Course: 3W04	**Solutions to Assignment #1**	Class 99/00

Instructor: Dr. W. Garland

1. [20 marks]

(a)

$$\int_{-\infty}^{+\infty} d(-3t)(1+\cos^2 pt)dt = \frac{1}{|-3|}(1+\cos^2 \frac{p \cdot 0}{-3}) = \frac{2}{3}$$

[5 marks]

(b)

$$\int_{-\infty}^{+\infty} d(t-\frac{1}{2})\frac{t^2}{(t^2+7)}dt = \frac{(\frac{1}{2})^2}{(\frac{1}{2})^2+7} = \frac{1}{29}$$

[5 marks]

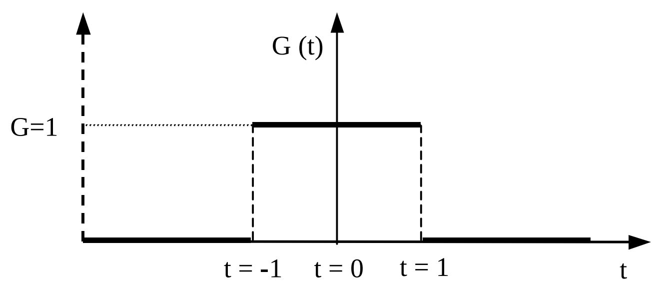
(c)

$$\int_{4}^{7} d(t-2)f(t)dt = 0$$

(since, if treated as an ordinary function, δ(t-2) = 0 for t∈[4,7])

[5 marks]

(d)



[5 marks]

2. [20 marks]

(a) If y(x) is linear then y(0)=y(0+0)=y(0)+y(0) and therefore y(0)=0. Take y(x)=ax+b. It follows that y(0)=a·0+b=b, and therefore ax+b is linear if and only if b=0.

[10 marks]

(b)

$$y(t) = \int_{-\infty}^{+\infty} x(t)h(t-t)dt = \int_{-\infty}^{+\infty} x(t)d(t-t)dt = x(t)$$

Physically, this means that, if the system response to an impulse is an impulse, then what goes in, goes out, i.e. y(t)=x(t).

[10 marks]

3. [20 marks]

The output signal can be presented as

$$y(t) = \int_{-\infty}^{+\infty} x(t)h(t-t)dt = x * h$$

When

$$x(t) = e^{2\pi i \nu_0 t} \quad ,$$

(then)

$$y(t) = \int_{-\infty}^{+\infty} e^{2pin_0 t} \cdot h(t-t)dt = \int_{-\infty}^{+\infty} e^{2pin_0(t-t')} \cdot h(t')dt'$$
$$= e^{2pin_0 t} \cdot H(n_0)$$

where $H(\nu_0)$ is the F.T. of h(t). The system response to an exponential function is another exponential function (modified by an amplitude $H(\nu_0)$).

[20 marks]

Total number of points: 60

Date: Jan 25, 2000