Solution to ECE Test #5 S05

1. Given that $Ae^{-at}\sin(3t)\mathrm{u}(t) \overset{\mathcal{L}}{\longleftrightarrow} \dfrac{12}{s^2+6s+b}$, what are the numerical values of *A*, *a* and *b*?

A = 4 , *a* = 3 , *b* = 18

$$Ae^{-at}\sin(3t)\mathrm{u}(t) \overset{\mathcal{L}}{\longleftrightarrow} \frac{3A}{(s+a)^2+9} = \frac{12}{s^2+6s+b} \Rightarrow A = 4\ ,\ a = 3 \text{ and } b = 18$$

2. Let the function $\mathrm{x}(t)$ be defined by $\mathrm{x}(t) \overset{\mathcal{L}}{\longleftrightarrow} \dfrac{s(s+5)}{s^2+16}$. $\mathrm{x}(t)$ can be written as the sum of three functions, two of which are sinusoids.

(a) What is the third function? An impulse

(b) What is the radian frequency ω of the sinusoids? ω = 4

The fraction is improper in *s*. Synthetically dividing,

$$\frac{s(s+5)}{s^2+16} = 1 + \frac{5s-16}{s^2+16} = 1 + 5\frac{s}{s^2+16} - 4\frac{4}{s^2+16}$$

$$\delta(t) + 5\cos(4t) - 4\sin(4t) \overset{\mathcal{L}}{\longleftrightarrow} 1 + 5\frac{s}{s^2+16} - 4\frac{4}{s^2+16}$$

Solution to ECE Test #5 S05

1. Let the function $\mathrm{x}(t)$ be defined by $\mathrm{x}(t) \overset{\mathcal{L}}{\longleftrightarrow} \dfrac{s(s+2)}{s^2+64}$. $\mathrm{x}(t)$ can be written as the sum of three functions, two of which are sinusoids.

(a) What is the third function? An impulse

(b) What is the radian frequency ω of the sinusoids? ω = 8

The fraction is improper in *s*. Synthetically dividing,

$$\frac{s(s+2)}{s^2+64} = 1 + \frac{2s-64}{s^2+64} = 1 + 2\frac{s}{s^2+64} - 8\frac{8}{s^2+64}$$

$$\delta(t) + 2\cos(16t) - 4\sin(16t) \overset{\mathcal{L}}{\longleftrightarrow} 1 + 2\frac{s}{s^2+64} - 8\frac{8}{s^2+64}$$

2. Given that $Ae^{-at}\sin(5t)\mathrm{u}(t) \overset{\mathcal{L}}{\longleftrightarrow} \dfrac{30}{s^2+12s+b}$, what are the numerical values of *A*, *a* and *b*?

A = 6 , *a* = 6 , *b* = 61

$$Ae^{-at}\sin(5t)\mathrm{u}(t) \overset{\mathcal{L}}{\longleftrightarrow} \frac{5A}{(s+a)^2+25} = \frac{30}{s^2+12s+b} \Rightarrow A = 6\ ,\ a = 6 \text{ and } b = 61$$