

## Homework Assignment #8 – Fourier Transforms

### Reading Assignment:

Chapter 17 in Electric Circuits, 9<sup>th</sup> Edition by Nilsson  
 Chapter 7 in Linear Systems and Signals, 2<sup>nd</sup> Edition by Lathi

### Problem Assignment:

Note: The use of integral tables is recommended for many of the assigned problems.

- 1) Work the following Ch. 17 problems in Electric Circuits, 9<sup>th</sup> Edition by Nilsson:  
 1, 2, 3, 5, 24, 28a, 37, 39
- 2) Work the following Ch. 7 problems in Linear Systems and Signals, 2<sup>nd</sup> Edition by Lathi:  
 7.1-4, 7.1-6, 7.2-4, 7.3-3, 7.3-7

### Selected Answers:

17.3) a)  $F(\omega) = \frac{-j4\pi A}{\pi^2 - 4\omega^2} \sin(2\omega)$       b)  $F(\omega) = \frac{4A}{\omega T^2} \left[ 1 - \cos\left(\frac{\omega \tau}{2}\right) \right]$

17.24)

$$H(j\omega) = \frac{j\omega}{j\omega + 40} \quad I_g = (200 \times 10^{-6}) \left( \frac{2}{j\omega} \right) = \frac{400 \times 10^{-6}}{j\omega} \quad i_o(t) = 400e^{-40t}u(t) \mu\text{A}$$

17.37) a)  $f(t) = \frac{1/\pi}{1+t^2}$       b)  $W = \frac{1}{2\pi} \text{ J}$       c)  $W = \frac{1}{2\pi} \text{ J}$       d)  $\omega_1 = \frac{1}{2} \ln(10) \approx 1.15 \text{ rad/s}$

17.39)

7.1-4) a)  $X(\omega) = \frac{1 - e^{-(j\omega+a)T}}{j\omega + a}$       b)  $X(\omega) = \frac{1 - e^{-(j\omega+a)T}}{j\omega - a}$

7.1-6) a)  $x(t) = \frac{(w_o^2 t^2 - 2) \sin(w_o t) + 2w_o t \cos(w_o t)}{\pi^3}$       b)  $x(t) = \frac{\sin(2t) + \sin(t)}{\pi}$

7.2-4) a)  $x(t) = \frac{w_o}{\pi} \text{sinc}[w_o(t - t_o)]$       b)  $x(t) = \frac{1 - \cos(w_o t)}{\pi t}$

7.3-3) a)  $X(\omega) = \frac{j4}{\omega} \sin^2\left(\frac{\omega T}{2}\right)$       b)  $X(\omega) = \frac{1}{1 - \omega^2} (1 + e^{-j\pi\omega})$

c)  $\frac{1}{1 - \omega^2} (j\omega + e^{-j\pi\omega/2})$       d)  $X(\omega) = \frac{1}{j\omega + a} (1 - e^{-(a+j\omega)T})$

7.3-7) a)  $x(t) = \frac{2}{\pi} \text{sinc}(t) \cos(4t)$       b)  $x(t) = \frac{2}{\pi} \text{sinc}^2(t) \cos(4t)$