EEE2035F: Signals and Systems I

Class Test 1

16 March 2015

Name:

Student number:

Information

- The test is closed-book.
- This test has *four* questions, totaling 20 marks.
- Answer *all* the questions.
- You have 45 minutes.

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1. (5 marks) Suppose

$$p_\tau(t) = \begin{cases} 1 & |t| \leq \tau/2 \\ 0 & \text{otherwise} \end{cases}$$

and $u(t)$ is the unit step. Sketch the following signals over the range $-3 \leq t \leq 3$:

(a) $x_1(t) = \cos(4\pi t - \pi)$

(b) $x_2(t) = -p_1(2t + 4)$

(c) $x_3(t) = 2u(t)u(2 - t)$.

2. (5 marks) Suppose the output $y(t)$ of a system is related to the input $x(t)$ via the relationship

$$y(t) = x(2t),$$

and $u(t)$ is the unit step.

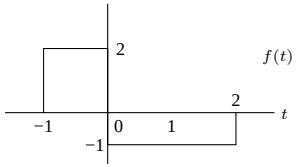
(a) Plot the output when the input is $x(t) = u(t)$.

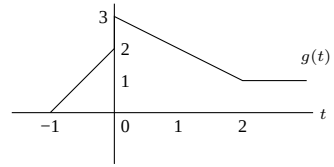
(b) Plot the output when the input is $x(t) = u(t-1)$.

(c) Is the system time invariant? Why?

(d) Show that the system is linear.

3. (5 marks) Suppose we have the following signals:



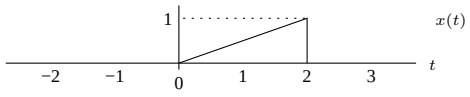


Plot the following:

(a) $x_1(t) = \int_{-\infty}^{t} f(\lambda)d\lambda$

(b) $x_2(t) = \frac{d}{dt}g(t)$ (the generalised derivative).

4. (5 marks) Suppose $s(t)$ is as defined as



Plot the following:

(a) $y_1(t) = s(t) * \delta(t-1)$

(b) $y_2(t) = s(-t) * \delta(t-1)$

(c) $y_3(t) = s(t)\delta(t-1)$.

(d) $y_4(t) = s(-t)\delta(t-1)$.