

ICPs – Inductive Reactance

Recall $X_L = \omega L = 2\pi f L$

P1 – Find the reactance of a 2H inductor at

a) $F=60\text{Hz}$

$$X_L = 2\pi \cdot 60 \cdot 2 = 754 \text{ Ohms}$$

b) $F=2\text{kHz}$

$$X_L = 2\pi \cdot 2000 \cdot 2 = 25.13 \text{ kOhms}$$

P2 – Determine the inductance of a coil with a reactance of

a) 20 Ohms @ 2Hz

$$L = 20 / (2\pi \cdot 2) = 1.59\text{H}$$

b) 5280 Ohms @ 1000Hz

$$L = 5280 / (2\pi \cdot 1000) = 0.84\text{H}$$

P3 – Determine the frequency (in Hz) for a 10H inductor with

a) $X_L = 50 \text{ Ohms}$

$$f = 50 / (2\pi \cdot 10) = 0.796\text{Hz}$$

b) $X_L = 3770 \text{ Ohms}$

$$f = 3770 / (2\pi \cdot 10) = 60\text{Hz}$$

ICPs – Capacitive Reactance

$$\text{Recall } X_c = 1/(w \cdot C) = 1/(2 \cdot \pi \cdot f \cdot C)$$

P1 – Find the reactance of a 5uF capacitor for

- a) **F=DC** $X_c = 1/(2 \cdot \pi \cdot 0 \cdot 5E-6) = \text{Infinity Ohms (o/c)}$
- b) **F=60Hz** $X_c = 1/(2 \cdot \pi \cdot 60 \cdot 5E-6) = 530.5 \text{ Ohms}$
- c) **F=24kHz** $X_c = 1/(2 \cdot \pi \cdot 24,000 \cdot 5E-6) = 1.33 \text{ Ohms}$

P2 – Find the frequency at which a 50uF capacitor has

- a) **$X_c = 342 \text{ Ohms}$** $f = 1/(2 \cdot \pi \cdot 342 \cdot 50E-6) = 9.31 \text{ Hz}$
- b) **$X_c = 2000 \text{ Ohms}$** $f = 1/(2 \cdot \pi \cdot 2000 \cdot 50E-6) = 1.59 \text{ Hz}$

P3 – Given $V_c(t) = 30 \cdot \sin(200t)$ Volts for a 1uF capacitor, find $i_c(t)$

$I_c(t) = (V_m/X_c) \cdot \sin(200t+90\text{deg}) \text{ A}$, Ohms law and I Leads V for cap

$$X_c = 1/(200 \cdot 1E-6) = 5000 \text{ Ohms}$$

$$I_c(t) = 6E-3 \cdot \sin(200t+90\text{deg}) \text{ A}$$