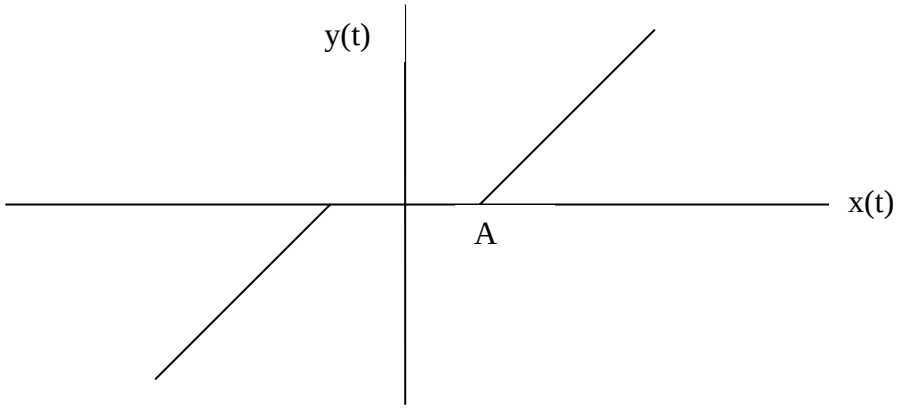
Student Number:

Information

- The test is closed book.
- The test has 3 questions.
- Answer all questions.
- You have 45 minutes.
- There are 20 available marks

Question 1:

A continuous time system is said to have a dead zone if the output response y(t) is zero for any input of x(t) with |x(t)| < A where A is a constant called the threshold. An example is a DC motor that is unable to supply any torque until the input voltage exceeds a threshold value (i.e. the input voltage x(t) does not result in a y(t) > 0). Show that such a system with a dead zone is non-linear.



Hint: To disprove linearity you must show that one of the properties of linear systems (homogeneity, additivity, or shift invariance) does not hold.

(5 marks)

Question 2:

A linear time invariant system responds the following inputs with the corresponding outputs:

If $x(t) = u(t)$ then $y(t) = (1 - e^{-2t})u(t)$

If $x(t) = \cos(2t)$ then $y(t) = 0.707\cos(2t - \pi/4)$

What will the output y(t) be for the following x(t):

(a) $x(t) = \delta(t)$

(b) $x(t) = tu(t)$

Hint: What relationship exists between the inputs?

(8 marks)

Question 3:

A linear time invariant system has the impulse response:

$h(t) = (\sin\ t)u(t-2)$

Compute the output response $y(t)$ for all $t \geq 0$ when:

$x(t) = u(t) - u(t-1)$

There is no initial energy in the system.

(7 marks)
