HW #20 Solutions EE301

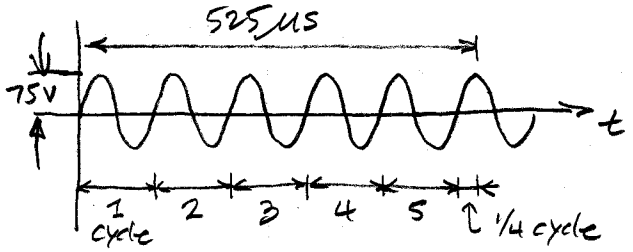
Ch. 15 #'s 13, 14, 18, 22, 25

15.13) Square wave, $f = 847\ Hz$

How many cycles in $T = 2min, 57sec$

$$\#\ Cycles = fT = \left(847\ \frac{cycles}{sec}\right)(177sec) = \boxed{149,919\ Cycles}$$

15.14)



a) Period = Duration of one cycle = T

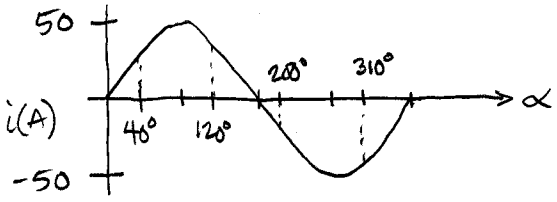
$$T = \frac{525\mu s}{5.25\ cycles} = \boxed{100\mu s/cycle}$$

b) Frequency = cycles/sec

$$f = \frac{1}{T} = \frac{1}{100\mu s/cycle} = \boxed{10kHz}$$

c) Peak-to-Peak Value = 2(75V) = $\boxed{150V}$

15.18)



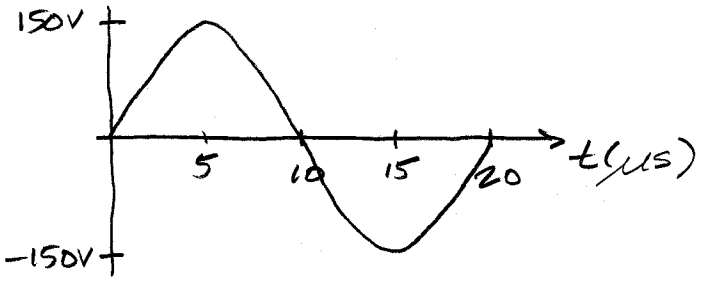
a) From the graph above, we can infer that the 50A peak occurs at 90° and crosses the y-axis at 180°. Therefore, this is a sine wave

$$\boxed{i = 50A \sin\alpha}$$

b)
$$i(40°) = 50A \sin 40° = \boxed{32.1A}$$
$$i(120°) = 50A \sin 120° = \boxed{43.3A}$$
$$i(200°) = 50A \sin 200° = \boxed{-17.1A}$$
$$i(310°) = 50A \sin 310° = \boxed{-38.3A}$$

15.22) 50 kHz sine wave, amplitude of 150V.

$$T = \frac{1}{f} = \frac{1}{50\text{kHz}} = 20\mu s$$



15.25) 20kHz sine wave, 50V at $t = 5\mu s$.
Find V_m and sketch waveform

First, find $\omega = 20{,}000 \frac{\text{cycles}}{\text{sec}}\left(\frac{360°}{1\text{ cycle}}\right) = 7.2\times10^6 \text{ deg/sec}$

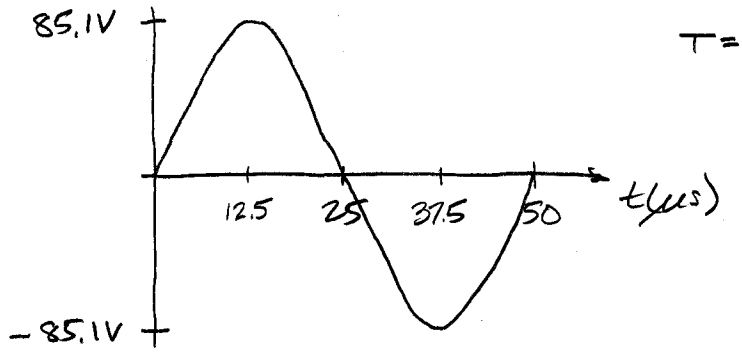
$V(t) = V_m \sin \omega t$ ← for use when calculator in DEGREE mode.

at $t = 5\mu s$, $V = 50V$

$$V(5\mu s) = V_m \sin\left(7.2\times10^6 \text{ deg/sec}\right)\left(5\times10^{-6}\text{ s}\right)$$

$$50V = V_m \sin(36°)$$

$$\boxed{V_m = 85.1V}$$



$$T = \frac{1}{f} = \frac{1}{20\text{kHz}} = 50\mu s$$