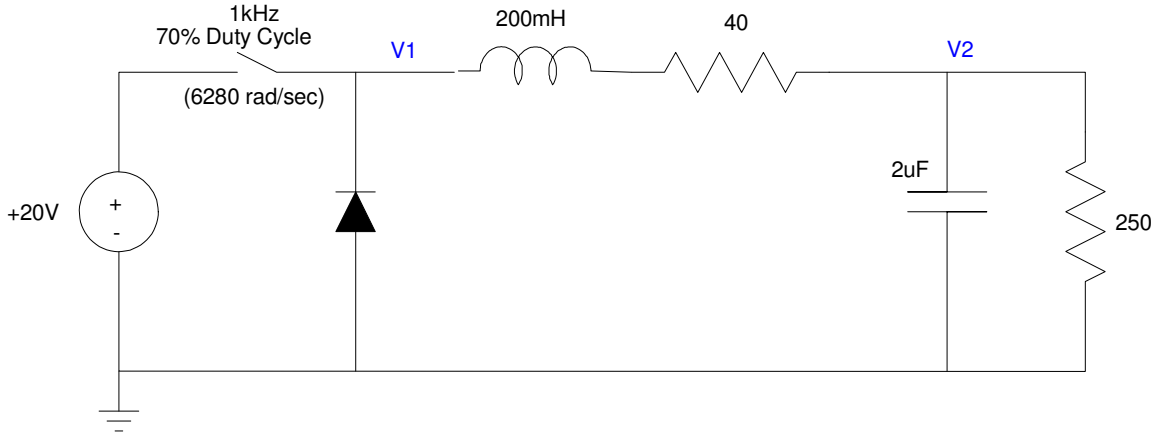
ECE 320: handout #16

Fourier Transforms

Assume the Fourier transform for V1(t) is

$$V1(t) = 113.78 - 6.26\cos(6280t) + 8.62\sin(6280t) + 1.94\cos(12560t) + 5.96\sin(12560t)$$

Find V2(t)



Solution:

V1(t) = 113.78 - 6.26 cos(6280t) + 8.62 sin(6280t) + 1.94 cos(12560t) + 5.96 sin(12560t)

Taking the DC term

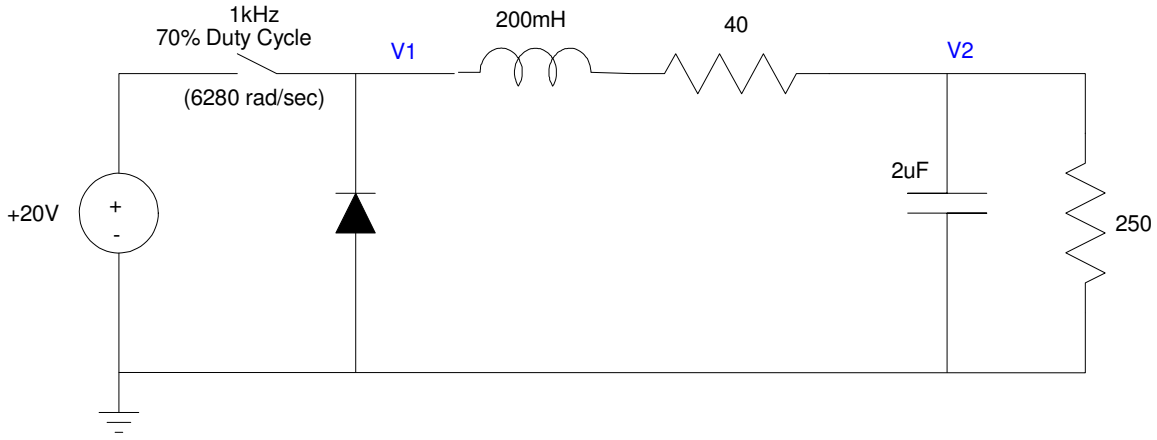
V1(t) = 113.78

Converting to phasors

$$V_1 = 113.78$$

$$V_2 = \left(\frac{250}{250+40}\right) 113.78$$

$$V_2 = 98.086$$



Solution:

V1(t) = 113.78 - 6.26 cos(6280t) + 8.62 sin(6280t) + 1.94 cos(12560t) + 5.96 sin(12560t)

1KHz Term:

V1(t) = - 6.26 cos(6280t) + 8.62 sin(6280t)

Convert to phasors

$$\omega = 6280$$

$$V_1 = -6.26 - j8.62$$

$$L \rightarrow j1256\Omega$$

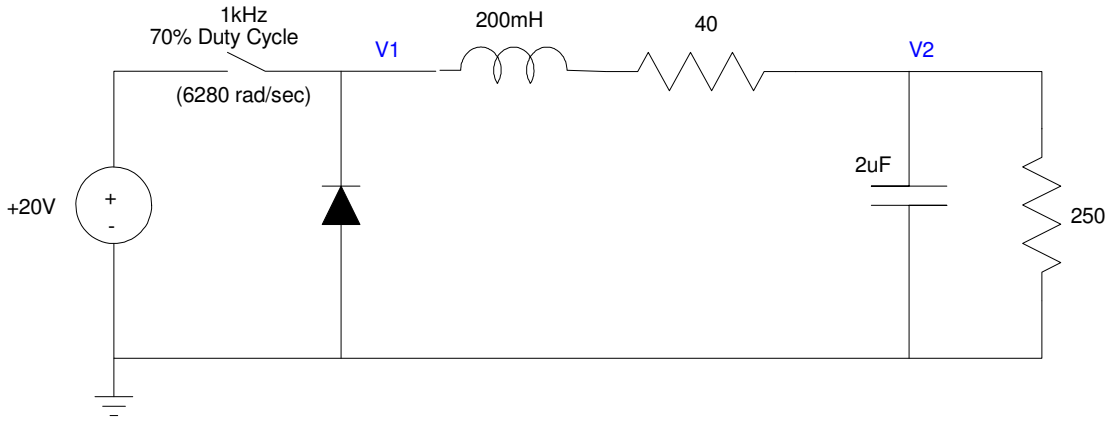
$$C \rightarrow \frac{1}{j\omega C} = -j79.62$$

$$250 || -j79.62 = 23.02 - j72.29$$

$$V_2 = \left(\frac{(23.02 - j72.09)}{(23.02 - j72.09) + (40 + j1256)} \right) (-6.26 - j8.62)$$

$$V_2 = 0.1801 + j0.6565$$

$$v_2(t) = 0.1801 \cos(6280t) - 0.6565 \sin(6280t)$$



Solution:

V1(t) = 113.78 - 6.26 cos(6280t) + 8.62 sin(6280t) + 1.94 cos(12560t) + 5.96 sin(12560t)

At 2kHz

V1(t) = + 1.94 cos(12560t) + 5.96 sin(12560t)

convert to phasors

$$\omega = 12,560$$

$$V_1 = 1.94 - j5.96$$

$$L \rightarrow j2512\Omega$$

$$C \rightarrow -j39.81\Omega$$

$$250 || -j39.81\Omega = 6.182 - j38.82$$

$$V_2 = \left(\frac{(6.182 - j38.82)}{(6.182 - 38.62) + (40 + j2512)}\right)(1.94 - j5.96)$$

$$V_2 = -0.0470 + j0.0870$$

$$v_2(t) = -0.0470\cos(12560t) - 0.0870\sin(12560t)$$

Total Answer: DC + 1kHz + 2kHz

$$v_2(t) = 98.086$$
$$+0.1801\cos(6280t) - 0.6565\sin(6280t)$$
$$-0.0470\cos(12560t) - 0.0870\sin(12560t)$$